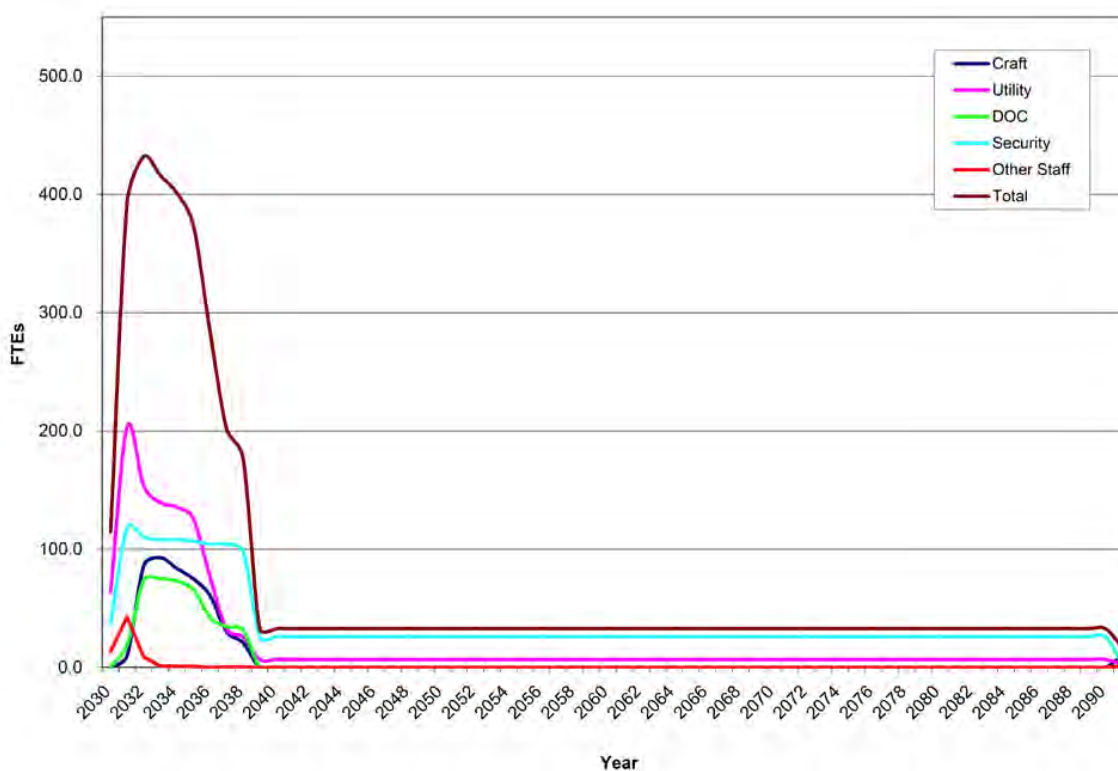


**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 3, Page 48 of 49**

**FIGURE 3.1
SCENARIO 2: DECON WITH 60 YEAR DFS
MONTICELLO NUCLEAR GENERATING PLANT
MANPOWER LEVELS**

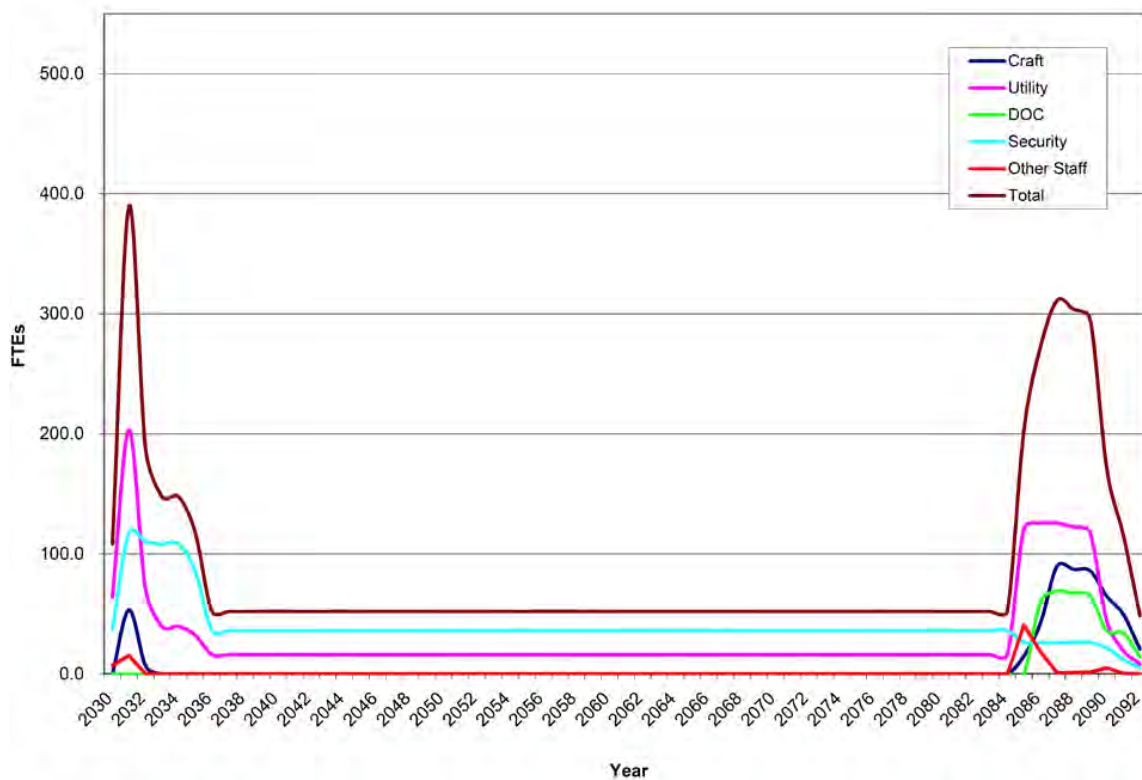


Note that the labor hour basis of this chart was taken from Appendix D; however not all line items in Appendix D have labor hour values available (e.g. spent fuel canister loading estimates from Xcel Energy)

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 3, Page 49 of 49**

**FIGURE 3.2
SCENARIO 7: SAFSTOR WITH 60 YEAR DFS
MONTICELLO NUCLEAR GENERATING PLANT
MANPOWER LEVELS**



Note that the labor hour basis of this chart was taken from Appendix I; however not all line items in Appendix I have labor hour values available (e.g. spent fuel canister loading estimates from Xcel Energy)

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis****Document X01-1725-002, Rev. 0
Section 4, Page 1 of 12**

4. SCHEDULE ESTIMATE

The schedules for the decommissioning scenarios considered in this study follow the sequence presented in the AIF/NESP-036 study, with minor changes to reflect recent experience and site-specific constraints. In addition, the scheduling has been revised to reflect the spent fuel management plans described in Section 3.4.1.

A schedule or sequence of activities for the DECON alternative is presented in Figure 4.1. The schedule is also representative of the work activities identified in the delayed dismantling scenarios, absent any spent fuel constraints. The scheduling sequence is based on the fuel being removed from the spent fuel pool within the first five years after operations cease. The key activities listed in the schedule do not reflect a one-to-one correspondence with those activities in the cost tables, but reflect dividing some activities for clarity and combining others for convenience. The schedule was prepared using the "Microsoft Project Professional" computer software.^[40]

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 reactor building is isolated until such time that all spent fuel has been discharged from the storage pool to the DOE or to the ISFSI. Decontamination and dismantling of the spent fuel storage pool is initiated once the transfer of spent fuel is complete (DECON option).
- 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.

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-002, Rev. 0
Section 4, Page 2 of 12***

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

4.2 PROJECT SCHEDULE

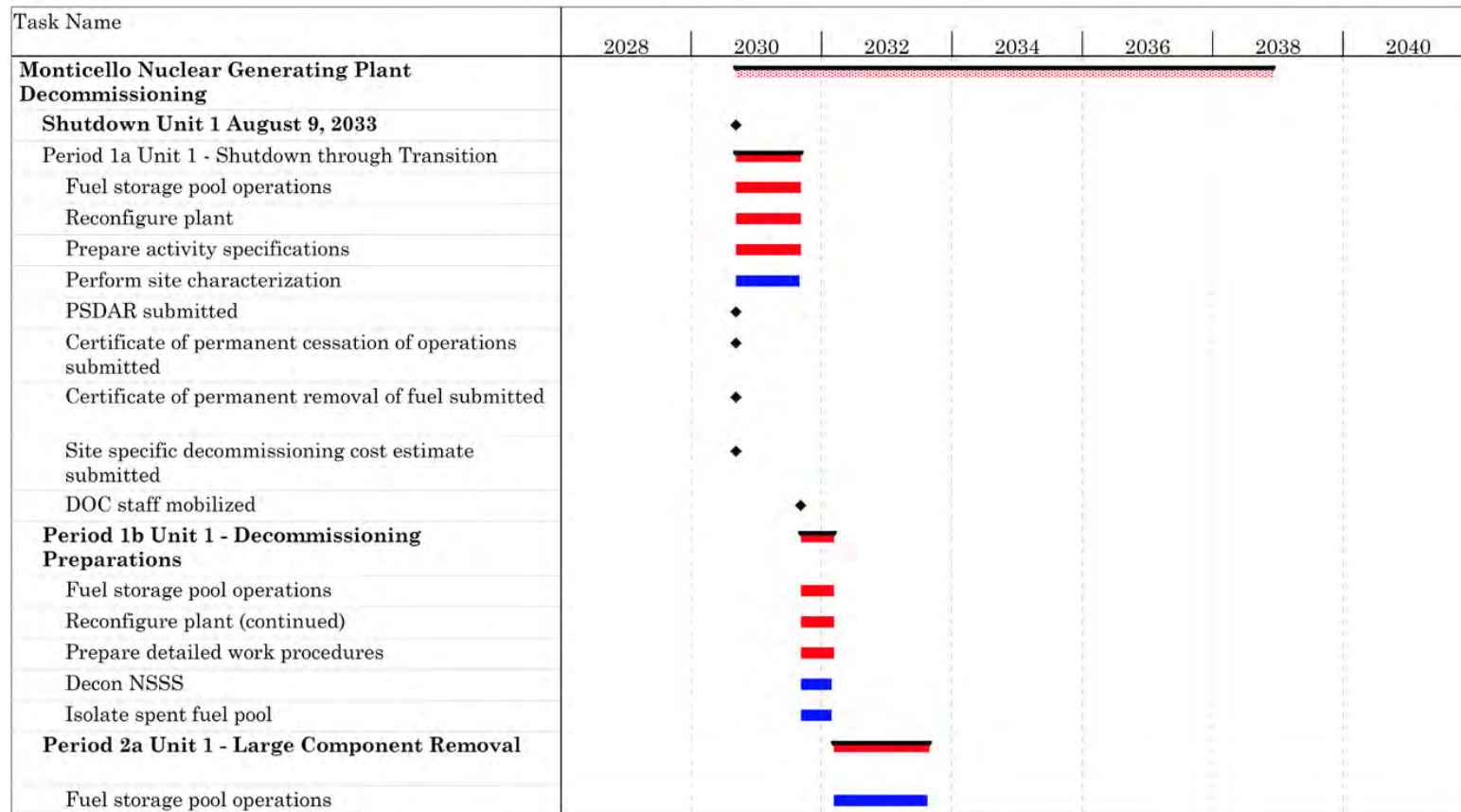
The period-dependent costs presented in the detailed cost tables are based upon the durations developed in the schedules for decommissioning Monticello. Durations are established between several milestones in each project period; these durations are used to establish a critical path for the entire project. In turn, the critical path duration for each period is used as the basis for determining the period-dependent costs. A second parallel path is also shown for the spent fuel cooling period, which determines the release of the reactor building for final decontamination.

Project timelines are provided in Figures 4.2 through 4.8, with milestone dates based on a 2030 shutdown date. The fuel pool is emptied approximately five years after shutdown, while ISFSI operations continue until the DOE completes the transfer of assemblies. Deferred decommissioning operations in the SAFSTOR scenarios are assumed to commence so that the operating license is terminated within a 60-year period from the cessation of operations.

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 4, Page 3 of 12**

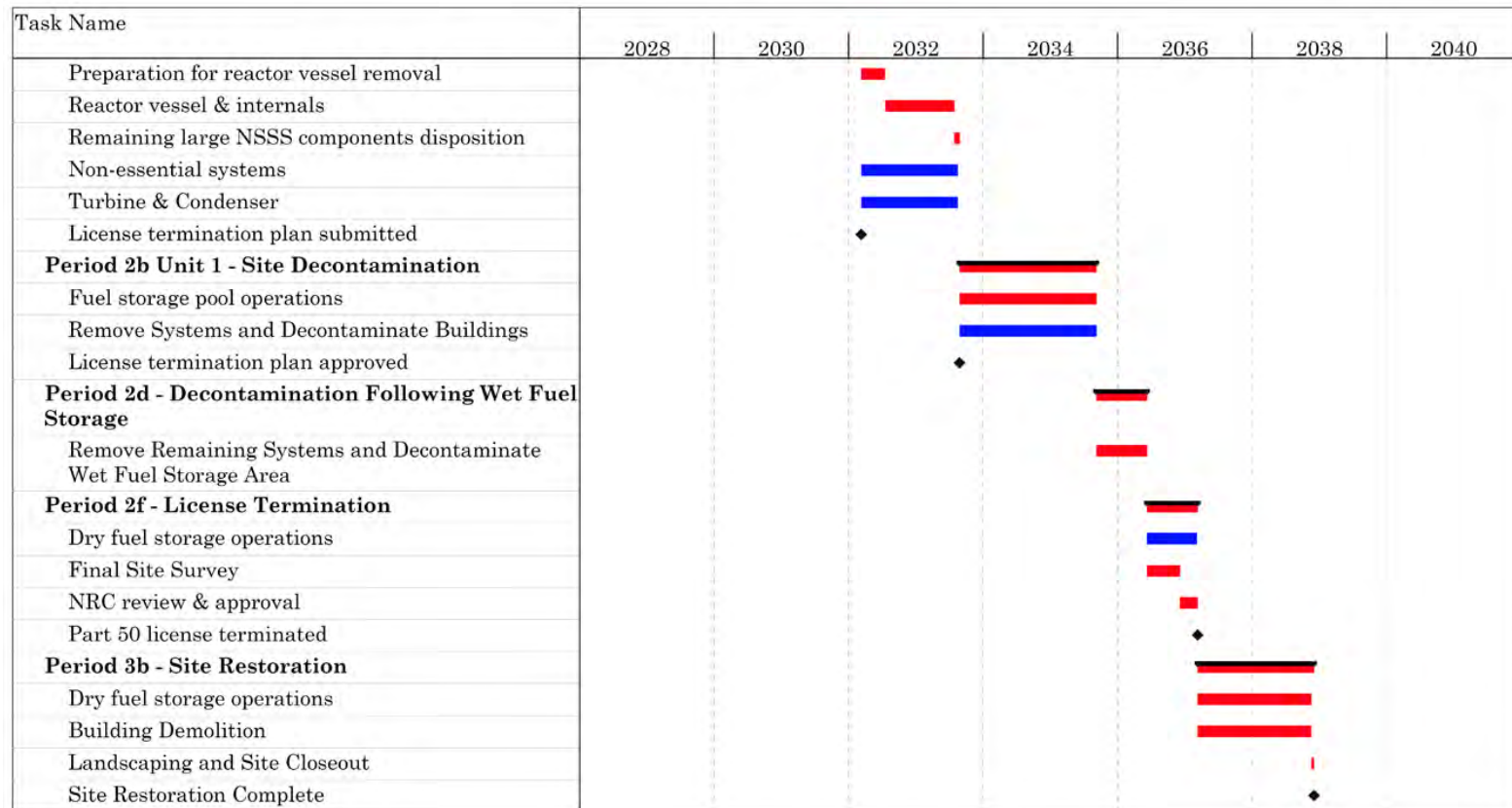
**FIGURE 4.1
DECON ACTIVITY SCHEDULE**



**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 4, Page 4 of 12**

**FIGURE 4.1 (continued)
DECON ACTIVITY SCHEDULE**



***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-002, Rev. 0
Section 4, Page 5 of 12***

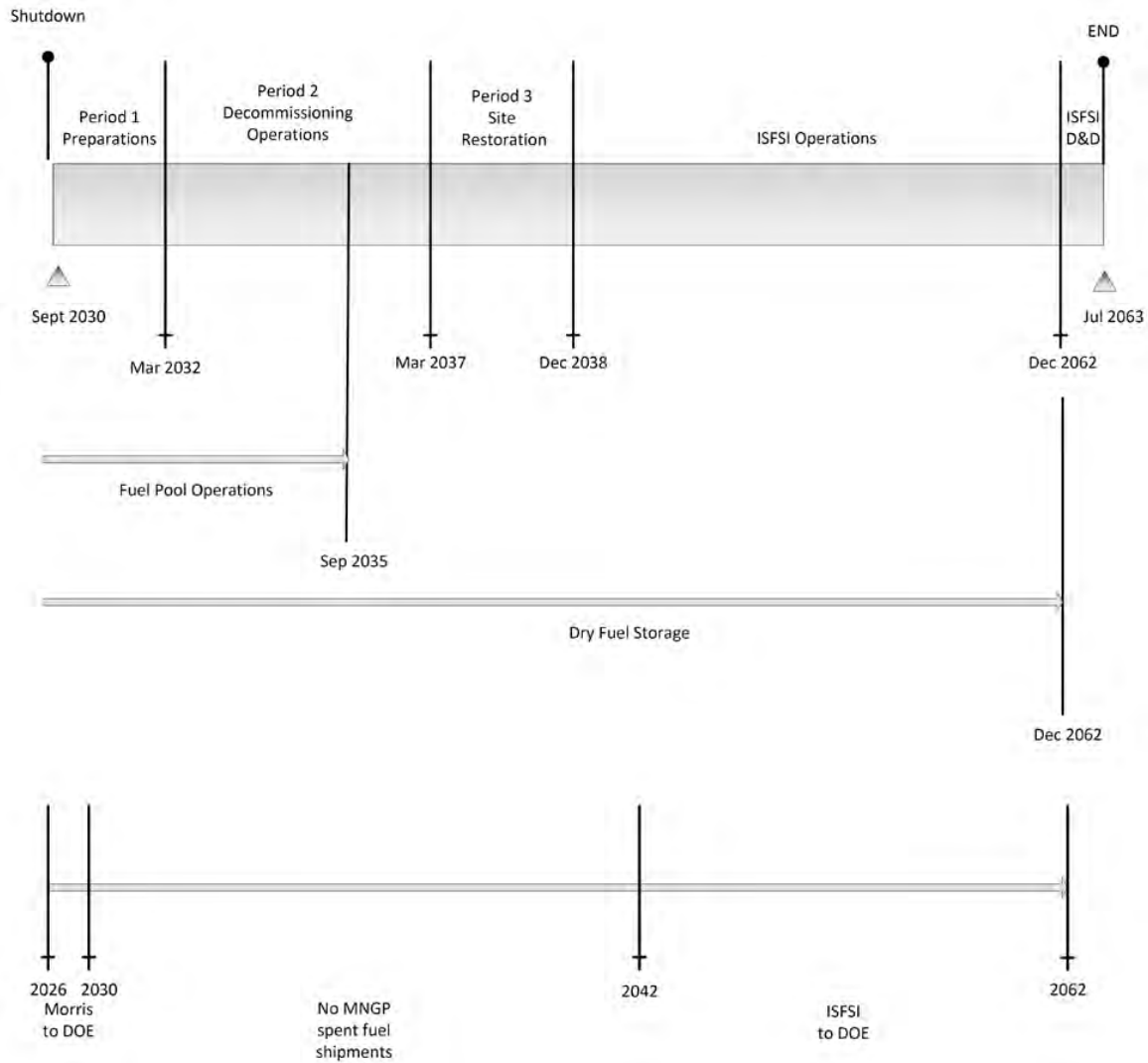
**FIGURE 4.1 (continued)
LEGEND**

1. Red scheduling bars indicate critical path activities
2. Blue scheduling bars associated with non-critical path activities
3. Diamond symbols indicate major milestones

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 4, Page 6 of 12**

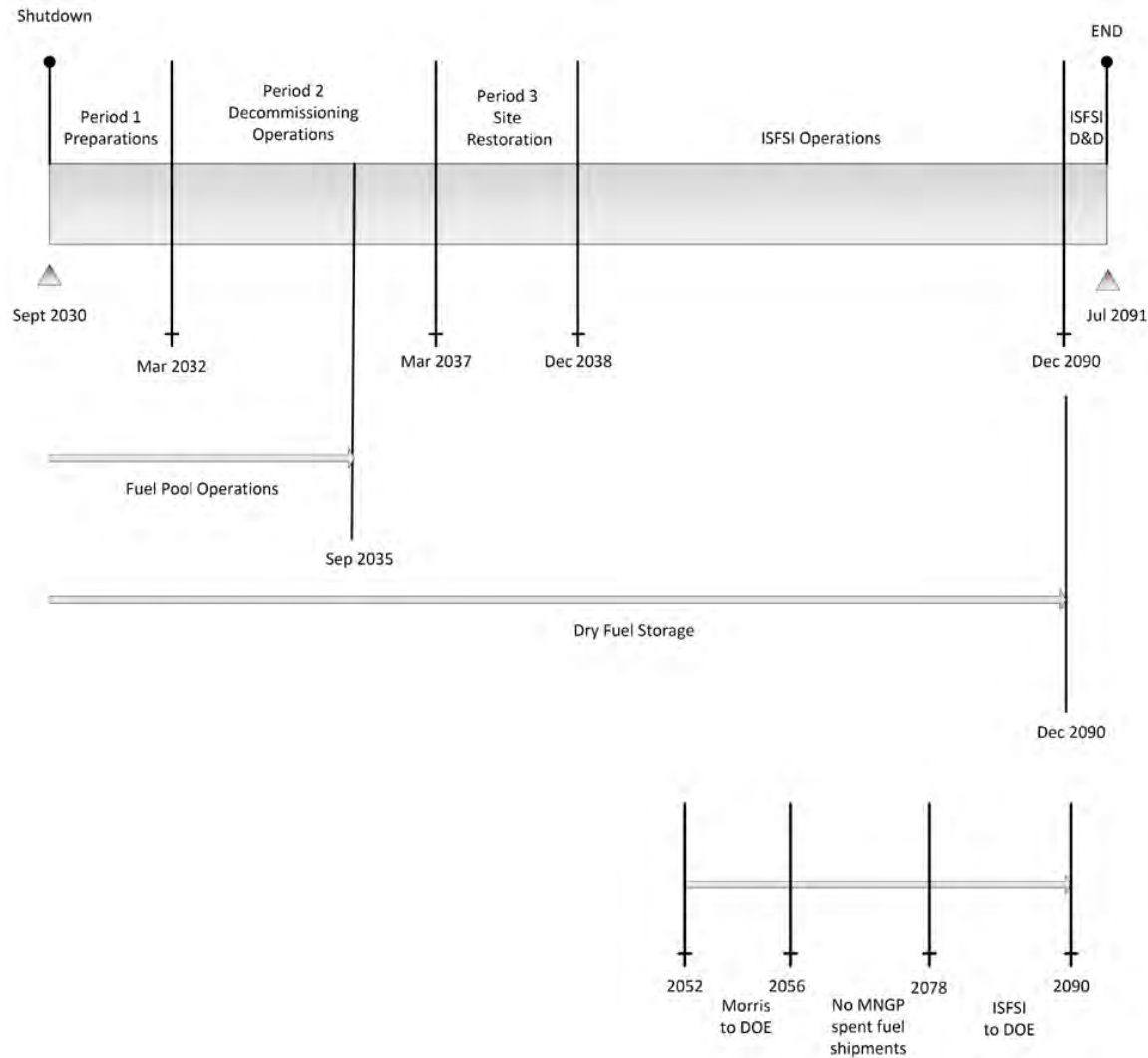
**FIGURE 4.2
SCENARIO 1: DECON WITH 32 YEAR DFS
DECOMMISSIONING TIMELINE**
(not to scale)



**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 4, Page 7 of 12**

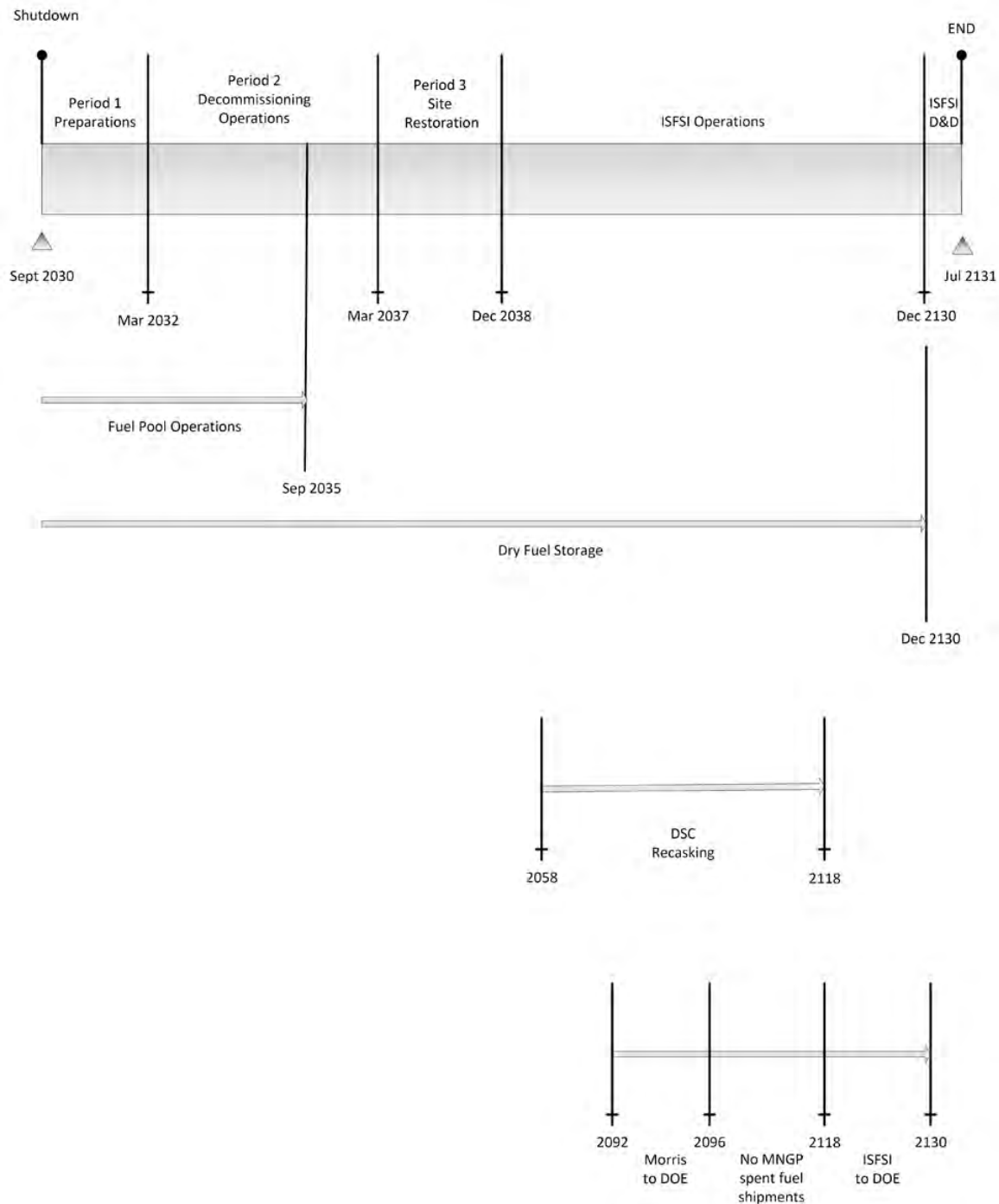
**FIGURE 4.3
SCENARIO 2: DECON WITH 60 YEAR DFS
DECOMMISSIONING TIMELINE**
(not to scale)



**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 4, Page 8 of 12**

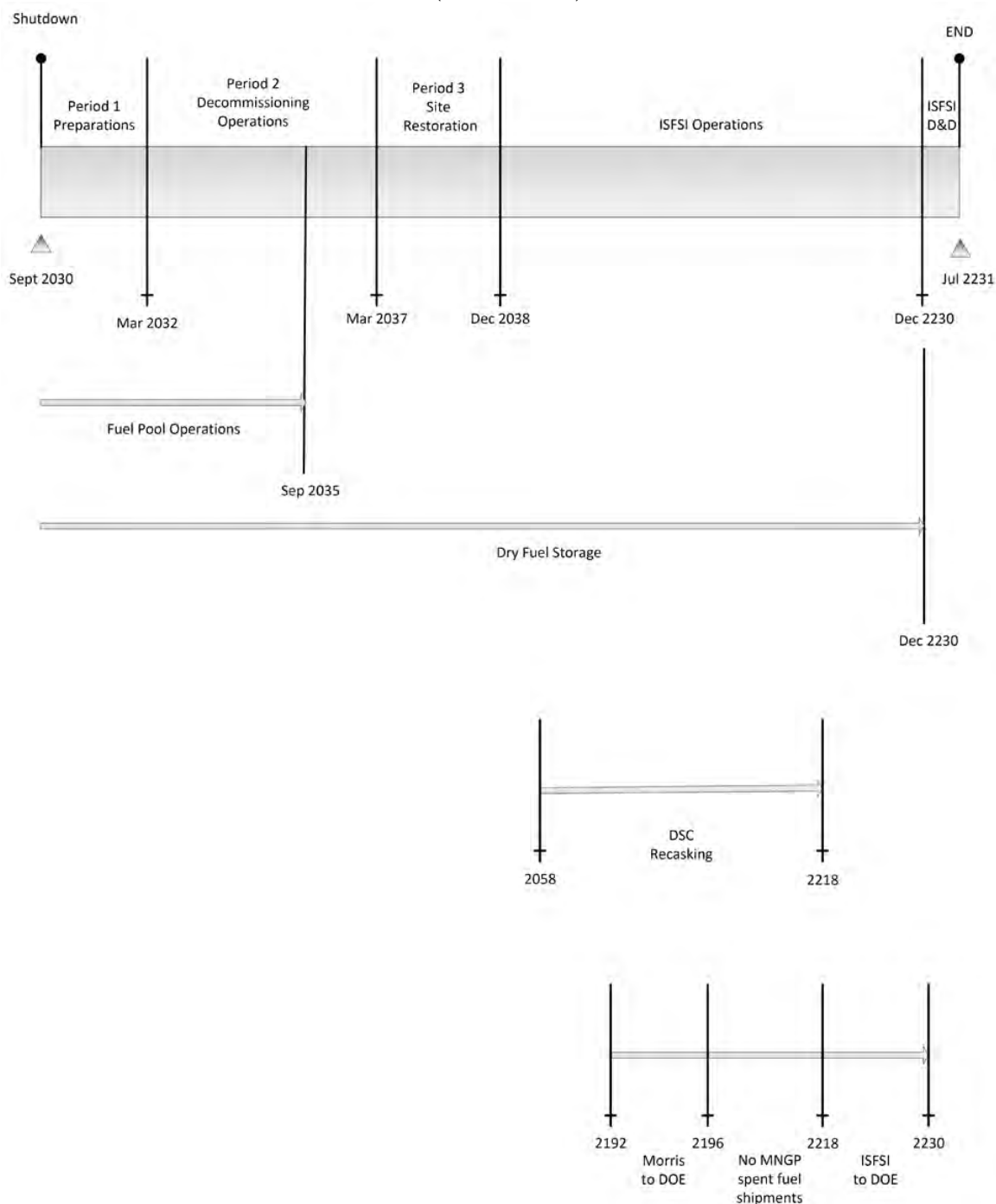
**FIGURE 4.4
SCENARIO 3: DECON WITH 100 YEAR DFS
DECOMMISSIONING TIMELINE**
(not to scale)



**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 4, Page 9 of 12**

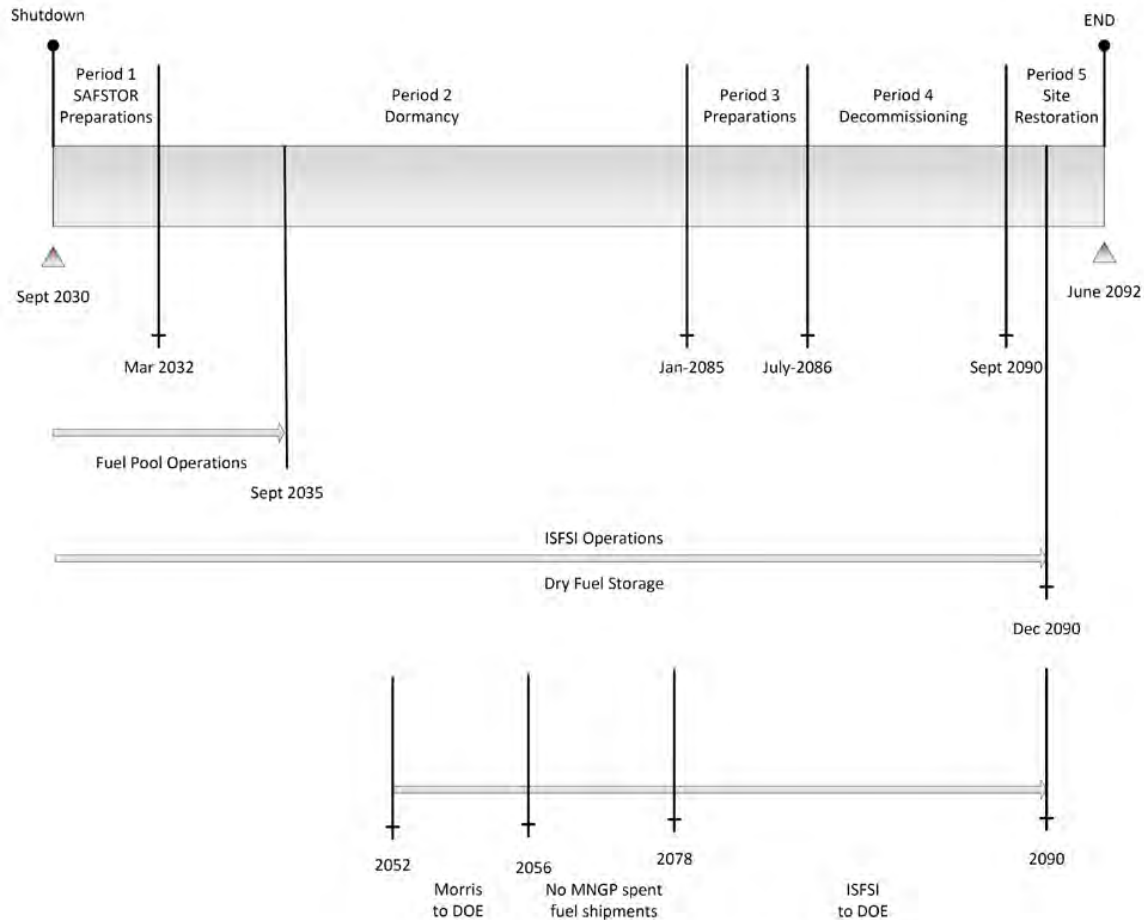
FIGURE 4.5
SCENARIO 4: DECON WITH 200 YEAR DFS
DECOMMISSIONING TIMELINE
(not to scale)



**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 4, Page 10 of 12**

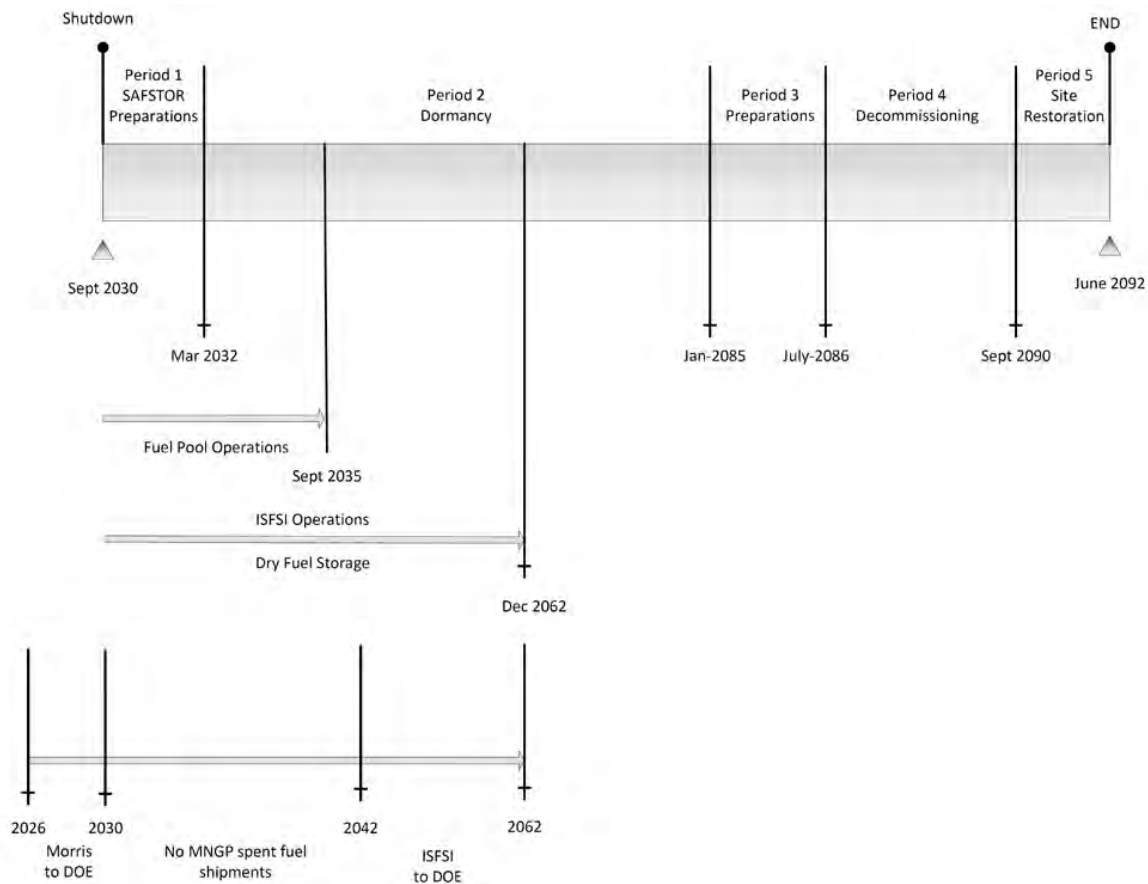
FIGURE 4.6
SCENARIO 5: DECON WITH 60 YEAR DFS WITH RECASKING
DECOMMISSIONING TIMELINE
(not to scale)



**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 4, Page 11 of 12**

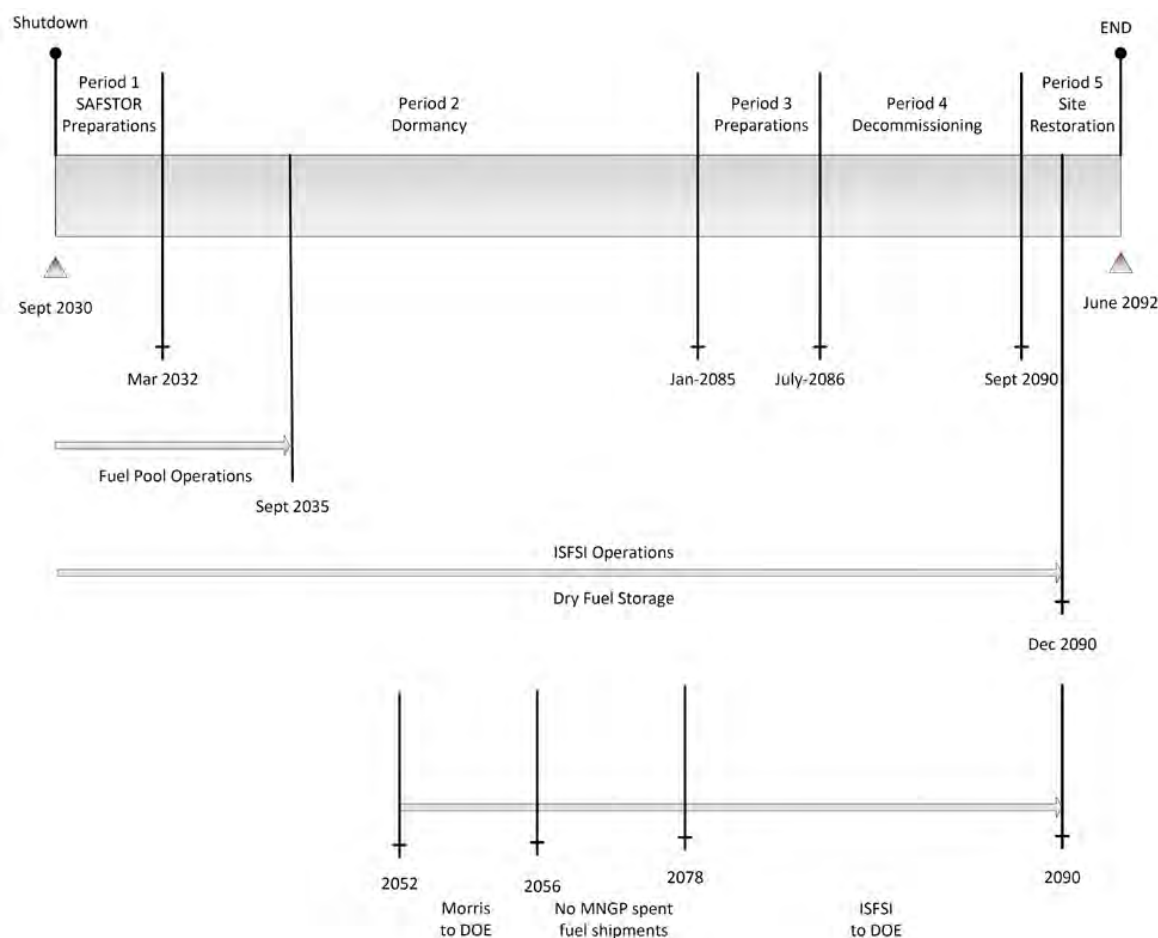
**FIGURE 4.7
SCENARIO 6: SAFSTOR WITH 32 YEAR DFS
DECOMMISSIONING TIMELINE**
(not to scale)



**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 4, Page 12 of 12**

FIGURE 4.8
SCENARIO 7: SAFSTOR WITH 60 YEAR DFS
DECOMMISSIONING TIMELINE
(not to scale)



**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis****Document X01-1725-002, Rev. 0
Section 5, Page 1 of 11****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, ^[41] 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 at the site are shown on a line-item basis in Appendices C through J and summarized in Tables 5.1 through 5.7. The quantified waste volume summaries shown in these tables are consistent with §61 classifications. The volumes are calculated based on the exterior dimensions for containerized material and on the displaced volume of components serving as their own waste containers.

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

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

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-002, Rev. 0
Section 5, Page 2 of 11***

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

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

Disposal fees are calculated using representative costs, with surcharges added for the highly activated components, for example, generated in the segmentation of the reactor vessel. The cost to dispose of the majority of the material generated from the decontamination and dismantling activities is based upon representative rates.

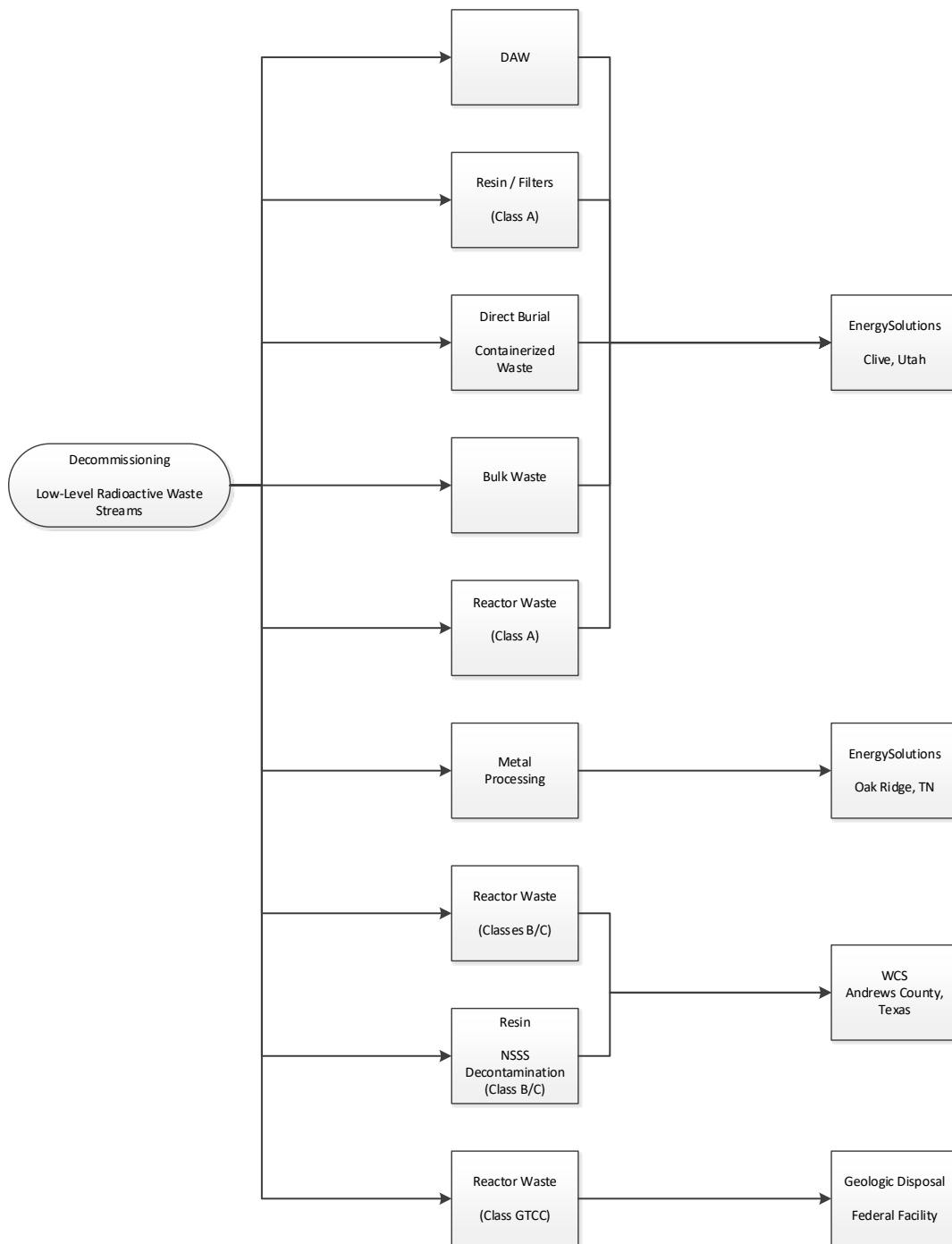
EnergySolutions is not able to accept the higher activity waste (Class B and C) generated in the decontamination of the NSSS and segmentation of the components closest to the core. Waste disposal costs for the higher activity waste (Class B and C) are based upon preliminary and indicative information on the cost for such from WCS.

A small quantity of material generated during the Monticello decommissioning will not be 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. Such material, known as Greater-Than-Class-C or GTCC material, is estimated to require four spent fuel storage canisters (or the equivalent) to dispose of the most radioactive portions of the reactor vessel internals. The volume and weight reported in Tables 5.1 through 5.7 represent the packaged weight and volume of the spent fuel storage canisters.

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 5, Page 3 of 11**

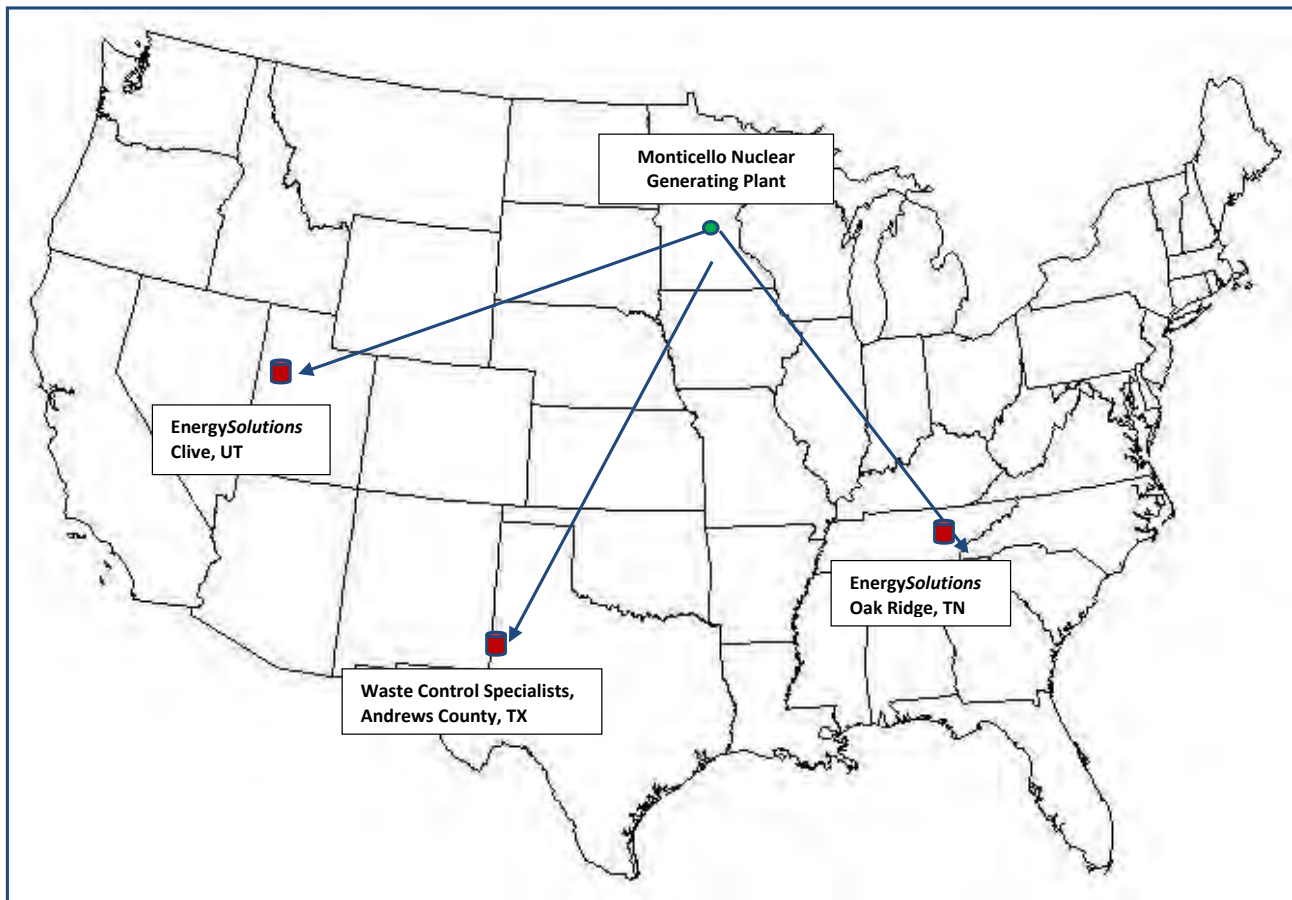
**FIGURE 5.1
RADIOACTIVE WASTE DISPOSITION**



**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 5, Page 4 of 11**

**FIGURE 5.2
DECOMMISSIONING WASTE DESTINATIONS
RADIOLOGICAL**



The figure indicates the destinations for the low-level radioactive waste designated for direct disposal (Clive, Utah) and processing/recovery (Oak Ridge, Tennessee).

Disposition of the Class B and C low-level radioactive waste will be at the Waste Control Specialists site in Andrews County, Texas.

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

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 5, Page 5 of 11**

**TABLE 5.1
SCENARIO 1: DECON WITH 32 YEAR DFS
DECOMMISSIONING WASTE SUMMARY**

Waste	Cost Basis	Class ^[1]	Waste Volume (cubic feet)	Mass (pounds)
Low-Level Radioactive Waste (near-surface disposal)	EnergySolutions Containerized	A	124,968	7,403,271
	EnergySolutions Bulk	A	78,091	5,653,134
	Future LLRW Disposal Facility (Proxy)	B	1,711	185,173
	Future LLRW Disposal Facility (Proxy)	C	1,010	79,764
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	1,547	311,184
Total ^[2]			207,327	13,632,526
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	288,153	12,124,710
Scrap Metal				45,392,000

^[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

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 5, Page 6 of 11**

**TABLE 5.2
SCENARIO 2: DECON WITH 60 YEAR DFS
DECOMMISSIONING WASTE SUMMARY**

Waste	Cost Basis	Class ^[1]	Waste Volume (cubic feet)	Mass (pounds)
Low-Level Radioactive Waste (near-surface disposal)	EnergySolutions Containerized	A	124,968	7,403,271
	EnergySolutions Bulk	A	78,091	5,653,134
	Future LLRW Disposal Facility (Proxy)	B	1,711	185,173
	Future LLRW Disposal Facility (Proxy)	C	1,010	79,764
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	1,547	311,184
Total ^[2]			207,327	13,632,526
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	288,153	12,124,710
Scrap Metal				45,392,000

^[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

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 5, Page 7 of 11**

**TABLE 5.3
SCENARIO 3: DECON WITH 100 YEAR DFS
DECOMMISSIONING WASTE SUMMARY**

Waste	Cost Basis	Class ^[1]	Waste Volume (cubic feet)	Mass (pounds)
Low-Level Radioactive Waste (near-surface disposal)	EnergySolutions Containerized	A	144,351	8,515,592
	EnergySolutions Bulk	A	55,265	2,218,598
	Future LLRW Disposal Facility (Proxy)	B	1,711	185,173
	Future LLRW Disposal Facility (Proxy)	C	1,010	79,764
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	1,547	311,184
Total ^[2]			203,884	11,310,311
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	288,153	12,124,710
Scrap Metal				45,392,000

^[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

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 5, Page 8 of 11**

**TABLE 5.4
SCENARIO 4: DECON WITH 200 YEAR DFS
DECOMMISSIONING WASTE SUMMARY**

Waste	Cost Basis	Class ^[1]	Waste Volume (cubic feet)	Mass (pounds)
Low-Level Radioactive Waste (near-surface disposal)	EnergySolutions Containerized	A	144,351	8,515,592
	EnergySolutions Bulk	A	55,265	2,218,598
	Future LLRW Disposal Facility (Proxy)	B	1,711	185,173
	Future LLRW Disposal Facility (Proxy)	C	1,010	79,764
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	1,547	311,184
Total ^[2]			203,884	11,310,311
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	288,153	12,124,710
Scrap Metal				45,392,000

^[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

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 5, Page 9 of 11**

**TABLE 5.5
SCENARIO 5: DECON WITH 60 YEAR DFS WITH RECASKING
DECOMMISSIONING WASTE SUMMARY**

Waste	Cost Basis	Class ^[1]	Waste Volume (cubic feet)	Mass (pounds)
Low-Level Radioactive Waste (near-surface disposal)	EnergySolutions Containerized	A	124,968	7,403,271
	EnergySolutions Bulk	A	78,280	5,669,770
	Future LLRW Disposal Facility (Proxy)	B	1,711	185,173
	Future LLRW Disposal Facility (Proxy)	C	1,010	79,764
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	1,547	311,184
Total ^[2]			207,517	13,649,162
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	288,153	12,124,710
Scrap Metal				45,392,000

^[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

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 5, Page 10 of 11**

**TABLE 5.6
SCENARIO 6: SAFSTOR WITH 32 YEAR DFS
DECOMMISSIONING WASTE SUMMARY**

Waste	Cost Basis	Class ^[1]	Waste Volume (cubic feet)	Mass (pounds)
Low-Level Radioactive Waste (near-surface disposal)	EnergySolutions Containerized	A	51,704	3,350,492
	EnergySolutions Bulk	A	98,724	6,508,668
	Future LLRW Disposal Facility (Proxy)	B	1,127	99,260
	Future LLRW Disposal Facility (Proxy)	C	643	71,913
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	1,547	311,184
Total ^[2]			153,744	10,341,518
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	340,130	14,284,870
Scrap Metal				45,392,000

^[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

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 5, Page 11 of 11**

**TABLE 5.7
SCENARIO 7: SAFSTOR WITH 60 YEAR DFS
DECOMMISSIONING WASTE SUMMARY**

Waste	Cost Basis	Class ^[1]	Waste Volume (cubic feet)	Mass (pounds)
Low-Level Radioactive Waste (near-surface disposal)	EnergySolutions Containerized	A	51,704	3,350,492
	EnergySolutions Bulk	A	98,926	6,512,710
	Future LLRW Disposal Facility (Proxy)	B	1,127	99,260
	Future LLRW Disposal Facility (Proxy)	C	643	71,913
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	1,547	311,184
Total ^[2]			153,946	10,345,560
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	340,130	14,284,870
Scrap Metal				45,392,000

^[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

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-002, Rev. 0
Section 6, Page 1 of 10***

6. RESULTS

This report presents estimates of the cost to decommission Monticello for the selected decommissioning scenarios following the cessation of plant operations. The estimates are based on numerous fundamental assumptions, including regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. While not an engineering study, the estimates provide Xcel Energy with sufficient information to assess their financial obligations, as they pertain to the eventual decommissioning of the nuclear station.

The decommissioning scenarios assume continued operation of the station's spent fuel pool for a minimum of five years following the cessation of operations for continued cooling of the assemblies. The existing ISFSI is expanded to accommodate the spent fuel, once sufficiently cooled, until such time that the DOE can complete the transfer of the assemblies to its repository.

The cost projected to promptly decommission the station, restore the site, and manage the spent fuel is estimated to be \$1.516 billion (2017 dollars). The majority of this cost (approximately 50.1%) is associated with the physical decontamination and dismantling of the nuclear plant so that the operating license can be terminated. Another 45.2% is associated with the management, interim storage, and eventual transfer of the spent fuel. The remaining 4.7% is for the demolition of the designated structures and limited restoration of the site.

The primary cost contributors, identified in Tables 6.1 through 6.7, are either labor-related or associated with the management and disposition of the spent fuel or radioactive waste. Program management (including security) 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 hire a contractor to manage the decommissioning labor force. The size and composition of the management organizations 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 (for the DECON alternative).

As described in this report, the spent fuel pool will remain operational for a minimum of five years following the cessation of operations. The pool will be isolated and an independent spent fuel island created. This will allow decommissioning operations to proceed in and around the pool areas. Over the five

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis****Document X01-1725-002, Rev. 0
Section 6, Page 2 of 10**

year period, the spent fuel will be packaged into transportable canisters for future loading into a DOE-provided transport cask or relocation to the ISFSI (DECON and both SAFSTOR alternatives). The canisters will be stored in horizontal storage casks at the ISFSI until the DOE is able to receive them. Dry storage of the fuel provides additional flexibility in the event the DOE is not able to meet the current timetable for completing the transfer of assemblies to an off-site facility and minimizes the associated caretaking expenses.

The cost for waste disposal includes only those costs associated with the controlled disposition of the low-level radioactive waste generated from decontamination and dismantling activities, including plant equipment and components, structural material, filters, resins and dry-active waste. As described in Section 5, disposition of the majority of the low-level radioactive material requiring controlled disposal is at the EnergySolutions facility, with higher-activity waste sent to the WCS facility. Highly activated components, requiring additional isolation from the environment (GTCC), 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.

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

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-002, Rev. 0
Section 6, Page 3 of 10***

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.

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 6, Page 4 of 10**

TABLE 6.1
SCENARIO 1: DECON WITH 32 YEAR DFS
DECOMMISSIONING COST ELEMENTS
(thousands of 2017 dollars)

Cost Element	Total	Percentage
Decontamination	23,268	1.9
Removal	119,462	9.7
Packaging	26,800	2.2
Transportation	12,389	1.0
Waste Disposal	95,919	7.8
Off-site Waste Processing	29,702	2.4
Program Management ^[1]	303,532	24.6
Security	233,970	19.0
Spent Fuel Pool Isolation	13,445	1.1
Spent Fuel Storage (Direct Costs) ^[2]	197,448	16.0
Insurance and Regulatory Fees	33,282	2.7
Energy	11,068	0.9
Characterization and Licensing Surveys	28,626	2.3
Property Taxes	36,452	3.0
Miscellaneous Equipment	7,265	0.6
Railroad Track Maintenance	5,048	0.4
Retention and Severance	43,877	3.6
Security Modifications	10,000	0.8
Total ^[3]	1,231,552	100.0

Cost Element	Total	Percentage
NRC License Termination	759,294	61.7
Spent Fuel Management	400,983	32.6
Site Restoration	71,275	5.8
Total ^[3]	1,231,552	100.0

^[1] Includes engineering

^[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

^[3] Columns may not add due to rounding

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 6, Page 5 of 10**

TABLE 6.2
SCENARIO 2: DECON WITH 60 YEAR DFS
DECOMMISSIONING COST ELEMENTS
(thousands of 2017 dollars)

Cost Element	Total	Percentage
Decontamination	23,268	1.5
Removal	119,501	7.9
Packaging	26,800	1.8
Transportation	12,389	0.8
Waste Disposal	95,919	6.3
Off-site Waste Processing	29,702	2.0
Program Management ^[1]	343,355	22.7
Security	359,469	23.7
Spent Fuel Pool Isolation	13,445	0.9
Spent Fuel Storage (Direct Costs) ^[2]	274,588	18.1
Insurance and Regulatory Fees	55,483	3.7
Energy	11,068	0.7
Characterization and Licensing Surveys	28,626	1.9
Property Taxes	52,336	3.5
Miscellaneous Equipment	7,265	0.5
Railroad Track Maintenance	8,759	0.6
Retention and Severance	43,877	2.9
Security Modifications	10,000	0.7
Total ^[3]	1,515,850	100.0

Cost Element	Total	Percentage
NRC License Termination	759,047	50.1
Spent Fuel Management	685,479	45.2
Site Restoration	71,324	4.7
Total ^[3]	1,515,850	100.0

^[1] Includes engineering

^[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

^[3] Columns may not add due to rounding

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 6, Page 6 of 10**

TABLE 6.3
SCENARIO 3: DECON WITH 100 YEAR DFS
DECOMMISSIONING COST ELEMENTS
(thousands of 2017 dollars)

Cost Element	Total	Percentage
Decontamination	23,306	1.0
Removal	119,474	4.9
Packaging	26,803	1.1
Transportation	11,749	0.5
Waste Disposal	95,178	3.9
Off-site Waste Processing	29,702	1.2
Program Management ^[1]	498,687	20.6
Security	538,987	22.3
Spent Fuel Pool Isolation	13,445	0.6
Spent Fuel Storage (Direct Costs) ^[2]	784,638	32.4
Insurance and Regulatory Fees	87,239	3.6
Energy	11,068	0.5
Characterization and Licensing Surveys	28,626	1.2
Property Taxes	75,024	3.1
Miscellaneous Equipment	7,265	0.3
Railroad Track Maintenance	14,068	0.6
Retention and Severance	43,877	1.8
Security Modifications	10,000	0.4
Total ^[3]	2,419,136	100.0

Cost Element	Total	Percentage
NRC License Termination	748,156	30.9
Spent Fuel Management	1,599,295	66.1
Site Restoration	71,685	3.0
Total ^[3]	2,419,136	100.0

^[1] Includes engineering

^[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

^[3] Columns may not add due to rounding

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 6, Page 7 of 10**

TABLE 6.4
SCENARIO 4: DECON WITH 200 YEAR DFS
DECOMMISSIONING COST ELEMENTS
(thousands of 2017 dollars)

Cost Element	Total	Percentage
Decontamination	23,306	0.5
Removal	119,474	2.8
Packaging	26,803	0.6
Transportation	11,749	0.3
Waste Disposal	95,178	2.2
Off-site Waste Processing	29,702	0.7
Program Management ^[1]	765,140	18.0
Security	987,801	23.2
Spent Fuel Pool Isolation	13,445	0.3
Spent Fuel Storage (Direct Costs) ^[2]	1,762,292	41.4
Insurance and Regulatory Fees	166,633	3.9
Energy	11,068	0.3
Characterization and Licensing Surveys	28,626	0.7
Property Taxes	131,743	3.1
Miscellaneous Equipment	7,265	0.2
Railroad Track Maintenance	27,341	0.6
Retention and Severance	43,877	1.0
Security Modifications	10,000	0.2
Total ^[3]	4,261,443	100.0

Cost Element	Total	Percentage
NRC License Termination	748,155	17.6
Spent Fuel Management	3,441,602	80.8
Site Restoration	71,685	1.7
Total ^[3]	4,261,443	100.0

^[1] Includes engineering

^[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

^[3] Columns may not add due to rounding

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 6, Page 8 of 10**

TABLE 6.5
SCENARIO 5: DECON WITH 60 YEAR DFS WITH RECASKING
DECOMMISSIONING COST ELEMENTS
(thousands of 2017 dollars)

Cost Element	Total	Percentage
Decontamination	23,306	1.5
Removal	119,505	7.5
Packaging	26,805	1.7
Transportation	12,393	0.8
Waste Disposal	95,943	6.0
Off-site Waste Processing	29,702	1.9
Program Management ^[1]	343,355	21.4
Security	359,469	22.4
Spent Fuel Pool Isolation	13,445	0.8
Spent Fuel Storage (Direct Costs) ^[2]	361,324	22.5
Insurance and Regulatory Fees	55,483	3.5
Energy	11,068	0.7
Characterization and Licensing Surveys	28,626	1.8
Property Taxes	52,336	3.3
Miscellaneous Equipment	7,265	0.5
Railroad Track Maintenance	8,759	0.5
Retention and Severance	43,877	2.7
Security Modifications	10,000	0.6
Total ^[3]	1,602,660	100.0

Cost Element	Total	Percentage
NRC License Termination	759,122	47.4
Spent Fuel Management	772,214	48.2
Site Restoration	71,324	4.5
Total ^[3]	1,602,660	100.0

^[1] Includes engineering

^[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

^[3] Columns may not add due to rounding

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 6, Page 9 of 10**

TABLE 6.6
SCENARIO 6: SAFSTOR WITH 32 YEAR DFS
DECOMMISSIONING COST ELEMENTS
(thousands of 2017 dollars)

Cost Element	Total	Percentage
Decontamination	25,220	1.7
Removal	122,447	8.3
Packaging	17,915	1.2
Transportation	8,026	0.5
Waste Disposal	66,222	4.5
Off-site Waste Processing	34,993	2.4
Program Management ^[1]	403,048	27.3
Security	236,063	16.0
Spent Fuel Pool Isolation	13,445	0.9
Spent Fuel Storage (Direct Costs) ^[2]	195,063	13.2
Insurance and Regulatory Fees	68,491	4.6
Energy	23,440	1.6
Characterization and Licensing Surveys	28,277	1.9
Property Taxes	148,737	10.1
Miscellaneous Equipment	20,825	1.4
Railroad Track Maintenance	8,536	0.6
Retention and Severance	43,877	3.0
Security Modifications	10,000	0.7
Total ^[3]	1,474,626	100.0

Cost Element	Total	Percentage
NRC License Termination	1,045,043	70.9
Spent Fuel Management	364,666	24.7
Site Restoration	64,917	4.4
Total ^[3]	1,474,626	100.0

^[1] Includes engineering

^[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

^[3] Columns may not add due to rounding

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 6, Page 10 of 10**

TABLE 6.7
SCENARIO 7: SAFSTOR WITH 60 YEAR DFS
DECOMMISSIONING COST ELEMENTS
(thousands of 2017 dollars)

Cost Element	Total	Percentage
Decontamination	25,220	1.5
Removal	122,659	7.1
Packaging	17,920	1.0
Transportation	8,028	0.5
Waste Disposal	66,243	3.9
Off-site Waste Processing	34,993	2.0
Program Management ^[1]	430,133	25.0
Security	386,682	22.5
Spent Fuel Pool Isolation	13,445	0.8
Spent Fuel Storage (Direct Costs) ^[2]	259,117	15.1
Insurance and Regulatory Fees	69,323	4.0
Energy	23,440	1.4
Characterization and Licensing Surveys	28,277	1.6
Property Taxes	148,737	8.7
Miscellaneous Equipment	20,825	1.2
Railroad Track Maintenance	8,536	0.5
Retention and Severance	43,877	2.6
Security Modifications	10,000	0.6
Total ^[3]	1,717,454	100.0

Cost Element	Total	
NRC License Termination	1,099,775	64.0
Spent Fuel Management	552,724	32.2
Site Restoration	64,956	3.8
Total ^[3]	1,717,454	100.0

^[1] Includes engineering costs

^[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

^[3] Columns may not add due to rounding

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 7, Page 1 of 4**

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**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 7, Page 2 of 4**

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**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Section 7, Page 3 of 4**

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**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis****Document X01-1725-002, Rev. 0
Section 7, Page 4 of 4****7. REFERENCES**

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***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-002, Rev. 0
Appendix A, Page 1 of 4***

APPENDIX A

UNIT COST FACTOR DEVELOPMENT

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Appendix A, Page 2 of 4**

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, send to waste processing area	<u>60</u>	<u>60</u>
Totals (Activity/Critical)		355	255

Duration adjustment(s):

+ Respiratory protection adjustment (50 of critical duration) 128

+ Radiation/ALARA adjustment (37.1 of critical duration) 95

Adjusted work duration 478

+ Protective clothing adjustment (30 of adjusted duration) 143

Productive work duration 621

+ Work break adjustment (8.33 of productive duration) 52

Total work duration (minutes) 673

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

* alpha designators indicate activities that can be performed in parallel

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Appendix A, Page 3 of 4**

**APPENDIX A
(continued)**

3. LABOR REQUIRED

Crew	Number	Duration (hours)	Rate (\$/hr)	Cost
Laborers	3.00	11.217	\$54.73	\$1841.72
Craftsmen	2.00	11.217	\$69.32	\$1,555.12
Foreman	1.00	11.217	\$72.53	\$813.57
General Foreman	0.25	11.217	\$74.83	\$209.84
Fire Watch	0.05	11.217	\$54.73	\$30.70
Health Physics Technician	1.00	11.217	\$76.50	<u>\$858.10</u>
Total Labor Cost				\$5,309.05

4. EQUIPMENT & CONSUMABLES COSTS

Equipment Costs none

Consumables/Materials Costs

- Universal Sorbent 50 @ \$0.61 sq ft ^{1} \$30.50
- Tarpaulins (oil resistant/fire retardant) 50 @ \$0.46/sq ft ^{2} \$23.00
- Gas torch consumables 1 @ \$20.45/hr x 1 hr ^{3} \$20.45

Subtotal cost of equipment and materials \$73.95

Overhead & profit on equipment and materials @ 16.88% \$12.48

Total costs, equipment & material \$86.43

TOTAL COST:

Removal of contaminated heat exchanger <3000 pounds: \$5,395.48

Total labor cost: \$5,309.05

Total equipment/material costs: \$86.43

Total craft labor man-hours required per unit: 81.88

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-002, Rev. 0
Appendix A, Page 4 of 4***

5. NOTES AND REFERENCES

- Work difficulty factors were developed in conjunction with the Atomic Industrial Forum's (now NEI) program to standardize nuclear decommissioning cost estimates and are delineated in Volume 1, Chapter 5 of the "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.
- References for equipment & consumables costs:
 1. www.mcmaster.com online catalog, McMaster Carr Spill Control (7193T88)
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- Material and consumable costs were adjusted using the regional indices for Minneapolis, Minnesota.

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-002, Rev. 0
Appendix B, Page 1 of 7***

APPENDIX B

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

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Appendix B, Page 2 of 7**

APPENDIX B

**UNIT COST FACTOR LISTING
(Power Block Structures Only)**

Unit Cost Factor	Cost/Unit
Removal of clean instrument and sampling tubing, \$/linear foot	0.59
Removal of clean pipe 0.25 to 2 inches diameter, \$/linear foot	6.38
Removal of clean pipe >2 to 4 inches diameter, \$/linear foot	9.07
Removal of clean pipe >4 to 8 inches diameter, \$/linear foot	17.58
Removal of clean pipe >8 to 14 inches diameter, \$/linear foot	34.02
Removal of clean pipe >14 to 20 inches diameter, \$/linear foot	44.29
Removal of clean pipe >20 to 36 inches diameter, \$/linear foot	65.15
Removal of clean pipe >36 inches diameter, \$/linear foot	77.38
Removal of clean valve >2 to 4 inches	116.53
Removal of clean valve >4 to 8 inches	175.82
Removal of clean valve >8 to 14 inches	340.22
Removal of clean valve >14 to 20 inches	442.86
Removal of clean valve >20 to 36 inches	651.46
Removal of clean valve >36 inches	773.78
Removal of clean pipe hanger for small bore piping	40.73
Removal of clean pipe hanger for large bore piping	144.67
Removal of clean pump, <300 pound	297.76
Removal of clean pump, 300-1000 pound	821.40
Removal of clean pump, 1000-10,000 pound	3,244.34
Removal of clean pump, >10,000 pound	6,278.73
Removal of clean pump motor, 300-1000 pound	342.77
Removal of clean pump motor, 1000-10,000 pound	1,347.11
Removal of clean pump motor, >10,000 pound	3,030.99
Removal of clean heat exchanger <3000 pound	1,743.26
Removal of clean heat exchanger >3000 pound	4,394.19
Removal of clean feedwater heater/deaerator	12,379.20
Removal of clean moisture separator/reheater	25,438.07
Removal of clean tank, <300 gallons	382.87
Removal of clean tank, 300-3000 gallon	1,205.00
Removal of clean tank, >3000 gallons, \$/square foot surface area	10.09

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Appendix B, Page 3 of 7**

APPENDIX B

**UNIT COST FACTOR LISTING
(Power Block Structures Only)**

Unit Cost Factor	Cost/Unit
Removal of clean electrical equipment, <300 pound	160.89
Removal of clean electrical equipment, 300-1000 pound	558.06
Removal of clean electrical equipment, 1000-10,000 pound	1,116.13
Removal of clean electrical equipment, >10,000 pound	2,646.83
Removal of clean electrical transformer < 30 tons	1,838.18
Removal of clean electrical transformer > 30 tons	5,293.67
Removal of clean standby diesel generator, <100 kW	1,877.56
Removal of clean standby diesel generator, 100 kW to 1 MW	4,190.82
Removal of clean standby diesel generator, >1 MW	8,675.83
Removal of clean electrical cable tray, \$/linear foot	15.16
Removal of clean electrical conduit, \$/linear foot	6.63
Removal of clean mechanical equipment, <300 pound	160.89
Removal of clean mechanical equipment, 300-1000 pound	558.06
Removal of clean mechanical equipment, 1000-10,000 pound	1,116.13
Removal of clean mechanical equipment, >10,000 pound	2,646.83
Removal of clean HVAC equipment, <300 pound	194.55
Removal of clean HVAC equipment, 300-1000 pound	670.56
Removal of clean HVAC equipment, 1000-10,000 pound	1,336.42
Removal of clean HVAC equipment, >10,000 pound	2,646.83
Removal of clean HVAC ductwork, \$/pound	0.63
Removal of contaminated instrument and sampling tubing, \$/linear foot	1.99
Removal of contaminated pipe 0.25 to 2 inches diameter, \$/linear foot	27.12
Removal of contaminated pipe >2 to 4 inches diameter, \$/linear foot	46.23
Removal of contaminated pipe >4 to 8 inches diameter, \$/linear foot	74.04
Removal of contaminated pipe >8 to 14 inches diameter, \$/linear foot	144.12
Removal of contaminated pipe >14 to 20 inches diameter, \$/linear foot	173.18
Removal of contaminated pipe >20 to 36 inches diameter, \$/linear foot	239.68
Removal of contaminated pipe >36 inches diameter, \$/linear foot	283.26
Removal of contaminated valve >2 to 4 inches	564.33
Removal of contaminated valve >4 to 8 inches	675.66

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Appendix B, Page 4 of 7**

APPENDIX B

**UNIT COST FACTOR LISTING
(Power Block Structures Only)**

Unit Cost Factor	Cost/Unit
Removal of contaminated valve >8 to 14 inches	1,378.64
Removal of contaminated valve >14 to 20 inches	1,752.81
Removal of contaminated valve >20 to 36 inches	2,334.29
Removal of contaminated valve >36 inches	2,770.04
Removal of contaminated pipe hanger for small bore piping	188.44
Removal of contaminated pipe hanger for large bore piping	611.48
Removal of contaminated pump, <300 pound	1,205.97
Removal of contaminated pump, 300-1000 pound	2,758.03
Removal of contaminated pump, 1000-10,000 pound	8,850.61
Removal of contaminated pump, >10,000 pound	21,559.16
Removal of contaminated pump motor, 300-1000 pound	1,173.89
Removal of contaminated pump motor, 1000-10,000 pound	3,603.57
Removal of contaminated pump motor, >10,000 pound	8,090.51
Removal of contaminated heat exchanger <3000 pound	5,395.48
Removal of contaminated heat exchanger >3000 pound	15,648.23
Removal of contaminated feedwater heater/deaerator	38,068.15
Removal of contaminated moisture separator/reheater	82,788.96
Removal of contaminated tank, <300 gallons	2,004.39
Removal of contaminated tank, >300 gallons, \$/square foot	38.67
Removal of contaminated electrical equipment, <300 pound	936.29
Removal of contaminated electrical equipment, 300-1000 pound	2,250.27
Removal of contaminated electrical equipment, 1000-10,000 pound	4,334.31
Removal of contaminated electrical equipment, >10,000 pound	8,447.10
Removal of contaminated electrical cable tray, \$/linear foot	45.27
Removal of contaminated electrical conduit, \$/linear foot	22.11
Removal of contaminated mechanical equipment, <300 pound	1,041.61
Removal of contaminated mechanical equipment, 300-1000 pound	2,484.99
Removal of contaminated mechanical equipment, 1000-10,000 pound	4,778.59
Removal of contaminated mechanical equipment, >10,000 pound	8,447.10
Removal of contaminated HVAC equipment, <300 pound	1,041.61

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Appendix B, Page 5 of 7**

APPENDIX B

**UNIT COST FACTOR LISTING
(Power Block Structures Only)**

Unit Cost Factor	Cost/Unit
Removal of contaminated HVAC equipment, 300-1000 pound	2,484.99
Removal of contaminated HVAC equipment, 1000-10,000 pound	4,778.59
Removal of contaminated HVAC equipment, >10,000 pound	8,447.10
Removal of contaminated HVAC ductwork, \$/pound	2.71
Removal/plasma arc cut of contaminated thin metal components, \$/linear in.	4.89
Additional decontamination of surface by washing, \$/square foot	10.12
Additional decontamination of surfaces by hydrolasing, \$/square foot	43.37
Decontamination rig hook up and flush, \$/ 250 foot length	8,781.13
Chemical flush of components/systems, \$/gallon	20.62
Removal of clean standard reinforced concrete, \$/cubic yard	76.85
Removal of grade slab concrete, \$/cubic yard	87.42
Removal of clean concrete floors, \$/cubic yard	431.26
Removal of sections of clean concrete floors, \$/cubic yard	1,298.07
Removal of clean heavily rein concrete w/#9 rebar, \$/cubic yard	111.01
Removal of contaminated heavily rein concrete w/#9 rebar, \$/cubic yard	2,568.54
Removal of clean heavily rein concrete w/#18 rebar, \$/cubic yard	150.46
Removal of contaminated heavily rein concrete w/#18 rebar, \$/cubic yard	3,397.61
Removal heavily rein concrete w/#18 rebar & steel embedments, \$/cubic yard	527.05
Removal of below-grade suspended floors, \$/cubic yard	211.02
Removal of clean monolithic concrete structures, \$/cubic yard	1,068.91
Removal of contaminated monolithic concrete structures, \$/cubic yard	2,555.68
Removal of clean foundation concrete, \$/cubic yard	840.09
Removal of contaminated foundation concrete, \$/cubic yard	2,381.01
Explosive demolition of bulk concrete, \$/cubic yard	56.88
Removal of clean hollow masonry block wall, \$/cubic yard	26.93
Removal of contaminated hollow masonry block wall, \$/cubic yard	72.18
Removal of clean solid masonry block wall, \$/cubic yard	26.93
Removal of contaminated solid masonry block wall, \$/cubic yard	72.18
Backfill of below-grade voids, \$/cubic yard	32.27
Removal of subterranean tunnels/voids, \$/linear foot	134.42

**Monticello Nuclear Generating Plant
Decommissioning Cost Analysis**

**Document X01-1725-002, Rev. 0
Appendix B, Page 6 of 7**

APPENDIX B

**UNIT COST FACTOR LISTING
(Power Block Structures Only)**

Unit Cost Factor	Cost/Unit
Placement of concrete for below-grade voids, \$/cubic yard	151.11
Excavation of clean material, \$/cubic yard	3.38
Excavation of contaminated material, \$/cubic yard	48.96
Removal of clean concrete rubble (tipping fee included), \$/cubic yard	27.80
Removal of contaminated concrete rubble, \$/cubic yard	31.35
Removal of building by volume, \$/cubic foot	0.35
Removal of clean building metal siding, \$/square foot	1.63
Removal of contaminated building metal siding, \$/square foot	5.82
Removal of standard asphalt roofing, \$/square foot	2.79
Removal of transite panels, \$/square foot	2.50
Scarifying contaminated concrete surfaces (drill & spall), \$/square foot	15.10
Scabbling contaminated concrete floors, \$/square foot	9.40
Scabbling contaminated concrete walls, \$/square foot	25.13
Scabbling contaminated ceilings, \$/square foot	86.52
Scabbling structural steel, \$/square foot	7.77
Removal of clean overhead crane/monorail < 10 ton capacity	776.71
Removal of contaminated overhead crane/monorail < 10 ton capacity	2,303.06
Removal of clean overhead crane/monorail >10-50 ton capacity	1,864.11
Removal of contaminated overhead crane/monorail >10-50 ton capacity	5,526.42
Removal of polar crane > 50 ton capacity	7,769.78
Removal of gantry crane > 50 ton capacity	33,085.40
Removal of structural steel, \$/pound	0.23
Removal of clean steel floor grating, \$/square foot	5.62
Removal of contaminated steel floor grating, \$/square foot	16.90
Removal of clean free standing steel liner, \$/square foot	15.14
Removal of contaminated free standing steel liner, \$/square foot	45.26
Removal of clean concrete-anchored steel liner, \$/square foot	7.57
Removal of contaminated concrete-anchored steel liner, \$/square foot	52.76
Placement of scaffolding in clean areas, \$/square foot	17.30
Placement of scaffolding in contaminated areas, \$/square foot	30.78

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-002, Rev. 0
Appendix B, Page 7 of 7***

APPENDIX B

**UNIT COST FACTOR LISTING
(Power Block Structures Only)**

Unit Cost Factor	Cost/Unit
Landscaping with topsoil, \$/acre	24,683.41
Cost of CPC B-88 LSA box & preparation for use	2,089.10
Cost of CPC B-25 LSA box & preparation for use	1,969.57
Cost of CPC B-12V 12 gauge LSA box & preparation for use	1,571.57
Cost of CPC B-144 LSA box & preparation for use	10,466.06
Cost of LSA drum & preparation for use	232.86
Cost of cask liner for CNSI 8 120A cask (resins)	12,441.18
Cost of cask liner for CNSI 8 120A cask (filters)	9,028.23
Decontamination of surfaces with vacuuming, \$/square foot	0.96

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-002, Rev. 0
Appendix C, Page 1 of 10***

APPENDIX C

DETAILED COST ANALYSIS

SCENARIO 1: DECON with 32 Year DFS

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table C
Monticello Nuclear Generating Plant
Scenario 1: DECON with 32 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 2f - License Termination																					
Period 2f Direct Decommissioning Activities																					
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	176	53	229	229	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license	-	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	176	53	229	229	-	-	-	-	-	-	-	-	-	-
Period 2f Additional Costs																					
2f.2.1	License Termination Survey	-	-	-	-	-	-	7,341	2,202	9,544	9,544	-	-	-	-	-	-	-	-	96,197	6,240
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	7,341	2,202	9,544	9,544	-	-	-	-	-	-	-	-	96,197	6,240
Period 2f Collateral Costs																					
2f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,189	178	1,367	1,367	-	-	-	-	-	-	-	-	-	-
2f.3	Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,189	178	1,367	1,367	-	-	-	-	-	-	-	-	-	-
Period 2f Period-Dependent Costs																					
2f.4.1	Insurance	-	-	-	-	-	-	543	54	598	598	-	-	-	-	-	-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	1,285	128	1,413	1,413	-	-	-	-	-	-	-	-	-	-
2f.4.3	Health physics supplies	-	597	-	-	-	-	-	149	747	747	-	-	-	-	-	-	-	-	-	-
2f.4.4	Disposal of DAW generated	-	-	8	2	-	29	-	8	47	47	-	-	-	355	-	-	-	7,097	12	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	420	42	463	463	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	103	10	113	-	113	-	-	-	-	-	-	-	-	-
2f.4.8	Fixed Overhead	-	-	-	-	-	-	1,747	262	2,009	2,009	-	-	-	-	-	-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	78	12	89	-	89	-	-	-	-	-	-	-	-	-
2f.4.10	Railroad Track Maintenance	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	-
2f.4.11	Security Staff Cost	-	-	-	-	-	-	9,608	1,441	11,049	7,668	3,381	-	-	-	-	-	-	-	-	162,981
2f.4.12	DOC Staff Cost	-	-	-	-	-	-	5,174	776	5,950	5,950	-	-	-	-	-	-	-	-	-	57,200
2f.4.13	Utility Staff Cost	-	-	-	-	-	-	5,456	818	6,274	5,415	860	-	-	-	-	-	-	-	-	80,707
2f.4	Subtotal Period 2f Period-Dependent Costs	-	597	8	2	-	29	24,761	3,754	29,152	24,708	4,443	-	-	355	-	-	-	7,097	12	300,888
2f.0	TOTAL PERIOD 2f COST	-	597	8	2	-	29	33,467	6,188	40,291	35,848	4,443	-	-	355	-	-	-	7,097	96,208	307,128
PERIOD 2 TOTALS		13,170	62,856	20,629	9,399	25,814	56,415	404,263	120,456	713,004	568,562	144,374	68	288,110	174,575	1,481	1,010	-	21,522,450	804,895	3,049,889
PERIOD 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor Building	-	1,881	-	-	-	-	-	282	2,163	-	-	2,163	-	-	-	-	-	-	13,966	-
3b.1.1.2	Condensate Tanks Foundation	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	50	-
3b.1.1.3	Discharge Retention Basin	-	4	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	25	-
3b.1.1.4	HPCI Room	-	18	-	-	-	-	-	3	21	-	-	21	-	-	-	-	-	-	97	-
3b.1.1.5	Hot Shop	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	177	-
3b.1.1.6	Hydrogen & Oxygen Storage	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	19	-
3b.1.1.7	LLRW Storage & Shipping	-	78	-	-	-	-	-	12	90	-	-	90	-	-	-	-	-	-	662	-
3b.1.1.8	MSIV	-	3	-	-	-	-	-	0	4	-	-	4	-	-	-	-	-	-	42	-
3b.1.1.9	Misc Structures 2017	-	759	-	-	-	-	-	114	872	-	-	872	-	-	-	-	-	-	7,919	-
3b.1.1.10	Offgas Stack	-	104	-	-	-	-	-	16	120	-	-	120	-	-	-	-	-	-	544	-
3b.1.1.11	Offgas Storage & Compressor	-	38	-	-	-	-	-	6	44	-	-	44	-	-	-	-	-	-	199	-
3b.1.1.12	Radwaste	-	219	-	-	-	-	-	33	252	-	-	252	-	-	-	-	-	-	1,220	-
3b.1.1.13	Recombiner	-	123	-	-	-	-	-	18	141	-	-	141	-	-	-	-	-	-	713	-
3b.1.1.14	Security Barrier	-	179	-	-	-	-	-	27	206	-	-	206	-	-	-	-	-	-	933	-
3b.1.1.15	Structures Greater than 3' Below Grade	-	2,380	-	-	-	-	-	357	2,738	-	-	2,738	-	-	-	-	-	-	12,649	-
3b.1.1.16	Tank Farm	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	21	-
3b.1.1.17	Turbine	-	1,175	-	-	-	-	-	176	1,351	-	-	1,351	-	-	-	-	-	-	13,091	-
3b.1.1.18	Turbine Building Addition	-	51	-	-	-	-	-	8	58	-	-	58	-	-	-	-	-	-	618	-
3b.1.1.19	Turbine Pedestal	-	175	-	-	-	-	-	26	202	-	-	202	-	-	-	-	-	-	926	-
3b.1.1	Totals	-	7,219	-	-	-	-	-	1,083	8,302	-	-	8,302	-	-	-	-	-	-	53,870	-
Site Closeout Activities																					
3b.1.2	Grade & landscape site	-	864	-	-	-	-	-	130	994	-	-	994	-	-	-	-	-	-	1,841	-
3b.1.3	Final report to NRC	-	-	-	-	-	-	183	27	211	211	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	8,083	-	-	-	-	183	1,240	9,506	211	-	9,295	-	-	-	-	-	-	55,711	1,560

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix C, Page 9 of 10

Table C
Monticello Nuclear Generating Plant
Scenario 1: DECON with 32 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 Additional Costs																					
3b.2.1	Clean Concrete Disposal	-	3,297	-	-	-	-	11	496	3,805	-	-	3,805	-	-	-	-	-	-	12	-
3b.2.2	Excavation of Underground Services	-	1,380	-	-	-	-	947	349	2,677	-	-	2,677	-	-	-	-	-	-	13,475	-
3b.2.3	Intake Structure Cofferdam	-	320	-	-	-	-	-	48	368	-	-	368	-	-	-	-	-	-	2,584	-
3b.2.4	Construction Debris	-	-	-	-	-	-	350	53	403	-	-	403	-	-	-	-	-	-	-	-
3b.2.5	Backfill	-	5,102	-	-	-	-	-	765	5,868	-	-	5,868	-	-	-	-	-	-	5,422	-
3b.2	Subtotal Period 3b Additional Costs	-	10,100	-	-	-	-	1,309	1,711	13,120	-	-	13,120	-	-	-	-	-	-	21,493	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	97	-	-	-	-	-	15	111	-	-	111	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	97	-	-	-	-	-	15	111	-	-	111	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	1,251	125	1,376	-	1,376	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	2,737	274	3,011	-	3,011	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	5,455	-	-	-	-	-	818	6,273	-	-	6,273	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	300	45	345	-	-	345	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	386	39	424	-	424	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	237	24	261	-	261	-	-	-	-	-	-	-	-	-
3b.4.7	Fixed Overhead	-	-	-	-	-	-	1,260	189	1,450	-	-	1,450	-	-	-	-	-	-	-	-
3b.4.8	ISFSI Operating Costs	-	-	-	-	-	-	179	27	206	-	206	-	-	-	-	-	-	-	-	-
3b.4.9	Railroad Track Maintenance	-	-	-	-	-	-	497	75	572	-	-	572	-	-	-	-	-	-	-	-
3b.4.10	Security Staff Cost	-	-	-	-	-	-	22,115	3,317	25,432	(0)	7,782	17,650	-	-	-	-	-	-	-	375,152
3b.4.11	DOC Staff Cost	-	-	-	-	-	-	11,290	1,693	12,983	-	-	12,983	-	-	-	-	-	-	-	122,646
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	6,583	987	7,571	-	1,976	5,595	-	-	-	-	-	-	-	98,297
3b.4	Subtotal Period 3b Period-Dependent Costs	-	5,455	-	-	-	-	46,836	7,613	59,904	(0)	15,036	44,868	-	-	-	-	-	-	-	596,095
3b.0	TOTAL PERIOD 3b COST	-	23,734	-	-	-	-	48,328	10,579	82,641	211	15,036	67,394	-	-	-	-	-	-	77,204	597,655
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	23,942	3,591	27,533	-	27,533	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	23,942	3,591	27,533	-	27,533	-	-	-	-	-	-	-	-	-
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	17,378	1,738	19,116	-	19,116	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	17,062	1,706	18,768	-	18,768	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	7,885	789	8,674	-	-	8,674	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	3,295	329	3,624	-	3,624	-	-	-	-	-	-	-	-	-
3c.4.6	Fixed Overhead	-	-	-	-	-	-	5,989	898	6,888	-	6,888	-	-	-	-	-	-	-	-	-
3c.4.7	ISFSI Operating Costs	-	-	-	-	-	-	2,487	373	2,861	-	2,861	-	-	-	-	-	-	-	-	-
3c.4.8	Railroad Track Maintenance	-	-	-	-	-	-	2,779	417	3,196	-	3,196	-	-	-	-	-	-	-	-	-
3c.4.9	Security Staff Cost	-	-	-	-	-	-	93,967	14,095	108,062	-	108,062	-	-	-	-	-	-	-	-	1,302,958
3c.4.10	Utility Staff Cost	-	-	-	-	-	-	23,828	3,574	27,402	-	27,402	-	-	-	-	-	-	-	-	338,268
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	174,671	23,920	198,591	-	198,591	-	-	-	-	-	-	-	-	1,641,226
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	198,613	27,511	226,124	-	226,124	-	-	-	-	-	-	-	-	1,641,226
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
3d.1.1	Totals	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	28	3	30	30	-	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	26	3	29	29	-	-	-	-	-	-	-	-	-	-
3d.4.4	Emergency Planning Fees	-	-	-	-	-	-	5	1	6	-	6	-	-	-	-	-	-	-	-	-
3d.4.5	Fixed Overhead	-	-	-	-	-	-	10	1	11	11	-	-	-	-	-	-	-	-	-	-
3d.4.6	ISFSI Operating Costs	-	-	-	-	-	-	4	1	5	-	5	-	-	-	-	-	-	-	-	-
3d.4.7	Railroad Track Maintenance	-	-	-	-	-	-	4	1	5	-	5	-	-	-	-	-	-	-	-	-
3d.4.8	Security Staff Cost	-	-	-	-	-	-	150	22	172	172	-	-	-	-	-	-	-	-	-	2,074
3d.4.9	Utility Staff Cost	-	-	-	-	-	-	38	6	44	44	-	-	-	-	-	-	-	-	-	539
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	265	37	301	286	15	-	-	-	-	-	-	-	-	2,613

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table C
Monticello Nuclear Generating Plant
Scenario 1: DECON with 32 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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			
3d.0	TOTAL PERIOD 3d COST	-	-	1,331	-	-	6,552	265	1,352	9,500	9,485	15	-	-	-	-	-	1,547	311,184	-	2,613
PERIOD 3e - ISFSI Decontamination																					
Period 3e Additional Costs																					
3e.2.1	Decommissioning of ISFSI	-	131	3	784	-	8,058	1,850	2,707	13,534	13,534	-	-	-	27,284	-	-	-	3,860,412	11,022	1,848
3e.2	Subtotal Period 3e Additional Costs	-	131	3	784	-	8,058	1,850	2,707	13,534	13,534	-	-	-	27,284	-	-	-	3,860,412	11,022	1,848
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	110	28	138	138	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	226	57	283	283	-	-	-	-	-	-	-	-	-	-
3e.4.4	Fixed Overhead	-	-	-	-	-	-	82	21	103	103	-	-	-	-	-	-	-	-	-	-
3e.4.5	Railroad Track Maintenance	-	-	-	-	-	-	38	10	48	48	-	-	-	-	-	-	-	-	-	-
3e.4.6	Security Staff Cost	-	-	-	-	-	-	308	77	385	385	-	-	-	-	-	-	-	-	-	4,999
3e.4.7	Utility Staff Cost	-	-	-	-	-	-	260	65	325	325	-	-	-	-	-	-	-	-	-	3,792
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	1,025	256	1,281	1,281	-	-	-	-	-	-	-	-	-	8,792
3e.0	TOTAL PERIOD 3e COST	-	131	3	784	-	8,058	2,875	2,963	14,815	14,815	-	-	-	27,284	-	-	-	3,860,412	11,022	10,640
PERIOD 3f - ISFSI Site Restoration																					
Period 3f Additional Costs																					
3f.2.1	Demolition and Site Restoration of ISFSI	-	1,733	-	-	-	-	185	288	2,205	-	-	2,205	-	-	-	-	-	-	8,390	160
3f.2	Subtotal Period 3f Additional Costs	-	1,733	-	-	-	-	185	288	2,205	-	-	2,205	-	-	-	-	-	-	8,390	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.4.2	Property taxes	-	-	-	-	-	-	114	11	125	-	-	125	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	123	-	-	-	-	-	19	142	-	-	142	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	29	4	33	-	-	33	-	-	-	-	-	-	-	-
3f.4.5	Fixed Overhead	-	-	-	-	-	-	42	6	48	-	-	48	-	-	-	-	-	-	-	-
3f.4.6	Railroad Track Maintenance	-	-	-	-	-	-	19	3	22	-	-	22	-	-	-	-	-	-	-	-
3f.4.7	Security Staff Cost	-	-	-	-	-	-	155	23	179	-	-	179	-	-	-	-	-	-	-	2,520
3f.4.8	Utility Staff Cost	-	-	-	-	-	-	103	16	119	-	-	119	-	-	-	-	-	-	-	1,564
3f.4	Subtotal Period 3f Period-Dependent Costs	-	123	-	-	-	-	462	82	668	-	-	668	-	-	-	-	-	-	-	4,084
3f.0	TOTAL PERIOD 3f COST	-	1,869	-	-	-	-	647	372	2,888	-	-	2,888	-	-	-	-	-	-	8,390	4,244
PERIOD 3 TOTALS		-	25,734	1,335	784	-	14,610	250,728	42,777	335,968	24,510	241,175	70,282	-	27,284	-	-	1,547	4,171,597	96,616	2,256,378
TOTAL COST TO DECOMMISSION		16,489	91,449	22,061	10,357	25,828	72,171	805,615	187,584	1,231,552	759,294	400,983	71,275	288,153	203,059	1,711	1,010	1,547	25,757,230	933,360	6,500,963

TOTAL COST TO DECOMMISSION WITH 17.97% CONTINGENCY:	\$1,231,552	thousands of 2017 dollars
TOTAL NRC LICENSE TERMINATION COST IS 61.65% OR:	\$759,294	thousands of 2017 dollars
SPENT FUEL MANAGEMENT COST IS 32.56% OR:	\$400,983	thousands of 2017 dollars
NON-NUCLEAR DEMOLITION COST IS 5.79% OR:	\$71,275	thousands of 2017 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	205,780	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,547	cubic feet
TOTAL SCRAP METAL REMOVED:	22,696	tons
TOTAL CRAFT LABOR REQUIREMENTS:	933,360	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

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-002, Rev. 0
Appendix D, Page 1 of 11***

APPENDIX D

DETAILED COST ANALYSIS

SCENARIO 2: DECON with 60 Year DFS

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix D, Page 7 of 11

Table D
Monticello Nuclear Generating Plant
Scenario 2: DECON with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 2b Period-Dependent Costs (continued)																					
2b.4.13	ISFSI Operating Costs	-	-	-	-	-	-	210	32	242	-	242	-	-	-	-	-	-	-	-	
2b.4.14	Railroad Track Maintenance	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	
2b.4.15	Security Staff Cost	-	-	-	-	-	-	26,840	4,026	30,867	30,867	-	-	-	-	-	-	-	-	457,896	
2b.4.16	DOC Staff Cost	-	-	-	-	-	-	27,122	4,068	31,191	31,191	-	-	-	-	-	-	-	-	309,504	
2b.4.17	Utility Staff Cost	-	-	-	-	-	-	35,641	5,346	40,988	40,988	-	-	-	-	-	-	-	-	574,490	
2b.4	Subtotal Period 2b Period-Dependent Costs	1,361	7,283	124	38	-	463	111,268	17,935	138,473	130,592	7,881	-	-	5,690	-	-	-	113,799	186	1,341,891
2b.0	TOTAL PERIOD 2b COST	9,211	21,684	820	1,580	11,212	5,324	198,269	42,159	290,260	206,561	83,688	10	133,979	31,367	-	-	-	6,798,079	339,814	1,345,987
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	634	56	114	109	-	2,091	-	881	3,884	3,884	-	-	-	7,653	-	-	-	486,170	906	-
Disposal of Plant Systems																					
2d.1.2.1	Cranes/Heavy Loads/Rigging - RCA	-	3	0	1	9	-	-	2	15	15	-	-	103	-	-	-	-	4,184	48	-
2d.1.2.2	Electrical - Contaminated Fuel Pool	-	46	1	2	21	2	-	16	87	87	-	-	240	9	-	-	-	10,334	665	-
2d.1.2.3	Electrical - Decontam. Fuel Pool Area	-	293	4	15	213	-	-	108	633	633	-	-	2,457	-	-	-	-	99,783	4,090	-
2d.1.2.4	Fire - RCA - Fuel Pool Area	-	11	0	0	5	-	-	4	20	20	-	-	62	-	-	-	-	2,499	143	-
2d.1.2.5	Fuel Pool Cooling & Cleanup	240	419	34	26	102	370	-	340	1,531	1,531	-	-	1,179	1,341	-	-	-	133,939	8,380	-
2d.1.2.6	Fuel Pool Cooling & Cleanup - Insulated	26	40	3	2	6	32	-	33	143	143	-	-	67	117	-	-	-	10,220	848	-
2d.1.2.7	HVAC Ductwork - Fuel Pool Area	-	34	1	2	26	3	-	14	79	79	-	-	296	11	-	-	-	12,733	457	-
2d.1.2.8	HVAC/Chilled Water - RCA Fuel Pool Area	-	32	0	1	19	-	-	11	64	64	-	-	223	-	-	-	-	9,072	397	-
2d.1.2.9	Instrument & Service Air-RCA-Fuel Pool	-	28	0	2	23	-	-	11	64	64	-	-	267	-	-	-	-	10,841	357	-
2d.1.2	Totals	266	907	44	51	423	408	-	537	2,637	2,637	-	-	4,894	1,479	-	-	-	293,606	15,385	-
Decontamination of Site Buildings																					
2d.1.3.1	Reactor (Post Fuel)	911	2,485	145	669	170	8,544	-	3,353	16,277	16,277	-	-	1,969	62,698	-	-	-	2,732,406	45,703	-
2d.1.3	Totals	911	2,485	145	669	170	8,544	-	3,353	16,277	16,277	-	-	1,969	62,698	-	-	-	2,732,406	45,703	-
2d.1.4	Scaffolding in support of decommissioning	-	547	6	2	25	6	-	143	729	729	-	-	257	23	-	-	-	13,028	5,641	-
2d.1	Subtotal Period 2d Activity Costs	1,811	3,994	309	831	618	11,049	-	4,915	23,527	23,527	-	-	7,120	71,852	-	-	-	3,525,210	67,635	-
Period 2d Additional Costs																					
2d.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,291	387	1,678	1,678	-	-	-	-	-	-	-	-	-	12,480
2d.2.2	Remedial Action Surveys	-	-	-	-	-	-	1,198	359	1,557	1,557	-	-	-	-	-	-	-	-	15,661	-
2d.2	Subtotal Period 2d Additional Costs	-	-	-	-	-	-	2,489	747	3,235	3,235	-	-	-	-	-	-	-	-	15,661	12,480
Period 2d Collateral Costs																					
2d.3.1	Process decommissioning water waste	69	-	47	120	-	191	-	105	533	533	-	-	-	457	-	-	-	27,391	89	-
2d.3.2	Process decommissioning chemical flush waste	1	-	25	92	-	185	-	63	366	366	-	-	-	249	-	-	-	26,553	47	-
2d.3.3	Small tool allowance	-	88	-	-	-	-	-	13	101	101	-	-	-	-	-	-	-	-	-	-
2d.3.4	Decommissioning Equipment Disposition	-	-	143	55	575	145	-	145	1,062	1,062	-	-	6,000	529	-	-	-	303,608	147	-
2d.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	27,061	4,059	31,120	-	31,120	-	-	-	-	-	-	-	-	-
2d.3	Subtotal Period 2d Collateral Costs	70	88	216	267	575	521	27,061	4,385	33,182	2,062	31,120	-	6,000	1,235	-	-	-	357,552	283	-
Period 2d Period-Dependent Costs																					
2d.4.1	Decon supplies	219	-	-	-	-	-	-	55	274	274	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	543	54	598	598	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	1,336	134	1,470	1,470	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	752	-	-	-	-	-	188	940	940	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,701	-	-	-	-	-	255	1,956	1,956	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	44	14	-	165	-	48	271	271	-	-	-	2,030	-	-	-	40,600	66	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	521	78	600	600	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	369	37	405	405	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,935	193	2,128	-	2,128	-	-	-	-	-	-	-	-	-
2d.4.10	Fixed Overhead	-	-	-	-	-	-	1,747	262	2,009	2,009	-	-	-	-	-	-	-	-	-	-
2d.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	305	46	351	351	-	-	-	-	-	-	-	-	-	-
2d.4.12	ISFSI Operating Costs	-	-	-	-	-	-	78	12	89	-	89	-	-	-	-	-	-	-	-	-
2d.4.13	Railroad Track Maintenance	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	-
2d.4.14	Security Staff Cost	-	-	-	-	-	-	9,608	1,441	11,049	7,668	3,381	-	-	-	-	-	-	-	-	162,981
2d.4.15	DOC Staff Cost	-	-	-	-	-	-	6,941	1,041	7,982	7,982	-	-	-	-	-	-	-	-	-	78,356
2d.4.16	Utility Staff Cost	-	-	-	-	-	-	9,556	1,433	10,989	10,132	857	-	-	-	-	-	-	-	-	149,660
2d.4	Subtotal Period 2d Period-Dependent Costs	219	2,453	44	14	-	165	33,025	5,290	41,210	34,754	6,456	-	-	2,030	-	-	-	40,600	66	390,997
2d.0	TOTAL PERIOD 2d COST	2,099	6,535	569	1,112	1,193	11,735	62,574	15,337	101,154	63,579	37,575	-	13,120	75,117	-	-	-	3,923,362	83,645	403,477

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix D, Page 8 of 11

Table D
Monticello Nuclear Generating Plant
Scenario 2: DECON with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 2f - License Termination																					
Period 2f Direct Decommissioning Activities																					
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	176	53	229	229	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license	-	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	176	53	229	229	-	-	-	-	-	-	-	-	-	-
Period 2f Additional Costs																					
2f.2.1	License Termination Survey	-	-	-	-	-	-	7,341	2,202	9,544	9,544	-	-	-	-	-	-	-	-	96,197	6,240
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	7,341	2,202	9,544	9,544	-	-	-	-	-	-	-	-	96,197	6,240
Period 2f Collateral Costs																					
2f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,189	178	1,367	1,367	-	-	-	-	-	-	-	-	-	-
2f.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	43	7	50	-	50	-	-	-	-	-	-	-	-	-
2f.3	Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,232	185	1,417	1,367	50	-	-	-	-	-	-	-	-	-
Period 2f Period-Dependent Costs																					
2f.4.1	Insurance	-	-	-	-	-	-	543	54	598	598	-	-	-	-	-	-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	1,285	128	1,413	1,413	-	-	-	-	-	-	-	-	-	-
2f.4.3	Health physics supplies	-	597	-	-	-	-	-	149	747	747	-	-	-	-	-	-	-	-	-	-
2f.4.4	Disposal of DAW generated	-	-	8	2	-	29	-	8	47	47	-	-	-	355	-	-	-	7,097	12	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	420	42	463	463	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	103	10	113	-	113	-	-	-	-	-	-	-	-	-
2f.4.8	Fixed Overhead	-	-	-	-	-	-	1,747	262	2,009	2,009	-	-	-	-	-	-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	78	12	89	-	89	-	-	-	-	-	-	-	-	-
2f.4.10	Railroad Track Maintenance	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	-
2f.4.11	Security Staff Cost	-	-	-	-	-	-	9,608	1,441	11,049	7,668	3,381	-	-	-	-	-	-	-	-	162,981
2f.4.12	DOC Staff Cost	-	-	-	-	-	-	5,174	776	5,950	5,950	-	-	-	-	-	-	-	-	-	57,200
2f.4.13	Utility Staff Cost	-	-	-	-	-	-	5,456	818	6,274	5,415	860	-	-	-	-	-	-	-	-	80,707
2f.4	Subtotal Period 2f Period-Dependent Costs	-	597	8	2	-	29	24,761	3,754	29,152	24,708	4,443	-	-	355	-	-	-	7,097	12	300,888
2f.0	TOTAL PERIOD 2f COST	-	597	8	2	-	29	33,511	6,194	40,341	35,848	4,493	-	-	355	-	-	-	7,097	96,208	307,128
PERIOD 2 TOTALS		13,170	62,856	20,629	9,399	25,814	56,415	406,552	120,800	715,636	568,562	147,006	68	288,110	174,575	1,481	1,010	-	21,522,450	804,895	3,049,889
PERIOD 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor Building	-	1,881	-	-	-	-	-	282	2,163	-	-	2,163	-	-	-	-	-	-	13,966	-
3b.1.1.2	Condensate Tanks Foundation	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	50	-
3b.1.1.3	Discharge Retention Basin	-	4	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	25	-
3b.1.1.4	HPCI Room	-	18	-	-	-	-	-	3	21	-	-	21	-	-	-	-	-	-	97	-
3b.1.1.5	Hot Shop	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	177	-
3b.1.1.6	Hydrogen & Oxygen Storage	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	19	-
3b.1.1.7	LLRW Storage & Shipping	-	78	-	-	-	-	-	12	90	-	-	90	-	-	-	-	-	-	662	-
3b.1.1.8	MSIV	-	3	-	-	-	-	-	0	4	-	-	4	-	-	-	-	-	-	42	-
3b.1.1.9	Misc Structures 2017	-	759	-	-	-	-	-	114	872	-	-	872	-	-	-	-	-	-	7,919	-
3b.1.1.10	Offgas Stack	-	104	-	-	-	-	-	16	120	-	-	120	-	-	-	-	-	-	544	-
3b.1.1.11	Offgas Storage & Compressor	-	38	-	-	-	-	-	6	44	-	-	44	-	-	-	-	-	-	199	-
3b.1.1.12	Radwaste	-	219	-	-	-	-	-	33	252	-	-	252	-	-	-	-	-	-	1,220	-
3b.1.1.13	Recombiner	-	123	-	-	-	-	-	18	141	-	-	141	-	-	-	-	-	-	713	-
3b.1.1.14	Security Barrier	-	179	-	-	-	-	-	27	206	-	-	206	-	-	-	-	-	-	933	-
3b.1.1.15	Structures Greater than 3' Below Grade	-	2,380	-	-	-	-	-	357	2,738	-	-	2,738	-	-	-	-	-	-	12,649	-
3b.1.1.16	Tank Farm	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	21	-
3b.1.1.17	Turbine	-	1,175	-	-	-	-	-	176	1,351	-	-	1,351	-	-	-	-	-	-	13,091	-
3b.1.1.18	Turbine Building Addition	-	51	-	-	-	-	-	8	58	-	-	58	-	-	-	-	-	-	618	-
3b.1.1.19	Turbine Pedestal	-	175	-	-	-	-	-	26	202	-	-	202	-	-	-	-	-	-	926	-
3b.1.1	Totals	-	7,219	-	-	-	-	-	1,083	8,302	-	-	8,302	-	-	-	-	-	-	53,870	-

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix D, Page 9 of 11

Table D
Monticello Nuclear Generating Plant
Scenario 2: DECON with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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			
Site Closeout Activities																					
3b.1.2	Grade & landscape site	-	864	-	-	-	-	-	130	994	-	-	994	-	-	-	-	-	-	1,841	-
3b.1.3	Final report to NRC	-	-	-	-	-	-	183	27	211	211	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	8,083	-	-	-	-	183	1,240	9,506	211	-	9,295	-	-	-	-	-	-	55,711	1,560
Period 3b Additional Costs																					
3b.2.1	Clean Concrete Disposal	-	3,297	-	-	-	-	11	496	3,805	-	-	3,805	-	-	-	-	-	-	12	-
3b.2.2	Excavation of Underground Services	-	1,380	-	-	-	-	947	349	2,677	-	-	2,677	-	-	-	-	-	-	13,475	-
3b.2.3	Intake Structure Cofferdam	-	320	-	-	-	-	-	48	368	-	-	368	-	-	-	-	-	-	2,584	-
3b.2.4	Construction Debris	-	-	-	-	-	-	350	53	403	-	-	403	-	-	-	-	-	-	-	-
3b.2.5	Backfill	-	5,102	-	-	-	-	-	765	5,868	-	-	5,868	-	-	-	-	-	-	5,422	-
3b.2	Subtotal Period 3b Additional Costs	-	10,100	-	-	-	-	1,309	1,711	13,120	-	-	13,120	-	-	-	-	-	-	21,493	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	97	-	-	-	-	-	15	111	-	-	111	-	-	-	-	-	-	-	-
3b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	100	15	115	-	115	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	97	-	-	-	-	100	30	226	-	115	111	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	1,251	125	1,376	-	1,376	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	2,737	274	3,011	-	3,011	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	5,455	-	-	-	-	-	818	6,273	-	-	6,273	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	300	45	345	-	-	345	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	386	39	424	-	424	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	237	24	261	-	261	-	-	-	-	-	-	-	-	-
3b.4.7	Fixed Overhead	-	-	-	-	-	-	1,260	189	1,450	-	-	1,450	-	-	-	-	-	-	-	-
3b.4.8	ISFSI Operating Costs	-	-	-	-	-	-	179	27	206	-	206	-	-	-	-	-	-	-	-	-
3b.4.9	Railroad Track Maintenance	-	-	-	-	-	-	497	75	572	-	-	572	-	-	-	-	-	-	-	-
3b.4.10	Security Staff Cost	-	-	-	-	-	-	22,115	3,317	25,432	(0)	7,782	17,650	-	-	-	-	-	-	-	375,152
3b.4.11	DOC Staff Cost	-	-	-	-	-	-	11,290	1,693	12,983	-	-	12,983	-	-	-	-	-	-	-	122,646
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	6,583	987	7,571	-	1,976	5,595	-	-	-	-	-	-	-	98,297
3b.4	Subtotal Period 3b Period-Dependent Costs	-	5,455	-	-	-	-	46,836	7,613	59,904	(0)	15,036	44,868	-	-	-	-	-	-	-	596,095
3b.0	TOTAL PERIOD 3b COST	-	23,734	-	-	-	-	48,428	10,594	82,756	211	15,152	67,394	-	-	-	-	-	-	77,204	597,655
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	59,208	8,881	68,089	-	68,089	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	59,208	8,881	68,089	-	68,089	-	-	-	-	-	-	-	-	-
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	28,205	2,821	31,026	-	31,026	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	24,796	2,480	27,276	-	27,276	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	8,697	870	9,567	-	9,567	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	5,348	535	5,883	-	5,883	-	-	-	-	-	-	-	-	-
3c.4.6	Fixed Overhead	-	-	-	-	-	-	9,721	1,458	11,179	-	11,179	-	-	-	-	-	-	-	-	-
3c.4.7	ISFSI Operating Costs	-	-	-	-	-	-	4,037	606	4,643	-	4,643	-	-	-	-	-	-	-	-	-
3c.4.8	Railroad Track Maintenance	-	-	-	-	-	-	4,510	677	5,187	-	5,187	-	-	-	-	-	-	-	-	-
3c.4.9	Security Staff Cost	-	-	-	-	-	-	152,513	22,877	175,389	-	175,389	-	-	-	-	-	-	-	-	2,114,750
3c.4.10	Utility Staff Cost	-	-	-	-	-	-	38,674	5,801	44,475	-	44,475	-	-	-	-	-	-	-	-	549,022
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	276,502	38,123	314,624	-	314,624	-	-	-	-	-	-	-	-	2,663,772
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	335,709	47,004	382,713	-	382,713	-	-	-	-	-	-	-	-	2,663,772

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix D, Page 10 of 11

Table D
Monticello Nuclear Generating Plant
Scenario 2: DECON with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
3d.1.1	Totals	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
Period 3d Collateral Costs																					
3d.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	23,942	3,591	27,533	-	27,533	-	-	-	-	-	-	-	-	-
3d.3	Subtotal Period 3d Collateral Costs	-	-	-	-	-	-	23,942	3,591	27,533	-	27,533	-	-	-	-	-	-	-	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	9,383	938	10,321	-	10,321	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	6,703	670	7,374	-	7,374	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	4,257	426	4,683	-	4,683	-	-	-	-	-	-	-	-	-
Period 3d Period-Dependent Costs (continued)																					
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	1,779	178	1,957	-	1,957	-	-	-	-	-	-	-	-	-
3d.4.6	Fixed Overhead	-	-	-	-	-	-	3,234	485	3,719	-	3,719	-	-	-	-	-	-	-	-	-
3d.4.7	ISFSI Operating Costs	-	-	-	-	-	-	1,343	201	1,544	-	1,544	-	-	-	-	-	-	-	-	-
3d.4.8	Railroad Track Maintenance	-	-	-	-	-	-	1,500	225	1,725	-	1,725	-	-	-	-	-	-	-	-	-
3d.4.9	Security Staff Cost	-	-	-	-	-	-	50,734	7,610	58,344	-	58,344	-	-	-	-	-	-	-	-	703,485
3d.4.10	Utility Staff Cost	-	-	-	-	-	-	12,865	1,930	14,795	-	14,795	-	-	-	-	-	-	-	-	182,635
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	91,799	12,664	104,462	-	104,462	-	-	-	-	-	-	-	-	886,120
3d.0	TOTAL PERIOD 3d COST	-	-	1,331	-	-	6,552	115,740	17,571	141,194	9,199	131,995	-	-	-	-	-	1,547	311,184	-	886,120
PERIOD 3e - ISFSI Decontamination																					
Period 3e Additional Costs																					
3e.2.1	Decommissioning of ISFSI	-	131	3	784	-	8,058	1,865	2,710	13,551	13,551	-	-	-	27,284	-	-	-	3,860,412	11,160	1,848
3e.2	Subtotal Period 3e Additional Costs	-	131	3	784	-	8,058	1,865	2,710	13,551	13,551	-	-	-	27,284	-	-	-	3,860,412	11,160	1,848
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	110	28	138	138	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	244	61	304	304	-	-	-	-	-	-	-	-	-	-
3e.4.4	Fixed Overhead	-	-	-	-	-	-	82	21	103	103	-	-	-	-	-	-	-	-	-	-
3e.4.5	Railroad Track Maintenance	-	-	-	-	-	-	38	10	48	48	-	-	-	-	-	-	-	-	-	-
3e.4.6	Security Staff Cost	-	-	-	-	-	-	308	77	385	385	-	-	-	-	-	-	-	-	-	4,999
3e.4.7	Utility Staff Cost	-	-	-	-	-	-	260	65	325	325	-	-	-	-	-	-	-	-	-	3,792
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	1,042	261	1,303	1,303	-	-	-	-	-	-	-	-	-	8,792
3e.0	TOTAL PERIOD 3e COST	-	131	3	784	-	8,058	2,907	2,971	14,854	14,854	-	-	-	27,284	-	-	-	3,860,412	11,160	10,640
PERIOD 3f - ISFSI Site Restoration																					
Period 3f Additional Costs																					
3f.2.1	Demolition and Site Restoration of ISFSI	-	1,766	-	-	-	-	185	293	2,244	-	-	2,244	-	-	-	-	-	-	8,537	160
3f.2	Subtotal Period 3f Additional Costs	-	1,766	-	-	-	-	185	293	2,244	-	-	2,244	-	-	-	-	-	-	8,537	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	-	-	-	-	-	-	-	-

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix D, Page 11 of 11

Table D
Monticello Nuclear Generating Plant
Scenario 2: DECON with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 Period-Dependent Costs																					
3f.4.2	Property taxes	-	-	-	-	-	-	123	12	135	-	-	135	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	123	-	-	-	-	-	19	142	-	-	142	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	29	4	33	-	-	33	-	-	-	-	-	-	-	-
3f.4.5	Fixed Overhead	-	-	-	-	-	-	42	6	48	-	-	48	-	-	-	-	-	-	-	-
3f.4.6	Railroad Track Maintenance	-	-	-	-	-	-	19	3	22	-	-	22	-	-	-	-	-	-	-	-
3f.4.7	Security Staff Cost	-	-	-	-	-	-	155	23	179	-	-	179	-	-	-	-	-	-	-	2,520
3f.4.8	Utility Staff Cost	-	-	-	-	-	-	103	16	119	-	-	119	-	-	-	-	-	-	-	1,564
3f.4	Subtotal Period 3f Period-Dependent Costs	-	123	-	-	-	-	471	83	678	-	-	678	-	-	-	-	-	-	-	4,084
3f.0	TOTAL PERIOD 3f COST	-	1,903	-	-	-	-	656	378	2,937	-	-	2,937	-	-	-	-	-	-	8,537	4,244
PERIOD 3 TOTALS		-	25,768	1,335	784	-	14,610	503,441	78,517	624,455	24,264	529,860	70,331	-	27,284	-	-	1,547	4,171,597	96,902	4,162,431
TOTAL COST TO DECOMMISSION		16,489	91,483	22,061	10,357	25,828	72,171	1,054,685	222,778	1,515,850	759,047	685,479	71,324	288,153	203,059	1,711	1,010	1,547	25,757,230	933,647	8,407,016

TOTAL COST TO DECOMMISSION WITH 17.23% CONTINGENCY:	\$1,515,850	thousands of 2017 dollars
TOTAL NRC LICENSE TERMINATION COST IS 50.07% OR:	\$759,047	thousands of 2017 dollars
SPENT FUEL MANAGEMENT COST IS 45.22% OR:	\$685,479	thousands of 2017 dollars
NON-NUCLEAR DEMOLITION COST IS 4.71% OR:	\$71,324	thousands of 2017 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	205,780	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,547	cubic feet
TOTAL SCRAP METAL REMOVED:	22,696	tons
TOTAL CRAFT LABOR REQUIREMENTS:	933,647	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

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-002, Rev. 0
Appendix E, Page 1 of 11***

APPENDIX E

DETAILED COST ANALYSIS

SCENARIO 3: DECON with 100 Year DFS

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix E, Page 2 of 11

Table E
Monticello Nuclear Generating Plant
Scenario 3: DECON with 100 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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	-	-	-	-	-	-	153	23	175	175	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	540	81	621	621	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	153	23	175	175	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	880	132	1,012	1,012	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	364	55	418	418	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Prepare/submit Defueled Technical Specifications	-	-	-	-	-	-	880	132	1,012	1,012	-	-	-	-	-	-	-	-	-	7,500
1a.1.15	Perform Site-Specific Cost Study	-	-	-	-	-	-	587	88	675	675	-	-	-	-	-	-	-	-	-	5,000
1a.1.16	Prepare/submit Irradiated Fuel Management Plan	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	578	87	664	598	-	66	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	489	73	562	506	-	56	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	59	9	67	67	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	833	125	958	958	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	763	114	877	877	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Sacrificial shield	-	-	-	-	-	-	59	9	67	67	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Moisture separators/reheaters	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	188	28	216	108	-	108	-	-	-	-	-	-	-	1,600
1a.1.17.9	Main Turbine	-	-	-	-	-	-	245	37	282	282	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.10	Main Condensers	-	-	-	-	-	-	245	37	282	282	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.11	Pressure suppression structure	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1a.1.17.12	Drywell	-	-	-	-	-	-	188	28	216	216	-	-	-	-	-	-	-	-	-	1,600
1a.1.17.13	Plant structures & buildings	-	-	-	-	-	-	366	55	421	211	-	211	-	-	-	-	-	-	-	3,120
1a.1.17.14	Waste management	-	-	-	-	-	-	540	81	621	621	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.15	Facility & site closeout	-	-	-	-	-	-	106	16	121	61	-	61	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	5,010	752	5,762	5,260	-	502	-	-	-	-	-	-	-	42,683
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	282	42	324	324	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	3,300	495	3,795	3,795	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	164	25	189	189	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlp/s/tooling/etc.	-	-	-	-	-	-	2,300	345	2,645	2,645	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	144	22	166	166	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	15,344	2,302	17,646	17,144	-	502	-	-	-	-	-	-	-	83,013
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	1,221	183	1,404	-	1,404	-	-	-	-	-	-	-	-	-
1a.3.2	Retention and Severance	-	-	-	-	-	-	9,892	1,484	11,376	11,376	-	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	11,113	1,667	12,779	11,376	1,404	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	2,408	241	2,649	2,649	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	2,242	224	2,466	2,466	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	515	-	-	-	-	-	129	644	644	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	567	-	-	-	-	-	85	652	652	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	4	-	50	-	14	81	81	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	1,730	259	1,989	1,989	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,110	111	1,221	1,221	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	3,166	317	3,482	-	3,482	-	-	-	-	-	-	-	-	-
1a.4.9	Fixed Overhead	-	-	-	-	-	-	2,833	425	3,258	3,258	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	803	120	923	-	923	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	103	15	119	-	119	-	-	-	-	-	-	-	-	-
1a.4.12	Railroad Track Maintenance	-	-	-	-	-	-	115	17	133	133	-	-	-	-	-	-	-	-	-	-
1a.4.13	Security Staff Cost	-	-	-	-	-	-	14,260	2,139	16,399	16,399	-	-	-	-	-	-	-	-	-	245,440
1a.4.14	Utility Staff Cost	-	-	-	-	-	-	25,791	3,869	29,660	29,660	-	-	-	-	-	-	-	-	-	422,240
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,083	13	4	-	50	54,561	7,966	63,676	59,153	4,524	-	-	610	-	-	-	12,190	20	667,680

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix E, Page 3 of 11

Table E
Monticello Nuclear Generating Plant
Scenario 3: DECON with 100 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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			
1a.0	TOTAL PERIOD 1a COST	-	1,083	13	4	-	50	81,017	11,935	94,101	87,672	5,927	502	-	610	-	-	-	12,190	20	750,693
PERIOD 1b - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	556	83	639	575	-	64	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	470	70	540	540	-	-	-	-	-	-	-	-	-	4,000
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	158	24	182	46	-	137	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	426	64	490	490	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	141	21	162	81	-	81	-	-	-	-	-	-	-	1,200
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	141	21	162	162	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	117	18	135	67	-	67	-	-	-	-	-	-	-	1,000
1b.1.1.12	Main Turbine	-	-	-	-	-	-	244	37	281	281	-	-	-	-	-	-	-	-	-	2,080
1b.1.1.13	Main Condensers	-	-	-	-	-	-	245	37	282	282	-	-	-	-	-	-	-	-	-	2,088
1b.1.1.14	Moisture separators & reheaters	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.15	Radwaste building	-	-	-	-	-	-	320	48	369	332	-	37	-	-	-	-	-	-	-	2,730
1b.1.1.16	Reactor building	-	-	-	-	-	-	320	48	369	332	-	37	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	3,961	594	4,555	4,132	-	423	-	-	-	-	-	-	-	33,741
1b.1.2	Decon NSSS	286	-	-	-	-	-	-	143	429	429	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	286	-	-	-	-	-	3,961	737	4,984	4,561	-	423	-	-	-	-	-	-	1,067	33,741
Period 1b Additional Costs																					
1b.2.1	Spent fuel pool isolation	-	-	-	-	-	-	11,691	1,754	13,445	13,445	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	6,446	1,934	8,380	8,380	-	-	-	-	-	-	-	-	30,500	10,852
1b.2.3	Mixed & RCRA Waste	-	-	29	19	13	-	-	8	69	69	-	-	43	-	-	-	-	5,253	163	-
1b.2	Subtotal Period 1b Additional Costs	-	-	29	19	13	-	18,137	3,695	21,894	21,894	-	-	43	-	-	-	-	5,253	30,663	10,852
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	973	-	-	-	-	-	-	146	1,119	1,119	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,189	178	1,367	1,367	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process decommissioning water waste	37	-	24	61	-	98	-	54	275	275	-	-	-	233	-	-	-	13,986	45	-
1b.3.4	Process decommissioning chemical flush waste	1	-	23	85	-	969	-	258	1,336	1,336	-	-	-	-	231	-	-	24,599	43	-
1b.3.5	Small tool allowance	-	2	-	-	-	-	-	0	2	2	-	-	-	-	-	-	-	-	-	-
1b.3.6	Pipe cutting equipment	-	1,200	-	-	-	-	-	180	1,380	1,380	-	-	-	-	-	-	-	-	-	-
1b.3.7	Decon rig	1,987	-	-	-	-	-	-	298	2,285	2,285	-	-	-	-	-	-	-	-	-	-
1b.3.8	Spent Fuel Capital and Transfer	-	-	-	-	-	-	2,557	383	2,940	-	2,940	-	-	-	-	-	-	-	-	-
1b.3.9	Retention and Severance	-	-	-	-	-	-	6,362	954	7,316	7,316	-	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	2,997	1,202	47	147	-	1,067	10,107	2,453	18,020	15,080	2,940	-	-	233	231	-	-	38,585	89	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	35	-	-	-	-	-	-	9	44	44	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	1,207	121	1,328	1,328	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	1,104	110	1,214	1,214	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	290	-	-	-	-	-	73	363	363	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	284	-	-	-	-	-	43	327	327	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	8	2	-	29	-	8	48	48	-	-	-	358	-	-	-	7,159	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	1,735	260	1,995	1,995	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	321	32	353	353	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,587	159	1,746	-	1,746	-	-	-	-	-	-	-	-	-
1b.4.10	Fixed Overhead	-	-	-	-	-	-	1,420	213	1,633	1,633	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	402	60	463	-	463	-	-	-	-	-	-	-	-	-
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	52	8	60	-	60	-	-	-	-	-	-	-	-	-
1b.4.13	Railroad Track Maintenance	-	-	-	-	-	-	58	9	67	67	-	-	-	-	-	-	-	-	-	-
1b.4.14	Security Staff Cost	-	-	-	-	-	-	7,150	1,072	8,222	8,222	-	-	-	-	-	-	-	-	-	123,056
1b.4.15	DOC Staff Cost	-	-	-	-	-	-	5,625	844	6,469	6,469	-	-	-	-	-	-	-	-	-	63,614
1b.4.16	Utility Staff Cost	-	-	-	-	-	-	13,003	1,950	14,953	14,953	-	-	-	-	-	-	-	-	-	212,741
1b.4	Subtotal Period 1b Period-Dependent Costs	35	575	8	2	-	29	33,663	4,971	39,283	37,015	2,268	-	-	358	-	-	-	7,159	12	399,411
1b.0	TOTAL PERIOD 1b COST	3,318	1,777	84	169	13	1,096	65,868	11,856	84,181	78,550	5,208	423	43	591	231	-	-	50,997	31,830	444,004
PERIOD 1 TOTALS		3,318	2,859	97	173	13	1,146	146,886	23,790	178,282	166,222	11,136	925	43	1,201	231	-	-	63,188	31,850	1,194,697

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table E
Monticello Nuclear Generating Plant
Scenario 3: DECON with 100 Year DFS Decommissioning Cost Estimate
(thousands of 2017 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site	LLRW	Other Costs	Total Contingency	Total Costs	NRC	Spent Fuel	Site	Processed	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
						Processing Costs	Disposal Costs				Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 2b Period-Dependent Costs (continued)																					
2b.4.13	ISFSI Operating Costs	-	-	-	-	-	-	210	32	242	-	242	-	-	-	-	-	-	-	-	-
2b.4.14	Railroad Track Maintenance	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	-
2b.4.15	Security Staff Cost	-	-	-	-	-	-	26,840	4,026	30,867	30,867	-	-	-	-	-	-	-	-	-	457,896
2b.4.16	DOC Staff Cost	-	-	-	-	-	-	27,122	4,068	31,191	31,191	-	-	-	-	-	-	-	-	-	309,504
2b.4.17	Utility Staff Cost	-	-	-	-	-	-	35,641	5,346	40,988	40,988	-	-	-	-	-	-	-	-	-	574,490
2b.4	Subtotal Period 2b Period-Dependent Costs	1,361	7,283	124	38	-	463	111,268	17,935	138,473	130,592	7,881	-	-	5,690	-	-	-	113,799	186	1,341,891
2b.0	TOTAL PERIOD 2b COST	9,211	21,684	820	1,580	11,212	5,324	198,269	42,159	290,260	206,561	83,688	10	133,979	31,367	-	-	-	6,798,079	339,814	1,345,987
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	634	56	114	109	-	2,091	-	881	3,884	3,884	-	-	-	7,653	-	-	-	486,170	906	-
Disposal of Plant Systems																					
2d.1.2.1	Cranes/Heavy Loads/Rigging - RCA	-	3	0	1	9	-	-	2	15	15	-	-	103	-	-	-	-	4,184	48	-
2d.1.2.2	Electrical - Contaminated Fuel Pool	-	46	1	2	21	2	-	16	87	87	-	-	240	9	-	-	-	10,334	665	-
2d.1.2.3	Electrical - Decontam. Fuel Pool Area	-	293	4	15	213	-	-	108	633	633	-	-	2,457	-	-	-	-	99,783	4,090	-
2d.1.2.4	Fire - RCA - Fuel Pool Area	-	11	0	0	5	-	-	4	20	20	-	-	62	-	-	-	-	2,499	143	-
2d.1.2.5	Fuel Pool Cooling & Cleanup	240	419	34	26	102	370	-	340	1,531	1,531	-	-	1,179	1,341	-	-	-	133,939	8,380	-
2d.1.2.6	Fuel Pool Cooling & Cleanup - Insulated	26	40	3	2	6	32	-	33	143	143	-	-	67	117	-	-	-	10,220	848	-
2d.1.2.7	HVAC Ductwork - Fuel Pool Area	-	34	1	2	26	3	-	14	79	79	-	-	296	11	-	-	-	12,733	457	-
2d.1.2.8	HVAC/Chilled Water - RCA Fuel Pool Area	-	32	0	1	19	-	-	11	64	64	-	-	223	-	-	-	-	9,072	397	-
2d.1.2.9	Instrument & Service Air-RCA-Fuel Pool	-	28	0	2	23	-	-	11	64	64	-	-	267	-	-	-	-	10,841	357	-
2d.1.2	Totals	266	907	44	51	423	408	-	537	2,637	2,637	-	-	4,894	1,479	-	-	-	293,606	15,385	-
Decontamination of Site Buildings																					
2d.1.3.1	Reactor (Post Fuel)	911	2,485	145	669	170	8,544	-	3,353	16,277	16,277	-	-	1,969	62,698	-	-	-	2,732,406	45,703	-
2d.1.3	Totals	911	2,485	145	669	170	8,544	-	3,353	16,277	16,277	-	-	1,969	62,698	-	-	-	2,732,406	45,703	-
2d.1.4	Scaffolding in support of decommissioning	-	547	6	2	25	6	-	143	729	729	-	-	257	23	-	-	-	13,028	5,641	-
2d.1	Subtotal Period 2d Activity Costs	1,811	3,994	309	831	618	11,049	-	4,915	23,527	23,527	-	-	7,120	71,852	-	-	-	3,525,210	67,635	-
Period 2d Additional Costs																					
2d.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,291	387	1,678	1,678	-	-	-	-	-	-	-	-	-	12,480
2d.2.2	Remedial Action Surveys	-	-	-	-	-	-	1,198	359	1,557	1,557	-	-	-	-	-	-	-	-	15,661	-
2d.2	Subtotal Period 2d Additional Costs	-	-	-	-	-	-	2,489	747	3,235	3,235	-	-	-	-	-	-	-	-	15,661	12,480
Period 2d Collateral Costs																					
2d.3.1	Process decommissioning water waste	69	-	47	120	-	191	-	105	533	533	-	-	-	457	-	-	-	27,391	89	-
2d.3.2	Process decommissioning chemical flush waste	1	-	25	92	-	185	-	63	366	366	-	-	-	249	-	-	-	26,553	47	-
2d.3.3	Small tool allowance	-	88	-	-	-	-	-	13	101	101	-	-	-	-	-	-	-	-	-	-
2d.3.4	Decommissioning Equipment Disposition	-	-	143	55	575	145	-	145	1,062	1,062	-	-	6,000	529	-	-	-	303,608	147	-
2d.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	27,061	4,059	31,120	-	31,120	-	-	-	-	-	-	-	-	-
2d.3	Subtotal Period 2d Collateral Costs	70	88	216	267	575	521	27,061	4,385	33,182	2,062	31,120	-	6,000	1,235	-	-	-	357,552	283	-

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table E
Monticello Nuclear Generating Plant
Scenario 3: DECON with 100 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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	219	-	-	-	-	-	-	55	274	274	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	543	54	598	598	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	1,336	134	1,470	1,470	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	752	-	-	-	-	-	188	940	940	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,701	-	-	-	-	-	255	1,956	1,956	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	44	14	-	165	-	48	271	271	-	-	-	2,030	-	-	-	40,600	66	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	521	78	600	600	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	369	37	405	405	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,935	193	2,128	-	2,128	-	-	-	-	-	-	-	-	-
2d.4.10	Fixed Overhead	-	-	-	-	-	-	1,747	262	2,009	2,009	-	-	-	-	-	-	-	-	-	-
2d.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	305	46	351	351	-	-	-	-	-	-	-	-	-	-
2d.4.12	ISFSI Operating Costs	-	-	-	-	-	-	78	12	89	-	89	-	-	-	-	-	-	-	-	-
2d.4.13	Railroad Track Maintenance	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	-
2d.4.14	Security Staff Cost	-	-	-	-	-	-	9,608	1,441	11,049	7,668	3,381	-	-	-	-	-	-	-	-	162,981
2d.4.15	DOC Staff Cost	-	-	-	-	-	-	6,941	1,041	7,982	7,982	-	-	-	-	-	-	-	-	-	78,356
2d.4.16	Utility Staff Cost	-	-	-	-	-	-	9,556	1,433	10,989	10,132	857	-	-	-	-	-	-	-	-	149,660
2d.4	Subtotal Period 2d Period-Dependent Costs	219	2,453	44	14	-	165	33,025	5,290	41,210	34,754	6,456	-	-	2,030	-	-	-	40,600	66	390,997
2d.0	TOTAL PERIOD 2d COST	2,099	6,535	569	1,112	1,193	11,735	62,574	15,337	101,154	63,579	37,575	-	13,120	75,117	-	-	-	3,923,362	83,645	403,477
PERIOD 2f - License Termination																					
Period 2f Direct Decommissioning Activities																					
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	176	53	229	229	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license	-	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	176	53	229	229	-	-	-	-	-	-	-	-	-	-
Period 2f Additional Costs																					
2f.2.1	License Termination Survey	-	-	-	-	-	-	7,341	2,202	9,544	9,544	-	-	-	-	-	-	-	-	96,197	6,240
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	7,341	2,202	9,544	9,544	-	-	-	-	-	-	-	-	96,197	6,240
Period 2f Collateral Costs																					
2f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,189	178	1,367	1,367	-	-	-	-	-	-	-	-	-	-
2f.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	43	7	50	-	50	-	-	-	-	-	-	-	-	-
2f.3	Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,232	185	1,417	1,367	50	-	-	-	-	-	-	-	-	-
Period 2f Period-Dependent Costs																					
2f.4.1	Insurance	-	-	-	-	-	-	543	54	598	598	-	-	-	-	-	-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	1,285	128	1,413	1,413	-	-	-	-	-	-	-	-	-	-
2f.4.3	Health physics supplies	-	597	-	-	-	-	-	149	747	747	-	-	-	-	-	-	-	-	-	-
2f.4.4	Disposal of DAW generated	-	-	8	2	-	29	-	8	47	47	-	-	-	355	-	-	-	7,097	12	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	420	42	463	463	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	103	10	113	-	113	-	-	-	-	-	-	-	-	-
2f.4.8	Fixed Overhead	-	-	-	-	-	-	1,747	262	2,009	2,009	-	-	-	-	-	-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	78	12	89	-	89	-	-	-	-	-	-	-	-	-
2f.4.10	Railroad Track Maintenance	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	-
2f.4.11	Security Staff Cost	-	-	-	-	-	-	9,608	1,441	11,049	7,668	3,381	-	-	-	-	-	-	-	-	162,981
2f.4.12	DOC Staff Cost	-	-	-	-	-	-	5,174	776	5,950	5,950	-	-	-	-	-	-	-	-	-	57,200
2f.4.13	Utility Staff Cost	-	-	-	-	-	-	5,456	818	6,274	5,415	860	-	-	-	-	-	-	-	-	80,707
2f.4	Subtotal Period 2f Period-Dependent Costs	-	597	8	2	-	29	24,761	3,754	29,152	24,708	4,443	-	-	355	-	-	-	7,097	12	300,888
2f.0	TOTAL PERIOD 2f COST	-	597	8	2	-	29	33,511	6,194	40,341	35,848	4,493	-	-	355	-	-	-	7,097	96,208	307,128
PERIOD 2 TOTALS		13,170	62,856	20,629	9,399	25,814	56,415	416,166	122,242	726,692	568,562	158,062	68	288,110	174,575	1,481	1,010	-	21,522,450	804,895	3,049,889

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table E
Monticello Nuclear Generating Plant
Scenario 3: DECON with 100 Year DFS Decommissioning Cost Estimate
(thousands of 2017 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site	LLRW	Other Costs	Total Contingency	Total Costs	NRC	Spent Fuel	Site	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
						Processing Costs	Disposal Costs				Lic. Term. Costs	Management Costs	Restoration Costs		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	-	1,881	-	-	-	-	-	282	2,163	-	-	2,163	-	-	-	-	-	-	13,966	-
3b.1.1.2	Condensate Tanks Foundation	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	50	-
3b.1.1.3	Discharge Retention Basin	-	4	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	25	-
3b.1.1.4	HPCI Room	-	18	-	-	-	-	-	3	21	-	-	21	-	-	-	-	-	-	97	-
3b.1.1.5	Hot Shop	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	177	-
3b.1.1.6	Hydrogen & Oxygen Storage	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	19	-
3b.1.1.7	LLRW Storage & Shipping	-	78	-	-	-	-	-	12	90	-	-	90	-	-	-	-	-	-	662	-
3b.1.1.8	MSIV	-	3	-	-	-	-	-	0	4	-	-	4	-	-	-	-	-	-	42	-
3b.1.1.9	Misc Structures 2017	-	759	-	-	-	-	-	114	872	-	-	872	-	-	-	-	-	-	7,919	-
3b.1.1.10	Offgas Stack	-	104	-	-	-	-	-	16	120	-	-	120	-	-	-	-	-	-	544	-
3b.1.1.11	Offgas Storage & Compressor	-	38	-	-	-	-	-	6	44	-	-	44	-	-	-	-	-	-	199	-
3b.1.1.12	Radwaste	-	219	-	-	-	-	-	33	252	-	-	252	-	-	-	-	-	-	1,220	-
3b.1.1.13	Recombiner	-	123	-	-	-	-	-	18	141	-	-	141	-	-	-	-	-	-	713	-
3b.1.1.14	Security Barrier	-	179	-	-	-	-	-	27	206	-	-	206	-	-	-	-	-	-	933	-
3b.1.1.15	Structures Greater than 3' Below Grade	-	2,380	-	-	-	-	-	357	2,738	-	-	2,738	-	-	-	-	-	-	12,649	-
3b.1.1.16	Tank Farm	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	21	-
3b.1.1.17	Turbine	-	1,175	-	-	-	-	-	176	1,351	-	-	1,351	-	-	-	-	-	-	13,091	-
3b.1.1.18	Turbine Building Addition	-	51	-	-	-	-	-	8	58	-	-	58	-	-	-	-	-	-	618	-
3b.1.1.19	Turbine Pedestal	-	175	-	-	-	-	-	26	202	-	-	202	-	-	-	-	-	-	926	-
3b.1.1	Totals	-	7,219	-	-	-	-	-	1,083	8,302	-	-	8,302	-	-	-	-	-	-	53,870	-
Site Closeout Activities																					
3b.1.2	Grade & landscape site	-	864	-	-	-	-	-	130	994	-	-	994	-	-	-	-	-	-	1,841	-
3b.1.3	Final report to NRC	-	-	-	-	-	-	183	27	211	211	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	8,083	-	-	-	-	183	1,240	9,506	211	-	9,295	-	-	-	-	-	-	55,711	1,560
Period 3b Additional Costs																					
3b.2.1	Clean Concrete Disposal	-	3,297	-	-	-	-	11	496	3,805	-	-	3,805	-	-	-	-	-	-	12	-
3b.2.2	Excavation of Underground Services	-	1,380	-	-	-	-	947	349	2,677	-	-	2,677	-	-	-	-	-	-	13,475	-
3b.2.3	Intake Structure Cofferdam	-	320	-	-	-	-	-	48	368	-	-	368	-	-	-	-	-	-	2,584	-
3b.2.4	Constrution Debris	-	-	-	-	-	-	350	53	403	-	-	403	-	-	-	-	-	-	-	-
3b.2.5	Backfill	-	5,102	-	-	-	-	-	765	5,868	-	-	5,868	-	-	-	-	-	-	5,422	-
3b.2	Subtotal Period 3b Additional Costs	-	10,100	-	-	-	-	1,309	1,711	13,120	-	-	13,120	-	-	-	-	-	-	21,493	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	97	-	-	-	-	-	15	111	-	-	111	-	-	-	-	-	-	-	-
3b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	100	15	115	-	115	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	97	-	-	-	-	100	30	226	-	115	111	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	1,251	125	1,376	-	1,376	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	2,737	274	3,011	-	3,011	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	5,455	-	-	-	-	-	818	6,273	-	-	6,273	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	300	45	345	-	-	345	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	386	39	424	-	424	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	237	24	261	-	261	-	-	-	-	-	-	-	-	-
3b.4.7	Fixed Overhead	-	-	-	-	-	-	1,260	189	1,450	-	-	1,450	-	-	-	-	-	-	-	-
3b.4.8	ISFSI Operating Costs	-	-	-	-	-	-	179	27	206	-	206	-	-	-	-	-	-	-	-	-
3b.4.9	Railroad Track Maintenance	-	-	-	-	-	-	497	75	572	-	-	572	-	-	-	-	-	-	-	-
3b.4.10	Security Staff Cost	-	-	-	-	-	-	22,115	3,317	25,432	(0)	7,782	17,650	-	-	-	-	-	-	-	375,152
3b.4.11	DOC Staff Cost	-	-	-	-	-	-	11,290	1,693	12,983	-	-	12,983	-	-	-	-	-	-	-	122,646
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	6,830	1,024	7,854	-	2,050	5,804	-	-	-	-	-	-	-	101,904
3b.4	Subtotal Period 3b Period-Dependent Costs	-	5,455	-	-	-	-	47,083	7,650	60,188	(0)	15,110	45,077	-	-	-	-	-	-	-	599,702
3b.0	TOTAL PERIOD 3b COST	-	23,734	-	-	-	-	48,675	10,631	83,040	211	15,226	67,604	-	-	-	-	-	-	77,204	601,262

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix E, Page 10 of 11

Table E
Monticello Nuclear Generating Plant
Scenario 3: DECON with 100 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 - Fuel Storage Operations																					
Period 3c Additional Costs																					
3c.2.1	ISFSI Disposition of Original MPC Canisters	-	-	-	293	-	7,257	-	1,844	9,395	-	9,395	-	-	23,007	-	-	-	1,317,864	-	-
3c.2	Subtotal Period 3c Additional Costs	-	-	-	293	-	7,257	-	1,844	9,395	-	9,395	-	-	23,007	-	-	-	1,317,864	-	-
Period 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	443,333	66,500	509,833	-	509,833	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	443,333	66,500	509,833	-	509,833	-	-	-	-	-	-	-	-	-
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	57,075	5,707	62,782	-	62,782	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	45,421	4,542	49,963	-	49,963	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	17,600	1,760	19,360	-	19,360	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	10,821	1,082	11,904	-	11,904	-	-	-	-	-	-	-	-	-
3c.4.6	Fixed Overhead	-	-	-	-	-	-	19,671	2,951	22,622	-	22,622	-	-	-	-	-	-	-	-	-
3c.4.7	ISFSI Operating Costs	-	-	-	-	-	-	8,169	1,225	9,395	-	9,395	-	-	-	-	-	-	-	-	-
3c.4.8	Railroad Track Maintenance	-	-	-	-	-	-	9,127	1,369	10,495	-	10,495	-	-	-	-	-	-	-	-	-
3c.4.9	Security Staff Cost	-	-	-	-	-	-	308,615	46,292	354,908	-	354,908	-	-	-	-	-	-	-	-	4,279,284
3c.4.10	DOC Staff Cost	-	-	-	-	-	-	15,257	2,289	17,545	-	17,545	-	-	-	-	-	-	-	-	164,588
3c.4.11	Utility Staff Cost	-	-	-	-	-	-	148,292	22,244	170,536	-	170,536	-	-	-	-	-	-	-	-	2,180,789
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	640,048	89,461	729,509	-	729,509	-	-	-	-	-	-	-	-	6,624,661
3c.0	TOTAL PERIOD 3c COST	-	-	-	293	-	7,257	1,083,381	157,805	1,248,737	-	1,248,737	-	-	23,007	-	-	-	1,317,864	-	6,624,661
PERIOD 3d - Spent Fuel/GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
3d.1.1	Totals	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
Period 3d Collateral Costs																					
3d.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	53,629	8,044	61,673	-	61,673	-	-	-	-	-	-	-	-	-
3d.3	Subtotal Period 3d Collateral Costs	-	-	-	-	-	-	53,629	8,044	61,673	-	61,673	-	-	-	-	-	-	-	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	9,383	938	10,321	-	10,321	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	6,703	670	7,374	-	7,374	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	4,257	426	4,683	-	4,683	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	1,779	178	1,957	-	1,957	-	-	-	-	-	-	-	-	-
3d.4.6	Fixed Overhead	-	-	-	-	-	-	3,234	485	3,719	-	3,719	-	-	-	-	-	-	-	-	-
3d.4.7	ISFSI Operating Costs	-	-	-	-	-	-	1,343	201	1,544	-	1,544	-	-	-	-	-	-	-	-	-
3d.4.8	Railroad Track Maintenance	-	-	-	-	-	-	1,500	225	1,725	-	1,725	-	-	-	-	-	-	-	-	-
3d.4.9	Security Staff Cost	-	-	-	-	-	-	50,734	7,610	58,344	-	58,344	-	-	-	-	-	-	-	-	703,485
3d.4.10	Utility Staff Cost	-	-	-	-	-	-	12,865	1,930	14,795	-	14,795	-	-	-	-	-	-	-	-	182,635
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	91,799	12,664	104,462	-	104,462	-	-	-	-	-	-	-	-	886,120
3d.0	TOTAL PERIOD 3d COST	-	-	1,331	-	-	6,552	145,427	22,024	175,334	9,199	166,135	-	-	-	-	-	1,547	311,184	-	886,120

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table E
Monticello Nuclear Generating Plant
Scenario 3: DECON with 100 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 3e - ISFSI Decontamination																					
Period 3e Additional Costs																					
3e.2.1	Decommissioning of ISFSI	30	2	6	14	-	208	1,867	532	2,659	2,659	-	-	-	834	-	-	-	220,333	10,633	1,848
3e.2	Subtotal Period 3e Additional Costs	30	2	6	14	-	208	1,867	532	2,659	2,659	-	-	-	834	-	-	-	220,333	10,633	1,848
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	110	28	138	138	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	244	61	304	304	-	-	-	-	-	-	-	-	-	-
3e.4.4	Fixed Overhead	-	-	-	-	-	-	82	21	103	103	-	-	-	-	-	-	-	-	-	-
3e.4.5	Railroad Track Maintenance	-	-	-	-	-	-	38	10	48	48	-	-	-	-	-	-	-	-	-	-
3e.4.6	Security Staff Cost	-	-	-	-	-	-	308	77	385	385	-	-	-	-	-	-	-	-	-	4,999
3e.4.7	Utility Staff Cost	-	-	-	-	-	-	260	65	325	325	-	-	-	-	-	-	-	-	-	3,792
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	1,042	261	1,303	1,303	-	-	-	-	-	-	-	-	-	8,792
3e.0	TOTAL PERIOD 3e COST	30	2	6	14	-	208	2,909	792	3,962	3,962	-	-	-	834	-	-	-	220,333	10,633	10,640
PERIOD 3f - ISFSI Site Restoration																					
Period 3f Additional Costs																					
3f.2.1	Demolition and Site Restoration of ISFSI	-	1,882	-	-	-	-	201	312	2,396	-	-	2,396	-	-	-	-	-	-	9,097	160
3f.2	Subtotal Period 3f Additional Costs	-	1,882	-	-	-	-	201	312	2,396	-	-	2,396	-	-	-	-	-	-	9,097	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.4.2	Property taxes	-	-	-	-	-	-	123	12	135	-	-	135	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	123	-	-	-	-	-	19	142	-	-	142	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	29	4	33	-	-	33	-	-	-	-	-	-	-	-
3f.4.5	Fixed Overhead	-	-	-	-	-	-	42	6	48	-	-	48	-	-	-	-	-	-	-	-
3f.4.6	Railroad Track Maintenance	-	-	-	-	-	-	19	3	22	-	-	22	-	-	-	-	-	-	-	-
3f.4.7	Security Staff Cost	-	-	-	-	-	-	155	23	179	-	-	179	-	-	-	-	-	-	-	2,520
3f.4.8	Utility Staff Cost	-	-	-	-	-	-	103	16	119	-	-	119	-	-	-	-	-	-	-	1,564
3f.4	Subtotal Period 3f Period-Dependent Costs	-	123	-	-	-	-	471	83	678	-	-	678	-	-	-	-	-	-	-	4,084
3f.0	TOTAL PERIOD 3f COST	-	2,018	-	-	-	-	673	398	3,088	-	-	3,088	-	-	-	-	-	-	9,097	4,244
PERIOD 3 TOTALS		30	25,755	1,337	308	-	14,017	1,281,065	191,649	1,514,161	13,372	1,430,098	70,692	-	23,841	-	-	1,547	1,849,382	96,934	8,126,927
TOTAL COST TO DECOMMISSION		16,519	91,470	22,063	9,880	25,828	71,578	1,844,117	337,682	2,419,136	748,155	1,599,295	71,685	288,153	199,616	1,711	1,010	1,547	23,435,020	933,679	12,371,510

TOTAL COST TO DECOMMISSION WITH 16.22% CONTINGENCY:	\$2,419,136	thousands of 2017 dollars
TOTAL NRC LICENSE TERMINATION COST IS 30.93% OR:	\$748,155	thousands of 2017 dollars
SPENT FUEL MANAGEMENT COST IS 66.11% OR:	\$1,599,295	thousands of 2017 dollars
NON-NUCLEAR DEMOLITION COST IS 2.96% OR:	\$71,685	thousands of 2017 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	202,337	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,547	cubic feet
TOTAL SCRAP METAL REMOVED:	22,696	tons
TOTAL CRAFT LABOR REQUIREMENTS:	933,679	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

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-002, Rev. 0
Appendix F, Page 1 of 11***

APPENDIX F

DETAILED COST ANALYSIS

SCENARIO 4: DECON with 200 Year DFS

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix F, Page 2 of 11

Table F
Monticello Nuclear Generating Plant
Scenario 4: DECON with 200 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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	-	-	-	-	-	-	153	23	175	175	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	540	81	621	621	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	153	23	175	175	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	880	132	1,012	1,012	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	364	55	418	418	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Prepare/submit Defueled Technical Specifications	-	-	-	-	-	-	880	132	1,012	1,012	-	-	-	-	-	-	-	-	-	7,500
1a.1.15	Perform Site-Specific Cost Study	-	-	-	-	-	-	587	88	675	675	-	-	-	-	-	-	-	-	-	5,000
1a.1.16	Prepare/submit Irradiated Fuel Management Plan	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	578	87	664	598	-	66	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	489	73	562	506	-	56	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	59	9	67	67	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	833	125	958	958	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	763	114	877	877	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Sacrificial shield	-	-	-	-	-	-	59	9	67	67	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Moisture separators/reheaters	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	188	28	216	108	-	108	-	-	-	-	-	-	-	1,600
1a.1.17.9	Main Turbine	-	-	-	-	-	-	245	37	282	282	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.10	Main Condensers	-	-	-	-	-	-	245	37	282	282	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.11	Pressure suppression structure	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1a.1.17.12	Drywell	-	-	-	-	-	-	188	28	216	216	-	-	-	-	-	-	-	-	-	1,600
1a.1.17.13	Plant structures & buildings	-	-	-	-	-	-	366	55	421	211	-	211	-	-	-	-	-	-	-	3,120
1a.1.17.14	Waste management	-	-	-	-	-	-	540	81	621	621	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.15	Facility & site closeout	-	-	-	-	-	-	106	16	121	61	-	61	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	5,010	752	5,762	5,260	-	502	-	-	-	-	-	-	-	42,683
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	282	42	324	324	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	3,300	495	3,795	3,795	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	164	25	189	189	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlp/s/tooling/etc.	-	-	-	-	-	-	2,300	345	2,645	2,645	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	144	22	166	166	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	15,344	2,302	17,646	17,144	-	502	-	-	-	-	-	-	-	83,013
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	1,221	183	1,404	-	1,404	-	-	-	-	-	-	-	-	-
1a.3.2	Retention and Severance	-	-	-	-	-	-	9,892	1,484	11,376	11,376	-	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	11,113	1,667	12,779	11,376	1,404	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	2,408	241	2,649	2,649	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	2,242	224	2,466	2,466	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	515	-	-	-	-	-	129	644	644	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	567	-	-	-	-	-	85	652	652	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	4	-	50	-	14	81	81	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	1,730	259	1,989	1,989	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,110	111	1,221	1,221	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	3,166	317	3,482	-	3,482	-	-	-	-	-	-	-	-	-
1a.4.9	Fixed Overhead	-	-	-	-	-	-	2,833	425	3,258	3,258	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	803	120	923	-	923	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	103	15	119	-	119	-	-	-	-	-	-	-	-	-
1a.4.12	Railroad Track Maintenance	-	-	-	-	-	-	115	17	133	133	-	-	-	-	-	-	-	-	-	-
1a.4.13	Security Staff Cost	-	-	-	-	-	-	14,260	2,139	16,399	16,399	-	-	-	-	-	-	-	-	-	245,440
1a.4.14	Utility Staff Cost	-	-	-	-	-	-	25,791	3,869	29,660	29,660	-	-	-	-	-	-	-	-	-	422,240
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,083	13	4	-	50	54,561	7,966	63,676	59,153	4,524	-	-	610	-	-	-	12,190	20	667,680

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix F, Page 3 of 11

Table F
Monticello Nuclear Generating Plant
Scenario 4: DECON with 200 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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			
1a.0	TOTAL PERIOD 1a COST	-	1,083	13	4	-	50	81,017	11,935	94,101	87,672	5,927	502	-	610	-	-	-	12,190	20	750,693
PERIOD 1b - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	556	83	639	575	-	64	-	-	-	-	-	-	4,733	
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	1,000	
1b.1.1.3	Reactor internals	-	-	-	-	-	-	470	70	540	540	-	-	-	-	-	-	-	-	4,000	
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	158	24	182	46	-	137	-	-	-	-	-	-	1,350	
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	1,000	
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	1,000	
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	2,000	
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	426	64	490	490	-	-	-	-	-	-	-	-	3,630	
1b.1.1.9	Facility closeout	-	-	-	-	-	-	141	21	162	81	-	81	-	-	-	-	-	-	1,200	
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	141	21	162	162	-	-	-	-	-	-	-	-	1,200	
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	117	18	135	67	-	67	-	-	-	-	-	-	1,000	
1b.1.1.12	Main Turbine	-	-	-	-	-	-	244	37	281	281	-	-	-	-	-	-	-	-	2,080	
1b.1.1.13	Main Condensers	-	-	-	-	-	-	245	37	282	282	-	-	-	-	-	-	-	-	2,088	
1b.1.1.14	Moisture separators & reheaters	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	2,000	
1b.1.1.15	Radwaste building	-	-	-	-	-	-	320	48	369	332	-	37	-	-	-	-	-	-	2,730	
1b.1.1.16	Reactor building	-	-	-	-	-	-	320	48	369	332	-	37	-	-	-	-	-	-	2,730	
1b.1.1	Total	-	-	-	-	-	-	3,961	594	4,555	4,132	-	423	-	-	-	-	-	-	33,741	
1b.1.2	Decon NSSS	286	-	-	-	-	-	-	143	429	429	-	-	-	-	-	-	-	1,067	-	
1b.1	Subtotal Period 1b Activity Costs	286	-	-	-	-	-	3,961	737	4,984	4,561	-	423	-	-	-	-	-	1,067	33,741	
Period 1b Additional Costs																					
1b.2.1	Spent fuel pool isolation	-	-	-	-	-	-	11,691	1,754	13,445	13,445	-	-	-	-	-	-	-	-	-	
1b.2.2	Site Characterization	-	-	-	-	-	-	6,446	1,934	8,380	8,380	-	-	-	-	-	-	-	30,500	10,852	
1b.2.3	Mixed & RCRA Waste	-	-	29	19	13	-	-	8	69	69	-	-	43	-	-	-	-	5,253	163	
1b.2	Subtotal Period 1b Additional Costs	-	-	29	19	13	-	18,137	3,695	21,894	21,894	-	-	43	-	-	-	-	5,253	30,663	
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	973	-	-	-	-	-	-	146	1,119	1,119	-	-	-	-	-	-	-	-	-	
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,189	178	1,367	1,367	-	-	-	-	-	-	-	-	-	
1b.3.3	Process decommissioning water waste	37	-	24	61	-	98	-	54	275	275	-	-	-	233	-	-	-	13,986	45	
1b.3.4	Process decommissioning chemical flush waste	1	-	23	85	-	969	-	258	1,336	1,336	-	-	-	-	231	-	-	24,599	43	
1b.3.5	Small tool allowance	-	2	-	-	-	-	-	0	2	2	-	-	-	-	-	-	-	-	-	
1b.3.6	Pipe cutting equipment	-	1,200	-	-	-	-	-	180	1,380	1,380	-	-	-	-	-	-	-	-	-	
1b.3.7	Decon rig	1,987	-	-	-	-	-	-	298	2,285	2,285	-	-	-	-	-	-	-	-	-	
1b.3.8	Spent Fuel Capital and Transfer	-	-	-	-	-	-	2,557	383	2,940	-	2,940	-	-	-	-	-	-	-	-	
1b.3.9	Retention and Severance	-	-	-	-	-	-	6,362	954	7,316	7,316	-	-	-	-	-	-	-	-	-	
1b.3	Subtotal Period 1b Collateral Costs	2,997	1,202	47	147	-	1,067	10,107	2,453	18,020	15,080	2,940	-	-	233	231	-	-	38,585	89	
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	35	-	-	-	-	-	-	9	44	44	-	-	-	-	-	-	-	-	-	
1b.4.2	Insurance	-	-	-	-	-	-	1,207	121	1,328	1,328	-	-	-	-	-	-	-	-	-	
1b.4.3	Property taxes	-	-	-	-	-	-	1,104	110	1,214	1,214	-	-	-	-	-	-	-	-	-	
1b.4.4	Health physics supplies	-	290	-	-	-	-	-	73	363	363	-	-	-	-	-	-	-	-	-	
1b.4.5	Heavy equipment rental	-	284	-	-	-	-	-	43	327	327	-	-	-	-	-	-	-	-	-	
1b.4.6	Disposal of DAW generated	-	-	8	2	-	29	-	8	48	48	-	-	-	358	-	-	-	7,159	12	
1b.4.7	Plant energy budget	-	-	-	-	-	-	1,735	260	1,995	1,995	-	-	-	-	-	-	-	-	-	
1b.4.8	NRC Fees	-	-	-	-	-	-	321	32	353	353	-	-	-	-	-	-	-	-	-	
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,587	159	1,746	-	1,746	-	-	-	-	-	-	-	-	
1b.4.10	Fixed Overhead	-	-	-	-	-	-	1,420	213	1,633	1,633	-	-	-	-	-	-	-	-	-	
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	402	60	463	-	463	-	-	-	-	-	-	-	-	
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	52	8	60	-	60	-	-	-	-	-	-	-	-	
1b.4.13	Railroad Track Maintenance	-	-	-	-	-	-	58	9	67	67	-	-	-	-	-	-	-	-	-	
1b.4.14	Security Staff Cost	-	-	-	-	-	-	7,150	1,072	8,222	8,222	-	-	-	-	-	-	-	-	123,056	
1b.4.15	DOC Staff Cost	-	-	-	-	-	-	5,625	844	6,469	6,469	-	-	-	-	-	-	-	-	63,614	
1b.4.16	Utility Staff Cost	-	-	-	-	-	-	13,003	1,950	14,953	14,953	-	-	-	-	-	-	-	-	212,741	
1b.4	Subtotal Period 1b Period-Dependent Costs	35	575	8	2	-	29	33,663	4,971	39,283	37,015	2,268	-	-	358	-	-	-	7,159	12	
1b.0	TOTAL PERIOD 1b COST	3,318	1,777	84	169	13	1,096	65,868	11,856	84,181	78,550	5,208	423	43	591	231	-	-	50,997	31,830	
PERIOD 1 TOTALS		3,318	2,859	97	173	13	1,146	146,886	23,790	178,282	166,222	11,136	925	43	1,201	231	-	-	63,188	31,850	

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix F, Page 6 of 11

Table F
Monticello Nuclear Generating Plant
Scenario 4: DECON with 200 Year DFS Decommissioning Cost Estimate
(thousands of 2017 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site	LLRW	Other Costs	Total Contingency	Total Costs	NRC	Spent Fuel	Site	Processed	Burial Volumes				Burial /		Utility and Contractor Manhours
						Processing Costs	Disposal Costs				Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	
Disposal of Plant Systems (continued)																					
2b.1.1.14	Off Gas Holdup	-	333	20	26	238	174	-	168	960	960	-	-	2,755	630	-	-	-	152,277	4,769	-
2b.1.1.15	Primary Containment	-	443	43	59	536	412	-	308	1,801	1,801	-	-	6,201	1,506	-	-	-	347,704	6,454	-
2b.1.1.16	Process Radiation Monitors	-	45	2	2	12	14	-	17	92	92	-	-	142	52	-	-	-	9,115	649	-
2b.1.1.17	Rx Bldg Closed Clng Water - Insul - RCA	-	111	2	6	85	-	-	42	245	245	-	-	977	-	-	-	-	39,675	1,484	-
2b.1.1.18	Rx Bldg Closed Clng Water - RCA	-	178	12	43	614	-	-	144	991	991	-	-	7,093	-	-	-	-	288,031	2,489	-
2b.1.1.19	Rx Component Handling Equip	26	138	19	19	100	227	-	124	653	653	-	-	1,158	829	-	-	-	99,730	2,462	-
2b.1.1.20	Rx Pressure Vessel	28	46	6	4	7	63	-	43	196	196	-	-	75	230	-	-	-	17,816	1,051	-
2b.1.1.21	Rx Water Cleanup	169	258	19	11	11	204	-	205	877	877	-	-	130	737	-	-	-	52,670	5,736	-
2b.1.1.22	Secondary Containment	-	121	7	10	88	70	-	63	360	360	-	-	1,017	255	-	-	-	57,567	1,763	-
2b.1.1.23	Service & Seal Water - Insulated - RCA	-	117	2	7	102	-	-	46	274	274	-	-	1,180	-	-	-	-	47,917	1,565	-
2b.1.1.24	Service & Seal Water - RCA	-	155	3	11	156	-	-	64	390	390	-	-	1,809	-	-	-	-	73,453	2,016	-
2b.1.1.25	Service Air Blower - RCA	-	15	0	1	18	-	-	7	41	41	-	-	206	-	-	-	-	8,364	206	-
2b.1.1.26	Solid Radwaste	327	483	36	34	206	380	-	419	1,885	1,885	-	-	2,387	1,380	-	-	-	185,221	10,820	-
2b.1.1.27	Structures & Buildings	-	76	2	3	31	23	-	30	166	166	-	-	357	85	-	-	-	19,933	1,128	-
2b.1.1.28	Wells & Domestic Water	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	144	-
2b.1.1.29	Wells & Domestic Water - RCA	-	51	1	2	30	-	-	18	101	101	-	-	342	-	-	-	-	13,874	633	-
2b.1.1	Totals	1,122	7,707	299	537	6,032	2,160	-	4,042	21,900	21,890	-	10	69,735	7,859	-	-	-	3,334,244	122,835	-
2b.1.2	Scaffolding in support of decommissioning	-	2,735	31	10	123	31	-	715	3,645	3,645	-	-	1,287	114	-	-	-	65,139	28,205	-
Decontamination of Site Buildings																					
2b.1.3.1	Reactor Building	5,006	2,817	155	347	4,159	1,007	-	4,150	17,641	17,641	-	-	48,077	7,014	-	-	-	2,317,670	112,518	-
2b.1.3.2	Admin	103	6	0	2	-	14	-	57	182	182	-	-	-	145	-	-	-	6,840	1,600	-
2b.1.3.3	HPCI Room	28	27	1	2	10	13	-	26	107	107	-	-	118	125	-	-	-	10,759	789	-
2b.1.3.4	Hot Shop	16	4	0	1	-	10	-	12	43	43	-	-	-	103	-	-	-	4,860	286	-
2b.1.3.5	LLRW Storage & Shipping	56	23	1	6	3	41	-	46	176	176	-	-	31	433	-	-	-	21,708	1,127	-
2b.1.3.6	Offgas Stack	360	256	6	16	116	73	-	283	1,109	1,109	-	-	1,343	669	-	-	-	87,045	8,860	-
2b.1.3.7	Offgas Storage & Compressor	39	17	1	4	2	30	-	32	125	125	-	-	25	316	-	-	-	15,948	785	-
2b.1.3.8	Radwaste	117	59	3	13	15	86	-	100	393	393	-	-	172	910	-	-	-	49,943	2,503	-
2b.1.3.9	Radwaste Material Storage Warehouse	62	23	1	6	-	47	-	49	189	189	-	-	-	495	-	-	-	23,400	1,197	-
2b.1.3.10	Recombiner	26	24	1	4	17	22	-	28	122	122	-	-	199	216	-	-	-	18,405	695	-
2b.1.3.11	Turbine	684	341	18	76	111	507	-	583	2,319	2,319	-	-	1,283	5,299	-	-	-	303,150	14,443	-
2b.1.3.12	Turbine Building Addition	56	20	1	6	-	41	-	44	169	169	-	-	-	434	-	-	-	20,478	1,087	-
2b.1.3	Totals	6,554	3,618	188	483	4,433	1,889	-	5,410	22,574	22,574	-	-	51,247	16,159	-	-	-	2,880,206	145,889	-
2b.1.4	Prepare/submit License Termination Plan	-	-	-	-	-	-	481	72	553	553	-	-	-	-	-	-	-	-	-	4,096
2b.1.5	Receive NRC approval of termination plan								a												
2b.1	Subtotal Period 2b Activity Costs	7,676	14,060	518	1,031	10,588	4,079	481	10,239	48,672	48,662	-	10	122,269	24,132	-	-	-	6,279,589	296,929	4,096
Period 2b Additional Costs																					
2b.2.1	Remedial Action Surveys	-	-	-	-	-	-	3,241	972	4,213	4,213	-	-	-	-	-	-	-	-	42,370	-
2b.2.2	Operational Equipment	-	-	19	60	624	-	-	104	807	807	-	-	11,710	-	-	-	-	292,750	32	-
2b.2.3	Security Modifications	-	-	-	-	-	-	8,696	1,304	10,000	10,000	-	-	-	-	-	-	-	-	-	-
2b.2	Subtotal Period 2b Additional Costs	-	-	19	60	624	-	11,937	2,381	15,020	15,020	-	-	11,710	-	-	-	-	292,750	42,402	-
Period 2b Collateral Costs																					
2b.3.1	Process decommissioning water waste	173	-	117	299	-	474	-	261	1,325	1,325	-	-	-	1,133	-	-	-	67,962	221	-
2b.3.2	Process decommissioning chemical flush waste	1	-	41	153	-	307	-	104	606	606	-	-	-	413	-	-	-	43,978	77	-
2b.3.3	Small tool allowance	-	341	-	-	-	-	-	51	392	392	-	-	-	-	-	-	-	-	-	-
2b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	65,919	9,888	75,807	-	75,807	-	-	-	-	-	-	-	-	-
2b.3.5	Retention and Severance	-	-	-	-	-	-	8,665	1,300	9,964	9,964	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	174	341	159	452	-	781	74,584	11,604	88,094	12,287	75,807	-	-	1,545	-	-	-	111,940	298	-

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table F
Monticello Nuclear Generating Plant
Scenario 4: DECON with 200 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	1,361	-	-	-	-	-	-	340	1,701	1,701	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	1,470	147	1,617	1,617	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	3,915	391	4,306	4,306	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	2,681	-	-	-	-	-	670	3,352	3,352	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	4,602	-	-	-	-	-	690	5,292	5,292	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	124	38	-	463	-	134	759	759	-	-	-	5,690	-	-	-	113,799	186	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	2,645	397	3,041	3,041	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,180	118	1,298	1,298	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	5,234	523	5,758	-	5,758	-	-	-	-	-	-	-	-	-
2b.4.10	Fixed Overhead	-	-	-	-	-	-	4,725	709	5,434	5,434	-	-	-	-	-	-	-	-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,636	245	1,881	-	1,881	-	-	-	-	-	-	-	-	-
2b.4.12	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	412	62	474	474	-	-	-	-	-	-	-	-	-	-
2b.4.13	ISFSI Operating Costs	-	-	-	-	-	-	210	32	242	-	242	-	-	-	-	-	-	-	-	-
2b.4.14	Railroad Track Maintenance	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	-
2b.4.15	Security Staff Cost	-	-	-	-	-	-	26,840	4,026	30,867	30,867	-	-	-	-	-	-	-	-	-	457,896
2b.4.16	DOC Staff Cost	-	-	-	-	-	-	27,122	4,068	31,191	31,191	-	-	-	-	-	-	-	-	-	309,504
2b.4.17	Utility Staff Cost	-	-	-	-	-	-	35,641	5,346	40,988	40,988	-	-	-	-	-	-	-	-	-	574,490
2b.4	Subtotal Period 2b Period-Dependent Costs	1,361	7,283	124	38	-	463	111,268	17,935	138,473	130,592	7,881	-	-	5,690	-	-	-	113,799	186	1,341,891
2b.0	TOTAL PERIOD 2b COST	9,211	21,684	820	1,580	11,212	5,324	198,269	42,159	290,260	206,561	83,688	10	133,979	31,367	-	-	-	6,798,079	339,814	1,345,987
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	634	56	114	109	-	2,091	-	881	3,884	3,884	-	-	-	7,653	-	-	-	486,170	906	-
Disposal of Plant Systems																					
2d.1.2.1	Cranes/Heavy Loads/Rigging - RCA	-	3	0	1	9	-	-	2	15	15	-	-	103	-	-	-	-	4,184	48	-
2d.1.2.2	Electrical - Contaminated Fuel Pool	-	46	1	2	21	2	-	16	87	87	-	-	240	9	-	-	-	10,334	665	-
2d.1.2.3	Electrical - Decontam. Fuel Pool Area	-	293	4	15	213	-	-	108	633	633	-	-	2,457	-	-	-	-	99,783	4,090	-
2d.1.2.4	Fire - RCA - Fuel Pool Area	-	11	0	0	5	-	-	4	20	20	-	-	62	-	-	-	-	2,499	143	-
2d.1.2.5	Fuel Pool Cooling & Cleanup	240	419	34	26	102	370	-	340	1,531	1,531	-	-	1,179	1,341	-	-	-	133,939	8,380	-
2d.1.2.6	Fuel Pool Cooling & Cleanup - Insulated	26	40	3	2	6	32	-	33	143	143	-	-	67	117	-	-	-	10,220	848	-
2d.1.2.7	HVAC Ductwork - Fuel Pool Area	-	34	1	2	26	3	-	14	79	79	-	-	296	11	-	-	-	12,733	457	-
2d.1.2.8	HVAC/Chilled Water - RCA Fuel Pool Area	-	32	0	1	19	-	-	11	64	64	-	-	223	-	-	-	-	9,072	397	-
2d.1.2.9	Instrument & Service Air-RCA-Fuel Pool	-	28	0	2	23	-	-	11	64	64	-	-	267	-	-	-	-	10,841	357	-
2d.1.2	Totals	266	907	44	51	423	408	-	537	2,637	2,637	-	-	4,894	1,479	-	-	-	293,606	15,385	-
Decontamination of Site Buildings																					
2d.1.3.1	Reactor (Post Fuel)	911	2,485	145	669	170	8,544	-	3,353	16,277	16,277	-	-	1,969	62,698	-	-	-	2,732,406	45,703	-
2d.1.3	Totals	911	2,485	145	669	170	8,544	-	3,353	16,277	16,277	-	-	1,969	62,698	-	-	-	2,732,406	45,703	-
2d.1.4	Scaffolding in support of decommissioning	-	547	6	2	25	6	-	143	729	729	-	-	257	23	-	-	-	13,028	5,641	-
2d.1	Subtotal Period 2d Activity Costs	1,811	3,994	309	831	618	11,049	-	4,915	23,527	23,527	-	-	7,120	71,852	-	-	-	3,525,210	67,635	-
Period 2d Additional Costs																					
2d.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,291	387	1,678	1,678	-	-	-	-	-	-	-	-	-	12,480
2d.2.2	Remedial Action Surveys	-	-	-	-	-	-	1,198	359	1,557	1,557	-	-	-	-	-	-	-	-	15,661	-
2d.2	Subtotal Period 2d Additional Costs	-	-	-	-	-	-	2,489	747	3,235	3,235	-	-	-	-	-	-	-	-	15,661	12,480
Period 2d Collateral Costs																					
2d.3.1	Process decommissioning water waste	69	-	47	120	-	191	-	105	533	533	-	-	-	457	-	-	-	27,391	89	-
2d.3.2	Process decommissioning chemical flush waste	1	-	25	92	-	185	-	63	366	366	-	-	-	249	-	-	-	26,553	47	-
2d.3.3	Small tool allowance	-	88	-	-	-	-	-	13	101	101	-	-	-	-	-	-	-	-	-	-
2d.3.4	Decommissioning Equipment Disposition	-	-	143	55	575	145	-	145	1,062	1,062	-	-	6,000	529	-	-	-	303,608	147	-
2d.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	27,061	4,059	31,120	-	31,120	-	-	-	-	-	-	-	-	-
2d.3	Subtotal Period 2d Collateral Costs	70	88	216	267	575	521	27,061	4,385	33,182	2,062	31,120	-	6,000	1,235	-	-	-	357,552	283	-

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table F
Monticello Nuclear Generating Plant
Scenario 4: DECON with 200 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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	219	-	-	-	-	-	-	55	274	274	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	543	54	598	598	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	1,336	134	1,470	1,470	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	752	-	-	-	-	-	188	940	940	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,701	-	-	-	-	-	255	1,956	1,956	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	44	14	-	165	-	48	271	271	-	-	-	2,030	-	-	-	40,600	66	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	521	78	600	600	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	369	37	405	405	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,935	193	2,128	-	2,128	-	-	-	-	-	-	-	-	-
2d.4.10	Fixed Overhead	-	-	-	-	-	-	1,747	262	2,009	2,009	-	-	-	-	-	-	-	-	-	-
2d.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	305	46	351	351	-	-	-	-	-	-	-	-	-	-
2d.4.12	ISFSI Operating Costs	-	-	-	-	-	-	78	12	89	-	89	-	-	-	-	-	-	-	-	-
2d.4.13	Railroad Track Maintenance	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	-
2d.4.14	Security Staff Cost	-	-	-	-	-	-	9,608	1,441	11,049	7,668	3,381	-	-	-	-	-	-	-	-	162,981
2d.4.15	DOC Staff Cost	-	-	-	-	-	-	6,941	1,041	7,982	7,982	-	-	-	-	-	-	-	-	-	78,356
2d.4.16	Utility Staff Cost	-	-	-	-	-	-	9,556	1,433	10,989	10,132	857	-	-	-	-	-	-	-	-	149,660
2d.4	Subtotal Period 2d Period-Dependent Costs	219	2,453	44	14	-	165	33,025	5,290	41,210	34,754	6,456	-	-	2,030	-	-	-	40,600	66	390,997
2d.0	TOTAL PERIOD 2d COST	2,099	6,535	569	1,112	1,193	11,735	62,574	15,337	101,154	63,579	37,575	-	13,120	75,117	-	-	-	3,923,362	83,645	403,477
PERIOD 2f - License Termination																					
Period 2f Direct Decommissioning Activities																					
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	176	53	229	229	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license	-	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	176	53	229	229	-	-	-	-	-	-	-	-	-	-
Period 2f Additional Costs																					
2f.2.1	License Termination Survey	-	-	-	-	-	-	7,341	2,202	9,544	9,544	-	-	-	-	-	-	-	-	96,197	6,240
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	7,341	2,202	9,544	9,544	-	-	-	-	-	-	-	-	96,197	6,240
Period 2f Collateral Costs																					
2f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,189	178	1,367	1,367	-	-	-	-	-	-	-	-	-	-
2f.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	43	7	50	-	50	-	-	-	-	-	-	-	-	-
2f.3	Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,232	185	1,417	1,367	50	-	-	-	-	-	-	-	-	-
Period 2f Period-Dependent Costs																					
2f.4.1	Insurance	-	-	-	-	-	-	543	54	598	598	-	-	-	-	-	-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	1,285	128	1,413	1,413	-	-	-	-	-	-	-	-	-	-
2f.4.3	Health physics supplies	-	597	-	-	-	-	-	149	747	747	-	-	-	-	-	-	-	-	-	-
2f.4.4	Disposal of DAW generated	-	-	8	2	-	29	-	8	47	47	-	-	-	355	-	-	-	7,097	12	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	420	42	463	463	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	103	10	113	-	113	-	-	-	-	-	-	-	-	-
2f.4.8	Fixed Overhead	-	-	-	-	-	-	1,747	262	2,009	2,009	-	-	-	-	-	-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	78	12	89	-	89	-	-	-	-	-	-	-	-	-
2f.4.10	Railroad Track Maintenance	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	-
2f.4.11	Security Staff Cost	-	-	-	-	-	-	9,608	1,441	11,049	7,668	3,381	-	-	-	-	-	-	-	-	162,981
2f.4.12	DOC Staff Cost	-	-	-	-	-	-	5,174	776	5,950	5,950	-	-	-	-	-	-	-	-	-	57,200
2f.4.13	Utility Staff Cost	-	-	-	-	-	-	5,456	818	6,274	5,415	860	-	-	-	-	-	-	-	-	80,707
2f.4	Subtotal Period 2f Period-Dependent Costs	-	597	8	2	-	29	24,761	3,754	29,152	24,708	4,443	-	-	355	-	-	-	7,097	12	300,888
2f.0	TOTAL PERIOD 2f COST	-	597	8	2	-	29	33,511	6,194	40,341	35,848	4,493	-	-	355	-	-	-	7,097	96,208	307,128
PERIOD 2 TOTALS		13,170	62,856	20,629	9,399	25,814	56,415	416,166	122,242	726,692	568,562	158,062	68	288,110	174,575	1,481	1,010	-	21,522,450	804,895	3,049,889

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix F, Page 9 of 11

Table F
Monticello Nuclear Generating Plant
Scenario 4: DECON with 200 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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	-	1,881	-	-	-	-	-	282	2,163	-	-	2,163	-	-	-	-	-	-	13,966	-
3b.1.1.2	Condensate Tanks Foundation	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	50	-
3b.1.1.3	Discharge Retention Basin	-	4	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	25	-
3b.1.1.4	HPCI Room	-	18	-	-	-	-	-	3	21	-	-	21	-	-	-	-	-	-	97	-
3b.1.1.5	Hot Shop	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	177	-
3b.1.1.6	Hydrogen & Oxygen Storage	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	19	-
3b.1.1.7	LLRW Storage & Shipping	-	78	-	-	-	-	-	12	90	-	-	90	-	-	-	-	-	-	662	-
3b.1.1.8	MSIV	-	3	-	-	-	-	-	0	4	-	-	4	-	-	-	-	-	-	42	-
3b.1.1.9	Misc Structures 2017	-	759	-	-	-	-	-	114	872	-	-	872	-	-	-	-	-	-	7,919	-
3b.1.1.10	Offgas Stack	-	104	-	-	-	-	-	16	120	-	-	120	-	-	-	-	-	-	544	-
3b.1.1.11	Offgas Storage & Compressor	-	38	-	-	-	-	-	6	44	-	-	44	-	-	-	-	-	-	199	-
3b.1.1.12	Radwaste	-	219	-	-	-	-	-	33	252	-	-	252	-	-	-	-	-	-	1,220	-
3b.1.1.13	Recombiner	-	123	-	-	-	-	-	18	141	-	-	141	-	-	-	-	-	-	713	-
3b.1.1.14	Security Barrier	-	179	-	-	-	-	-	27	206	-	-	206	-	-	-	-	-	-	933	-
3b.1.1.15	Structures Greater than 3' Below Grade	-	2,380	-	-	-	-	-	357	2,738	-	-	2,738	-	-	-	-	-	-	12,649	-
3b.1.1.16	Tank Farm	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	21	-
3b.1.1.17	Turbine	-	1,175	-	-	-	-	-	176	1,351	-	-	1,351	-	-	-	-	-	-	13,091	-
3b.1.1.18	Turbine Building Addition	-	51	-	-	-	-	-	8	58	-	-	58	-	-	-	-	-	-	618	-
3b.1.1.19	Turbine Pedestal	-	175	-	-	-	-	-	26	202	-	-	202	-	-	-	-	-	-	926	-
3b.1.1	Totals	-	7,219	-	-	-	-	-	1,083	8,302	-	-	8,302	-	-	-	-	-	-	53,870	-
Site Closeout Activities																					
3b.1.2	Grade & landscape site	-	864	-	-	-	-	-	130	994	-	-	994	-	-	-	-	-	-	1,841	-
3b.1.3	Final report to NRC	-	-	-	-	-	-	183	27	211	211	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	8,083	-	-	-	-	183	1,240	9,506	211	-	9,295	-	-	-	-	-	-	55,711	1,560
Period 3b Additional Costs																					
3b.2.1	Clean Concrete Disposal	-	3,297	-	-	-	-	11	496	3,805	-	-	3,805	-	-	-	-	-	-	12	-
3b.2.2	Excavation of Underground Services	-	1,380	-	-	-	-	947	349	2,677	-	-	2,677	-	-	-	-	-	-	13,475	-
3b.2.3	Intake Structure Cofferdam	-	320	-	-	-	-	-	48	368	-	-	368	-	-	-	-	-	-	2,584	-
3b.2.4	Construction Debris	-	-	-	-	-	-	350	53	403	-	-	403	-	-	-	-	-	-	-	-
3b.2.5	Backfill	-	5,102	-	-	-	-	-	765	5,868	-	-	5,868	-	-	-	-	-	-	5,422	-
3b.2	Subtotal Period 3b Additional Costs	-	10,100	-	-	-	-	1,309	1,711	13,120	-	-	13,120	-	-	-	-	-	-	21,493	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	97	-	-	-	-	-	15	111	-	-	111	-	-	-	-	-	-	-	-
3b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	100	15	115	-	115	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	97	-	-	-	-	100	30	226	-	115	111	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	1,251	125	1,376	-	1,376	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	2,737	274	3,011	-	3,011	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	5,455	-	-	-	-	-	818	6,273	-	-	6,273	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	300	45	345	-	-	345	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	386	39	424	-	424	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	237	24	261	-	261	-	-	-	-	-	-	-	-	-
3b.4.7	Fixed Overhead	-	-	-	-	-	-	1,260	189	1,450	-	-	1,450	-	-	-	-	-	-	-	-
3b.4.8	ISFSI Operating Costs	-	-	-	-	-	-	179	27	206	-	206	-	-	-	-	-	-	-	-	-
3b.4.9	Railroad Track Maintenance	-	-	-	-	-	-	497	75	572	-	-	572	-	-	-	-	-	-	-	-
3b.4.10	Security Staff Cost	-	-	-	-	-	-	22,115	3,317	25,432	(0)	7,782	17,650	-	-	-	-	-	-	-	375,152
3b.4.11	DOC Staff Cost	-	-	-	-	-	-	11,290	1,693	12,983	-	-	12,983	-	-	-	-	-	-	-	122,646
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	6,830	1,024	7,854	-	2,050	5,804	-	-	-	-	-	-	-	101,904
3b.4	Subtotal Period 3b Period-Dependent Costs	-	5,455	-	-	-	-	47,083	7,650	60,188	(0)	15,110	45,077	-	-	-	-	-	-	-	599,702
3b.0	TOTAL PERIOD 3b COST	-	23,734	-	-	-	-	48,675	10,631	83,040	211	15,226	67,604	-	-	-	-	-	-	77,204	601,262

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix F, Page 10 of 11

Table F
Monticello Nuclear Generating Plant
Scenario 4: DECON with 200 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 - Fuel Storage Operations																					
Period 3c Additional Costs																					
3c.2.1	ISFSI Disposition of Retired MPC Canisters	-	-	-	293	-	7,257	-	1,844	9,395	-	9,395	-	-	23,007	-	-	-	1,317,864	-	-
3c.2	Subtotal Period 3c Additional Costs	-	-	-	293	-	7,257	-	1,844	9,395	-	9,395	-	-	23,007	-	-	-	1,317,864	-	-
Period 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	1,251,066	187,660	1,438,726	-	1,438,726	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	1,251,066	187,660	1,438,726	-	1,438,726	-	-	-	-	-	-	-	-	-
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	129,251	12,925	142,177	-	142,177	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	96,984	9,698	106,683	-	106,683	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	39,856	3,986	43,841	-	43,841	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	24,506	2,451	26,957	-	26,957	-	-	-	-	-	-	-	-	-
3c.4.6	Fixed Overhead	-	-	-	-	-	-	44,547	6,682	51,229	-	51,229	-	-	-	-	-	-	-	-	-
3c.4.7	ISFSI Operating Costs	-	-	-	-	-	-	18,500	2,775	21,275	-	21,275	-	-	-	-	-	-	-	-	-
3c.4.8	Railroad Track Maintenance	-	-	-	-	-	-	20,668	3,100	23,768	-	23,768	-	-	-	-	-	-	-	-	-
3c.4.9	Security Staff Cost	-	-	-	-	-	-	698,888	104,833	803,721	-	803,721	-	-	-	-	-	-	-	-	9,690,840
3c.4.10	DOC Staff Cost	-	-	-	-	-	-	34,551	5,183	39,733	-	39,733	-	-	-	-	-	-	-	-	372,725
3c.4.11	Utility Staff Cost	-	-	-	-	-	-	335,821	50,373	386,194	-	386,194	-	-	-	-	-	-	-	-	4,938,601
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	1,443,572	202,006	1,645,578	-	1,645,578	-	-	-	-	-	-	-	-	15,002,170
3c.0	TOTAL PERIOD 3c COST	-	-	-	293	-	7,257	2,694,638	391,510	3,093,699	-	3,093,699	-	-	23,007	-	-	-	1,317,864	-	15,002,170
PERIOD 3d - Spent Fuel/GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
3d.1.1	Totals	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
Period 3d Collateral Costs																					
3d.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	51,320	7,698	59,018	-	59,018	-	-	-	-	-	-	-	-	-
3d.3	Subtotal Period 3d Collateral Costs	-	-	-	-	-	-	51,320	7,698	59,018	-	59,018	-	-	-	-	-	-	-	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	9,383	938	10,321	-	10,321	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	6,703	670	7,374	-	7,374	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	4,257	426	4,683	-	4,683	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	1,779	178	1,957	-	1,957	-	-	-	-	-	-	-	-	-
3d.4.6	Fixed Overhead	-	-	-	-	-	-	3,234	485	3,719	-	3,719	-	-	-	-	-	-	-	-	-
3d.4.7	ISFSI Operating Costs	-	-	-	-	-	-	1,343	201	1,544	-	1,544	-	-	-	-	-	-	-	-	-
3d.4.8	Railroad Track Maintenance	-	-	-	-	-	-	1,500	225	1,725	-	1,725	-	-	-	-	-	-	-	-	-
3d.4.9	Security Staff Cost	-	-	-	-	-	-	50,734	7,610	58,344	-	58,344	-	-	-	-	-	-	-	-	703,485
3d.4.10	Utility Staff Cost	-	-	-	-	-	-	12,865	1,930	14,795	-	14,795	-	-	-	-	-	-	-	-	182,635
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	91,799	12,664	104,462	-	104,462	-	-	-	-	-	-	-	-	886,120
3d.0	TOTAL PERIOD 3d COST	-	-	1,331	-	-	6,552	143,119	21,677	172,679	9,199	163,481	-	-	-	-	-	1,547	311,184	-	886,120
PERIOD 3e - ISFSI Decontamination																					
Period 3e Additional Costs																					
3e.2.1	Decommissioning of ISFSI	30	2	6	14	-	208	1,867	532	2,659	2,659	-	-	-	834	-	-	-	220,333	10,633	1,848
3e.2	Subtotal Period 3e Additional Costs	30	2	6	14	-	208	1,867	532	2,659	2,659	-	-	-	834	-	-	-	220,333	10,633	1,848
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	110	28	138	138	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	244	61	304	304	-	-	-	-	-	-	-	-	-	-
3e.4.4	Fixed Overhead	-	-	-	-	-	-	82	21	103	103	-	-	-	-	-	-	-	-	-	-
3e.4.5	Railroad Track Maintenance	-	-	-	-	-	-	38	10	48	48	-	-	-	-	-	-	-	-	-	-
3e.4.6	Security Staff Cost	-	-	-	-	-	-	308	77	385	385	-	-	-	-	-	-	-	-	-	4,999
3e.4.7	Utility Staff Cost	-	-	-	-	-	-	260	65	325	325	-	-	-	-	-	-	-	-	-	3,792
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	1,042	261	1,303	1,303	-	-	-	-	-	-	-	-	-	8,792
3e.0	TOTAL PERIOD 3e COST	30	2	6	14	-	208	2,909	792	3,962	3,962	-	-	-	834	-	-	-	220,333	10,633	10,640

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix F, Page 11 of 11

Table F
Monticello Nuclear Generating Plant
Scenario 4: DECON with 200 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 Additional Costs																					
3f.2.1	Demolition and Site Restoration of ISFSI	-	1,882	-	-	-	-	201	312	2,396	-	-	2,396	-	-	-	-	-	-	9,097	160
3f.2	Subtotal Period 3f Additional Costs	-	1,882	-	-	-	-	201	312	2,396	-	-	2,396	-	-	-	-	-	-	9,097	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.4.2	Property taxes	-	-	-	-	-	-	123	12	135	-	-	135	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	123	-	-	-	-	-	19	142	-	-	142	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	29	4	33	-	-	33	-	-	-	-	-	-	-	-
3f.4.5	Fixed Overhead	-	-	-	-	-	-	42	6	48	-	-	48	-	-	-	-	-	-	-	-
3f.4.6	Railroad Track Maintenance	-	-	-	-	-	-	19	3	22	-	-	22	-	-	-	-	-	-	-	-
3f.4.7	Security Staff Cost	-	-	-	-	-	-	155	23	179	-	-	179	-	-	-	-	-	-	-	2,520
3f.4.8	Utility Staff Cost	-	-	-	-	-	-	103	16	119	-	-	119	-	-	-	-	-	-	-	1,564
3f.4	Subtotal Period 3f Period-Dependent Costs	-	123	-	-	-	-	471	83	678	-	-	678	-	-	-	-	-	-	-	4,084
3f.0	TOTAL PERIOD 3f COST	-	2,018	-	-	-	-	673	398	3,088	-	-	3,088	-	-	-	-	-	-	9,097	4,244
PERIOD 3 TOTALS		30	25,755	1,337	308	-	14,017	2,890,014	425,008	3,356,469	13,372	3,272,405	70,692	-	23,841	-	-	1,547	1,849,382	96,934	16,504,430
TOTAL COST TO DECOMMISSION		16,519	91,470	22,063	9,880	25,828	71,578	3,453,065	571,040	4,261,443	748,155	3,441,602	71,685	288,153	199,616	1,711	1,010	1,547	23,435,020	933,679	20,749,020

TOTAL COST TO DECOMMISSION WITH 15.47% CONTINGENCY:	\$4,261,443	thousands of 2017	dollars
TOTAL NRC LICENSE TERMINATION COST IS 17.56% OR:	\$748,155	thousands of 2017	dollars
SPENT FUEL MANAGEMENT COST IS 80.76% OR:	\$3,441,602	thousands of 2017	dollars
NON-NUCLEAR DEMOLITION COST IS 1.68% OR:	\$71,685	thousands of 2017	dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	202,337	cubic feet	
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,547	cubic feet	
TOTAL SCRAP METAL REMOVED:	22,696	tons	
TOTAL CRAFT LABOR REQUIREMENTS:	933,679	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

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-002, Rev. 0
Appendix G, Page 1 of 11***

APPENDIX G

DETAILED COST ANALYSIS

SCENARIO 5: DECON with 60 Year DFS with Recasking

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix G, Page 2 of 11

Table G
Monticello Nuclear Generating Plant
Scenario 5: DECON with 60 Year DFS and Recasking Decommissioning Cost Estimate
(thousands of 2017 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	-	-	-	-	-	-	153	23	175	175	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	540	81	621	621	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	153	23	175	175	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	880	132	1,012	1,012	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	364	55	418	418	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Prepare/submit Defueled Technical Specifications	-	-	-	-	-	-	880	132	1,012	1,012	-	-	-	-	-	-	-	-	-	7,500
1a.1.15	Perform Site-Specific Cost Study	-	-	-	-	-	-	587	88	675	675	-	-	-	-	-	-	-	-	-	5,000
1a.1.16	Prepare/submit Irradiated Fuel Management Plan	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	578	87	664	598	-	66	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	489	73	562	506	-	56	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	59	9	67	67	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	833	125	958	958	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	763	114	877	877	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Sacrificial shield	-	-	-	-	-	-	59	9	67	67	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Moisture separators/reheaters	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	188	28	216	108	-	108	-	-	-	-	-	-	-	1,600
1a.1.17.9	Main Turbine	-	-	-	-	-	-	245	37	282	282	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.10	Main Condensers	-	-	-	-	-	-	245	37	282	282	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.11	Pressure suppression structure	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1a.1.17.12	Drywell	-	-	-	-	-	-	188	28	216	216	-	-	-	-	-	-	-	-	-	1,600
1a.1.17.13	Plant structures & buildings	-	-	-	-	-	-	366	55	421	211	-	211	-	-	-	-	-	-	-	3,120
1a.1.17.14	Waste management	-	-	-	-	-	-	540	81	621	621	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.15	Facility & site closeout	-	-	-	-	-	-	106	16	121	61	-	61	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	5,010	752	5,762	5,260	-	502	-	-	-	-	-	-	-	42,683
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	282	42	324	324	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	3,300	495	3,795	3,795	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	164	25	189	189	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlp/s/tooling/etc.	-	-	-	-	-	-	2,300	345	2,645	2,645	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	144	22	166	166	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	15,344	2,302	17,646	17,144	-	502	-	-	-	-	-	-	-	83,013
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	1,221	183	1,404	-	1,404	-	-	-	-	-	-	-	-	-
1a.3.2	Retention and Severance	-	-	-	-	-	-	9,892	1,484	11,376	11,376	-	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	11,113	1,667	12,779	11,376	1,404	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	2,408	241	2,649	2,649	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	2,242	224	2,466	2,466	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	515	-	-	-	-	-	129	644	644	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	567	-	-	-	-	-	85	652	652	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	4	-	50	-	14	81	81	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	1,730	259	1,989	1,989	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,110	111	1,221	1,221	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	3,166	317	3,482	-	3,482	-	-	-	-	-	-	-	-	-
1a.4.9	Fixed Overhead	-	-	-	-	-	-	2,833	425	3,258	3,258	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	803	120	923	-	923	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	103	15	119	-	119	-	-	-	-	-	-	-	-	-
1a.4.12	Railroad Track Maintenance	-	-	-	-	-	-	115	17	133	133	-	-	-	-	-	-	-	-	-	-
1a.4.13	Security Staff Cost	-	-	-	-	-	-	14,260	2,139	16,399	16,399	-	-	-	-	-	-	-	-	-	245,440
1a.4.14	Utility Staff Cost	-	-	-	-	-	-	25,791	3,869	29,660	29,660	-	-	-	-	-	-	-	-	-	422,240
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,083	13	4	-	50	54,561	7,966	63,676	59,153	4,524	-	-	610	-	-	-	12,190	20	667,680

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table G
Monticello Nuclear Generating Plant
Scenario 5: DECON with 60 Year DFS and Recasking Decommissioning Cost Estimate
(thousands of 2017 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			
1a.0	TOTAL PERIOD 1a COST	-	1,083	13	4	-	50	81,017	11,935	94,101	87,672	5,927	502	-	610	-	-	-	12,190	20	750,693
PERIOD 1b - Decommissioning Preparations																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	556	83	639	575	-	64	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	470	70	540	540	-	-	-	-	-	-	-	-	-	4,000
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	158	24	182	46	-	137	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	426	64	490	490	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	141	21	162	81	-	81	-	-	-	-	-	-	-	1,200
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	141	21	162	162	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	117	18	135	67	-	67	-	-	-	-	-	-	-	1,000
1b.1.1.12	Main Turbine	-	-	-	-	-	-	244	37	281	281	-	-	-	-	-	-	-	-	-	2,080
1b.1.1.13	Main Condensers	-	-	-	-	-	-	245	37	282	282	-	-	-	-	-	-	-	-	-	2,088
1b.1.1.14	Moisture separators & reheaters	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.15	Radwaste building	-	-	-	-	-	-	320	48	369	332	-	37	-	-	-	-	-	-	-	2,730
1b.1.1.16	Reactor building	-	-	-	-	-	-	320	48	369	332	-	37	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	3,961	594	4,555	4,132	-	423	-	-	-	-	-	-	-	33,741
1b.1.2	Decon NSSS	286	-	-	-	-	-	-	143	429	429	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	286	-	-	-	-	-	3,961	737	4,984	4,561	-	423	-	-	-	-	-	-	1,067	33,741
Period 1b Additional Costs																					
1b.2.1	Spent fuel pool isolation	-	-	-	-	-	-	11,691	1,754	13,445	13,445	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	6,446	1,934	8,380	8,380	-	-	-	-	-	-	-	-	30,500	10,852
1b.2.3	Mixed & RCRA Waste	-	-	29	19	13	-	-	8	69	69	-	-	43	-	-	-	-	5,253	163	-
1b.2	Subtotal Period 1b Additional Costs	-	-	29	19	13	-	18,137	3,695	21,894	21,894	-	-	43	-	-	-	-	5,253	30,663	10,852
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	973	-	-	-	-	-	-	146	1,119	1,119	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,189	178	1,367	1,367	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process decommissioning water waste	37	-	24	61	-	98	-	54	275	275	-	-	-	233	-	-	-	13,986	45	-
1b.3.4	Process decommissioning chemical flush waste	1	-	23	85	-	969	-	258	1,336	1,336	-	-	-	-	231	-	-	24,599	43	-
1b.3.5	Small tool allowance	-	2	-	-	-	-	-	0	2	2	-	-	-	-	-	-	-	-	-	-
1b.3.6	Pipe cutting equipment	-	1,200	-	-	-	-	-	180	1,380	1,380	-	-	-	-	-	-	-	-	-	-
1b.3.7	Decon rig	1,987	-	-	-	-	-	-	298	2,285	2,285	-	-	-	-	-	-	-	-	-	-
1b.3.8	Spent Fuel Capital and Transfer	-	-	-	-	-	-	2,557	383	2,940	-	2,940	-	-	-	-	-	-	-	-	-
1b.3.9	Retention and Severance	-	-	-	-	-	-	6,362	954	7,316	7,316	-	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	2,997	1,202	47	147	-	1,067	10,107	2,453	18,020	15,080	2,940	-	-	233	231	-	-	38,585	89	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	35	-	-	-	-	-	-	9	44	44	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	1,207	121	1,328	1,328	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	1,104	110	1,214	1,214	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	290	-	-	-	-	-	73	363	363	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	284	-	-	-	-	-	43	327	327	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	8	2	-	29	-	8	48	48	-	-	-	358	-	-	-	7,159	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	1,735	260	1,995	1,995	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	321	32	353	353	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,587	159	1,746	-	1,746	-	-	-	-	-	-	-	-	-
1b.4.10	Fixed Overhead	-	-	-	-	-	-	1,420	213	1,633	1,633	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	402	60	463	-	463	-	-	-	-	-	-	-	-	-
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	52	8	60	-	60	-	-	-	-	-	-	-	-	-
1b.4.13	Railroad Track Maintenance	-	-	-	-	-	-	58	9	67	67	-	-	-	-	-	-	-	-	-	-
1b.4.14	Security Staff Cost	-	-	-	-	-	-	7,150	1,072	8,222	8,222	-	-	-	-	-	-	-	-	-	123,056
1b.4.15	DOC Staff Cost	-	-	-	-	-	-	5,625	844	6,469	6,469	-	-	-	-	-	-	-	-	-	63,614
1b.4.16	Utility Staff Cost	-	-	-	-	-	-	13,003	1,950	14,953	14,953	-	-	-	-	-	-	-	-	-	212,741
1b.4	Subtotal Period 1b Period-Dependent Costs	35	575	8	2	-	29	33,663	4,971	39,283	37,015	2,268	-	-	358	-	-	-	7,159	12	399,411
1b.0	TOTAL PERIOD 1b COST	3,318	1,777	84	169	13	1,096	65,868	11,856	84,181	78,550	5,208	423	43	591	231	-	-	50,997	31,830	444,004
PERIOD 1 TOTALS		3,318	2,859	97	173	13	1,146	146,886	23,790	178,282	166,222	11,136	925	43	1,201	231	-	-	63,188	31,850	1,194,697

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix G, Page 5 of 11

Table G
Monticello Nuclear Generating Plant
Scenario 5: DECON with 60 Year DFS and Recasking Decommissioning Cost Estimate
(thousands of 2017 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.1.5.48	Rx Core Isolation Cooling	-	47	2	3	22	21	-	21	116	116	-	-	259	76	-	-	-	15,396	691	-
2a.1.5.49	Rx Core Isolation Cooling - Insulated	-	105	5	5	25	55	-	45	240	240	-	-	288	198	-	-	-	24,419	1,479	-
2a.1.5.50	Rx Recirculation	56	57	6	3	4	53	-	57	235	235	-	-	43	190	-	-	-	14,095	1,580	-
2a.1.5.51	Snubbers	-	168	2	4	33	25	-	54	285	285	-	-	377	90	-	-	-	21,009	2,548	-
2a.1.5.52	Standby Liquid Control - Insul - RCA	-	4	0	0	2	-	-	1	7	7	-	-	22	-	-	-	-	904	48	-
2a.1.5.53	Standby Liquid Control - RCA	-	26	0	1	21	-	-	10	59	59	-	-	245	-	-	-	-	9,969	341	-
2a.1.5.54	Stator Cooling - RCA	-	7	0	1	11	-	-	4	23	23	-	-	126	-	-	-	-	5,135	98	-
2a.1.5.55	Traversing Incore Probe	0	4	0	0	0	2	-	1	7	7	-	-	1	5	-	-	-	386	51	-
2a.1.5	Totals	1,007	7,978	931	1,079	8,447	9,287	-	6,340	35,068	35,046	-	22	97,654	33,808	-	-	-	6,125,515	119,943	-
2a.1.6	Scaffolding in support of decommissioning	-	2,188	25	8	99	25	-	572	2,916	2,916	-	-	1,030	91	-	-	-	52,111	22,564	-
2a.1	Subtotal Period 2a Activity Costs	1,669	28,379	18,848	5,754	13,409	37,095	711	38,602	144,467	144,445	-	22	141,010	59,545	1,481	1,010	-	10,427,730	254,140	2,778
Period 2a Additional Costs																					
2a.2.1	Remedial Action Surveys	-	-	-	-	-	-	2,326	698	3,024	3,024	-	-	-	-	-	-	-	-	30,411	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	2,326	698	3,024	3,024	-	-	-	-	-	-	-	-	30,411	-
Period 2a Collateral Costs																					
2a.3.1	Process decommissioning water waste	83	-	55	140	-	222	-	123	623	623	-	-	-	531	-	-	-	31,838	103	-
2a.3.2	Process decommissioning chemical flush waste	6	-	208	774	-	1,557	-	529	3,075	3,075	-	-	-	2,093	-	-	-	223,008	392	-
2a.3.3	Small tool allowance	-	315	-	-	-	-	-	47	363	326	-	36	-	-	-	-	-	-	-	-
2a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	23,173	3,476	26,649	-	26,649	-	-	-	-	-	-	-	-	-
2a.3.5	Retention and Severance	-	-	-	-	-	-	13,235	1,985	15,221	15,221	-	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	89	315	263	914	-	1,779	36,408	6,161	45,930	19,245	26,649	36	-	2,623	-	-	-	254,846	495	-
Period 2a Period-Dependent Costs																					
2a.4.1	Decon supplies	102	-	-	-	-	-	-	25	127	127	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	1,055	106	1,161	1,161	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	3,061	306	3,367	3,367	-	-	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	2,133	-	-	-	-	-	533	2,666	2,666	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	3,212	-	-	-	-	-	482	3,694	3,694	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	122	37	-	453	-	131	743	743	-	-	-	5,567	-	-	-	111,335	182	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	2,404	361	2,765	2,765	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	847	85	932	932	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	3,757	376	4,133	-	4,133	-	-	-	-	-	-	-	-	-
2a.4.10	Fixed Overhead	-	-	-	-	-	-	3,392	509	3,900	3,900	-	-	-	-	-	-	-	-	-	-
2a.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,174	176	1,350	-	1,350	-	-	-	-	-	-	-	-	-
2a.4.12	ISFSI Operating Costs	-	-	-	-	-	-	151	23	174	-	174	-	-	-	-	-	-	-	-	-
2a.4.13	Railroad Track Maintenance	-	-	-	-	-	-	466	70	536	536	-	-	-	-	-	-	-	-	-	-
2a.4.14	Security Staff Cost	-	-	-	-	-	-	19,265	2,890	22,154	22,154	-	-	-	-	-	-	-	-	-	328,651
2a.4.15	DOC Staff Cost	-	-	-	-	-	-	20,125	3,019	23,144	23,144	-	-	-	-	-	-	-	-	-	231,273
2a.4.16	Utility Staff Cost	-	-	-	-	-	-	26,670	4,000	30,670	30,670	-	-	-	-	-	-	-	-	-	430,594
2a.4	Subtotal Period 2a Period-Dependent Costs	102	5,345	122	37	-	453	82,366	13,090	101,515	95,858	5,657	-	-	5,567	-	-	-	111,335	182	990,519
2a.0	TOTAL PERIOD 2a COST	1,860	34,039	19,233	6,705	13,409	39,327	121,812	58,551	294,937	262,573	32,305	58	141,010	67,735	1,481	1,010	-	10,793,910	285,228	993,297

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix G, Page 6 of 11

Table G
Monticello Nuclear Generating Plant
Scenario 5: DECON with 60 Year DFS and Recasking Decommissioning Cost Estimate
(thousands of 2017 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site	LLRW	Other Costs	Total Contingency	Total Costs	NRC	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial/ Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
						Processing Costs	Disposal Costs				Lic. Term. Costs				Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
PERIOD 2b - Site Decontamination																					
Disposal of Plant Systems																					
2b.1.1.1	ALARA/Radiological	-	18	0	0	3	3	-	6	30	30	-	-	35	10	-	-	-	2,060	277	-
2b.1.1.2	Alternate N2 - RCA	-	16	0	1	8	-	-	5	30	30	-	-	93	-	-	-	-	3,765	185	-
2b.1.1.3	Decontamination Projects	-	1	0	0	0	0	-	0	2	2	-	-	2	0	-	-	-	129	17	-
2b.1.1.4	Electrical - Contaminated	-	439	6	16	207	25	-	150	841	841	-	-	2,389	90	-	-	-	102,726	6,325	-
2b.1.1.5	Electrical - Decontaminated	-	2,657	41	142	2,019	-	-	993	5,852	5,852	-	-	23,344	-	-	-	-	948,013	37,107	-
2b.1.1.6	Fire - RCA	-	99	1	4	53	-	-	33	191	191	-	-	614	-	-	-	-	24,917	1,324	-
2b.1.1.7	HVAC Ductwork	-	309	7	18	231	27	-	122	713	713	-	-	2,665	100	-	-	-	114,598	4,111	-
2b.1.1.8	HVAC/Chilled Water - RCA	-	317	5	17	238	-	-	118	694	694	-	-	2,752	-	-	-	-	111,779	3,985	-
2b.1.1.9	Heating & Ventilation	-	473	15	40	521	62	-	219	1,329	1,329	-	-	6,018	227	-	-	-	258,789	7,101	-
2b.1.1.10	Heating Boiler - Insulated - RCA	-	3	0	0	2	-	-	1	6	6	-	-	26	-	-	-	-	1,058	35	-
2b.1.1.11	Liquid Radwaste	572	669	46	44	266	476	-	623	2,697	2,697	-	-	3,073	1,728	-	-	-	235,484	17,194	-
2b.1.1.12	Makeup Demin - RCA	-	101	3	9	127	-	-	46	286	286	-	-	1,471	-	-	-	-	59,747	1,412	-
2b.1.1.13	Non-Essential Diesel Generator - RCA	-	26	2	9	123	-	-	27	187	187	-	-	1,424	-	-	-	-	57,832	395	-
2b.1.1.14	Off Gas Holdup	-	333	20	26	238	174	-	168	960	960	-	-	2,755	630	-	-	-	152,277	4,769	-
2b.1.1.15	Primary Containment	-	443	43	59	536	412	-	308	1,801	1,801	-	-	6,201	1,506	-	-	-	347,704	6,454	-
2b.1.1.16	Process Radiation Monitors	-	45	2	2	12	14	-	17	92	92	-	-	142	52	-	-	-	9,115	649	-
2b.1.1.17	Rx Bldg Closed Clng Water - Insul - RCA	-	111	2	6	85	-	-	42	245	245	-	-	977	-	-	-	-	39,675	1,484	-
2b.1.1.18	Rx Bldg Closed Clng Water - RCA	-	178	12	43	614	-	-	144	991	991	-	-	7,093	-	-	-	-	288,031	2,489	-
2b.1.1.19	Rx Component Handling Equip	26	138	19	19	100	227	-	124	653	653	-	-	1,158	829	-	-	-	99,730	2,462	-
2b.1.1.20	Rx Pressure Vessel	28	46	6	4	7	63	-	43	196	196	-	-	75	230	-	-	-	17,816	1,051	-
2b.1.1.21	Rx Water Cleanup	169	258	19	11	11	204	-	205	877	877	-	-	130	737	-	-	-	52,670	5,736	-
2b.1.1.22	Secondary Containment	-	121	7	10	88	70	-	63	360	360	-	-	1,017	255	-	-	-	57,567	1,763	-
2b.1.1.23	Service & Seal Water - Insulated - RCA	-	117	2	7	102	-	-	46	274	274	-	-	1,180	-	-	-	-	47,917	1,565	-
2b.1.1.24	Service & Seal Water - RCA	-	155	3	11	156	-	-	64	390	390	-	-	1,809	-	-	-	-	73,453	2,016	-
2b.1.1.25	Service Air Blower - RCA	-	15	0	1	18	-	-	7	41	41	-	-	206	-	-	-	-	8,364	206	-
2b.1.1.26	Solid Radwaste	327	483	36	34	206	380	-	419	1,885	1,885	-	-	2,387	1,380	-	-	-	185,221	10,820	-
2b.1.1.27	Structures & Buildings	-	76	2	3	31	23	-	30	166	166	-	-	357	85	-	-	-	19,933	1,128	-
2b.1.1.28	Wells & Domestic Water	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	144	-
2b.1.1.29	Wells & Domestic Water - RCA	-	51	1	2	30	-	-	18	101	101	-	-	342	-	-	-	-	13,874	633	-
2b.1.1	Totals	1,122	7,707	299	537	6,032	2,160	-	4,042	21,900	21,890	-	10	69,735	7,859	-	-	-	3,334,244	122,835	-
2b.1.2	Scaffolding in support of decommissioning	-	2,735	31	10	123	31	-	715	3,645	3,645	-	-	1,287	114	-	-	-	65,139	28,205	-
Decontamination of Site Buildings																					
2b.1.3.1	Reactor Building	5,006	2,817	155	347	4,159	1,007	-	4,150	17,641	17,641	-	-	48,077	7,014	-	-	-	2,317,670	112,518	-
2b.1.3.2	Admin	103	6	0	2	-	14	-	57	182	182	-	-	-	145	-	-	-	6,840	1,600	-
2b.1.3.3	HPCI Room	28	27	1	2	10	13	-	26	107	107	-	-	118	125	-	-	-	10,759	789	-
2b.1.3.4	Hot Shop	16	4	0	1	-	10	-	12	43	43	-	-	-	103	-	-	-	4,860	286	-
2b.1.3.5	LLRW Storage & Shipping	56	23	1	6	3	41	-	46	176	176	-	-	31	433	-	-	-	21,708	1,127	-
2b.1.3.6	Offgas Stack	360	256	6	16	116	73	-	283	1,109	1,109	-	-	1,343	669	-	-	-	87,045	8,860	-
2b.1.3.7	Offgas Storage & Compressor	39	17	1	4	2	30	-	32	125	125	-	-	25	316	-	-	-	15,948	785	-
2b.1.3.8	Radwaste	117	59	3	13	15	86	-	100	393	393	-	-	172	910	-	-	-	49,943	2,503	-
2b.1.3.9	Radwaste Material Storage Warehouse	62	23	1	6	-	47	-	49	189	189	-	-	-	495	-	-	-	23,400	1,197	-
2b.1.3.10	Recombiner	26	24	1	4	17	22	-	28	122	122	-	-	199	216	-	-	-	18,405	695	-
2b.1.3.11	Turbine	684	341	18	76	111	507	-	583	2,319	2,319	-	-	1,283	5,299	-	-	-	303,150	14,443	-
2b.1.3.12	Turbine Building Addition	56	20	1	6	-	41	-	44	169	169	-	-	-	434	-	-	-	20,478	1,087	-
2b.1.3	Totals	6,554	3,618	188	483	4,433	1,889	-	5,410	22,574	22,574	-	-	51,247	16,159	-	-	-	2,880,206	145,889	-
2b.1.4	Prepare/submit License Termination Plan	-	-	-	-	-	-	481	72	553	553	-	-	-	-	-	-	-	-	-	4,096
2b.1.5	Receive NRC approval of termination plan	-	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-
2b.1	Subtotal Period 2b Activity Costs	7,676	14,060	518	1,031	10,588	4,079	481	10,239	48,672	48,662	-	10	122,269	24,132	-	-	-	6,279,589	296,929	4,096
Period 2b Additional Costs																					
2b.2.1	Remedial Action Surveys	-	-	-	-	-	-	3,241	972	4,213	4,213	-	-	-	-	-	-	-	-	42,370	-
2b.2.2	Operational Equipment	-	-	19	60	624	-	-	104	807	807	-	-	11,710	-	-	-	-	292,750	32	-
2b.2.3	Security Modifications	-	-	-	-	-	-	8,696	1,304	10,000	10,000	-	-	-	-	-	-	-	-	-	-
2b.2	Subtotal Period 2b Additional Costs	-	-	19	60	624	-	11,937	2,381	15,020	15,020	-	-	11,710	-	-	-	-	292,750	42,402	-

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix G, Page 7 of 11

Table G
Monticello Nuclear Generating Plant
Scenario 5: DECON with 60 Year DFS and Recasking Decommissioning Cost Estimate
(thousands of 2017 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 2b Collateral Costs																					
2b.3.1	Process decommissioning water waste	173	-	117	299	-	474	-	261	1,325	1,325	-	-	-	1,133	-	-	-	67,962	221	-
2b.3.2	Process decommissioning chemical flush waste	1	-	41	153	-	307	-	104	606	606	-	-	-	413	-	-	-	43,978	77	-
2b.3.3	Small tool allowance	-	341	-	-	-	-	-	51	392	392	-	-	-	-	-	-	-	-	-	-
2b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	65,919	9,888	75,807	-	75,807	-	-	-	-	-	-	-	-	-
2b.3.5	Retention and Severance	-	-	-	-	-	-	8,665	1,300	9,964	9,964	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	174	341	159	452	-	781	74,584	11,604	88,094	12,287	75,807	-	-	1,545	-	-	-	111,940	298	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	1,361	-	-	-	-	-	-	340	1,701	1,701	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	1,470	147	1,617	1,617	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	3,915	391	4,306	4,306	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	2,681	-	-	-	-	-	670	3,352	3,352	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	4,602	-	-	-	-	-	690	5,292	5,292	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	124	38	-	463	-	134	759	759	-	-	-	5,690	-	-	-	113,799	186	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	2,645	397	3,041	3,041	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,180	118	1,298	1,298	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	5,234	523	5,758	-	5,758	-	-	-	-	-	-	-	-	-
2b.4.10	Fixed Overhead	-	-	-	-	-	-	4,725	709	5,434	5,434	-	-	-	-	-	-	-	-	-	-
2b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	1,636	245	1,881	-	1,881	-	-	-	-	-	-	-	-	-
2b.4.12	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	412	62	474	474	-	-	-	-	-	-	-	-	-	-
2b.4.13	ISFSI Operating Costs	-	-	-	-	-	-	210	32	242	-	242	-	-	-	-	-	-	-	-	-
2b.4.14	Railroad Track Maintenance	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	-
2b.4.15	Security Staff Cost	-	-	-	-	-	-	26,840	4,026	30,867	30,867	-	-	-	-	-	-	-	-	-	457,896
2b.4.16	DOC Staff Cost	-	-	-	-	-	-	27,122	4,068	31,191	31,191	-	-	-	-	-	-	-	-	-	309,504
2b.4.17	Utility Staff Cost	-	-	-	-	-	-	35,641	5,346	40,988	40,988	-	-	-	-	-	-	-	-	-	574,490
2b.4	Subtotal Period 2b Period-Dependent Costs	1,361	7,283	124	38	-	463	111,268	17,935	138,473	130,592	7,881	-	-	5,690	-	-	-	113,799	186	1,341,891
2b.0	TOTAL PERIOD 2b COST	9,211	21,684	820	1,580	11,212	5,324	198,269	42,159	290,260	206,561	83,688	10	133,979	31,367	-	-	-	6,798,079	339,814	1,345,987
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	634	56	114	109	-	2,091	-	881	3,884	3,884	-	-	-	7,653	-	-	-	486,170	906	-
Disposal of Plant Systems																					
2d.1.2.1	Cranes/Heavy Loads/Rigging - RCA	-	3	0	1	9	-	-	2	15	15	-	-	103	-	-	-	-	4,184	48	-
2d.1.2.2	Electrical - Contaminated Fuel Pool	-	46	1	2	21	2	-	16	87	87	-	-	240	9	-	-	-	10,334	665	-
2d.1.2.3	Electrical - Decontam. Fuel Pool Area	-	293	4	15	213	-	-	108	633	633	-	-	2,457	-	-	-	-	99,783	4,090	-
2d.1.2.4	Fire - RCA - Fuel Pool Area	-	11	0	0	5	-	-	4	20	20	-	-	62	-	-	-	-	2,499	143	-
2d.1.2.5	Fuel Pool Cooling & Cleanup	240	419	34	26	102	370	-	340	1,531	1,531	-	-	1,179	1,341	-	-	-	133,939	8,380	-
2d.1.2.6	Fuel Pool Cooling & Cleanup - Insulated	26	40	3	2	6	32	-	33	143	143	-	-	67	117	-	-	-	10,220	848	-
2d.1.2.7	HVAC Ductwork - Fuel Pool Area	-	34	1	2	26	3	-	14	79	79	-	-	296	11	-	-	-	12,733	457	-
2d.1.2.8	HVAC/Chilled Water - RCA Fuel Pool Area	-	32	0	1	19	-	-	11	64	64	-	-	223	-	-	-	-	9,072	397	-
2d.1.2.9	Instrument & Service Air-RCA-Fuel Pool	-	28	0	2	23	-	-	11	64	64	-	-	267	-	-	-	-	10,841	357	-
2d.1.2	Totals	266	907	44	51	423	408	-	537	2,637	2,637	-	-	4,894	1,479	-	-	-	293,606	15,385	-
Decontamination of Site Buildings																					
2d.1.3.1	Reactor (Post Fuel)	911	2,485	145	669	170	8,544	-	3,353	16,277	16,277	-	-	1,969	62,698	-	-	-	2,732,406	45,703	-
2d.1.3	Totals	911	2,485	145	669	170	8,544	-	3,353	16,277	16,277	-	-	1,969	62,698	-	-	-	2,732,406	45,703	-
2d.1.4	Scaffolding in support of decommissioning	-	547	6	2	25	6	-	143	729	729	-	-	257	23	-	-	-	13,028	5,641	-
2d.1	Subtotal Period 2d Activity Costs	1,811	3,994	309	831	618	11,049	-	4,915	23,527	23,527	-	-	7,120	71,852	-	-	-	3,525,210	67,635	-

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix G, Page 8 of 11

Table G
Monticello Nuclear Generating Plant
Scenario 5: DECON with 60 Year DFS and Recasking Decommissioning Cost Estimate
(thousands of 2017 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 Additional Costs																					
2d.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,291	387	1,678	1,678	-	-	-	-	-	-	-	-	-	12,480
2d.2.2	Remedial Action Surveys	-	-	-	-	-	-	1,198	359	1,557	1,557	-	-	-	-	-	-	-	-	15,661	-
2d.2	Subtotal Period 2d Additional Costs	-	-	-	-	-	-	2,489	747	3,235	3,235	-	-	-	-	-	-	-	-	15,661	12,480
Period 2d Collateral Costs																					
2d.3.1	Process decommissioning water waste	69	-	47	120	-	191	-	105	533	533	-	-	-	457	-	-	-	27,391	89	-
2d.3.2	Process decommissioning chemical flush waste	1	-	25	92	-	185	-	63	366	366	-	-	-	249	-	-	-	26,553	47	-
2d.3.3	Small tool allowance	-	88	-	-	-	-	-	13	101	101	-	-	-	-	-	-	-	-	-	-
2d.3.4	Decommissioning Equipment Disposition	-	-	143	55	575	145	-	145	1,062	1,062	-	-	6,000	529	-	-	-	303,608	147	-
2d.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	27,061	4,059	31,120	-	31,120	-	-	-	-	-	-	-	-	-
2d.3	Subtotal Period 2d Collateral Costs	70	88	216	267	575	521	27,061	4,385	33,182	2,062	31,120	-	6,000	1,235	-	-	-	357,552	283	-
Period 2d Period-Dependent Costs																					
2d.4.1	Decon supplies	219	-	-	-	-	-	-	55	274	274	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	543	54	598	598	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	1,336	134	1,470	1,470	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	752	-	-	-	-	-	188	940	940	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,701	-	-	-	-	-	255	1,956	1,956	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	44	14	-	165	-	48	271	271	-	-	-	2,030	-	-	-	40,600	66	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	521	78	600	600	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	369	37	405	405	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,935	193	2,128	-	2,128	-	-	-	-	-	-	-	-	-
2d.4.10	Fixed Overhead	-	-	-	-	-	-	1,747	262	2,009	2,009	-	-	-	-	-	-	-	-	-	-
2d.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	305	46	351	351	-	-	-	-	-	-	-	-	-	-
2d.4.12	ISFSI Operating Costs	-	-	-	-	-	-	78	12	89	-	89	-	-	-	-	-	-	-	-	-
2d.4.13	Railroad Track Maintenance	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	-
2d.4.14	Security Staff Cost	-	-	-	-	-	-	9,608	1,441	11,049	7,668	3,381	-	-	-	-	-	-	-	-	162,981
2d.4.15	DOC Staff Cost	-	-	-	-	-	-	6,941	1,041	7,982	7,982	-	-	-	-	-	-	-	-	-	78,356
2d.4.16	Utility Staff Cost	-	-	-	-	-	-	9,556	1,433	10,989	10,132	857	-	-	-	-	-	-	-	-	149,660
2d.4	Subtotal Period 2d Period-Dependent Costs	219	2,453	44	14	-	165	33,025	5,290	41,210	34,754	6,456	-	-	2,030	-	-	-	40,600	66	390,997
2d.0	TOTAL PERIOD 2d COST	2,099	6,535	569	1,112	1,193	11,735	62,574	15,337	101,154	63,579	37,575	-	13,120	75,117	-	-	-	3,923,362	83,645	403,477
PERIOD 2f - License Termination																					
Period 2f Direct Decommissioning Activities																					
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	176	53	229	229	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license	-	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	176	53	229	229	-	-	-	-	-	-	-	-	-	-
Period 2f Additional Costs																					
2f.2.1	License Termination Survey	-	-	-	-	-	-	7,341	2,202	9,544	9,544	-	-	-	-	-	-	-	-	96,197	6,240
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	7,341	2,202	9,544	9,544	-	-	-	-	-	-	-	-	96,197	6,240
Period 2f Collateral Costs																					
2f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,189	178	1,367	1,367	-	-	-	-	-	-	-	-	-	-
2f.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	43	7	50	-	50	-	-	-	-	-	-	-	-	-
2f.3	Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,232	185	1,417	1,367	50	-	-	-	-	-	-	-	-	-

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table G
Monticello Nuclear Generating Plant
Scenario 5: DECON with 60 Year DFS and Recasking Decommissioning Cost Estimate
(thousands of 2017 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 2f Period-Dependent Costs																					
2f.4.1	Insurance	-	-	-	-	-	-	543	54	598	598	-	-	-	-	-	-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	1,285	128	1,413	1,413	-	-	-	-	-	-	-	-	-	-
2f.4.3	Health physics supplies	-	597	-	-	-	-	-	149	747	747	-	-	-	-	-	-	-	-	-	-
2f.4.4	Disposal of DAW generated	-	-	8	2	-	29	-	8	47	47	-	-	-	355	-	-	-	7,097	12	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	420	42	463	463	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	103	10	113	-	113	-	-	-	-	-	-	-	-	-
2f.4.8	Fixed Overhead	-	-	-	-	-	-	1,747	262	2,009	2,009	-	-	-	-	-	-	-	-	-	-
2f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	78	12	89	-	89	-	-	-	-	-	-	-	-	-
2f.4.10	Railroad Track Maintenance	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	-
2f.4.11	Security Staff Cost	-	-	-	-	-	-	9,608	1,441	11,049	7,668	3,381	-	-	-	-	-	-	-	-	162,981
2f.4.12	DOC Staff Cost	-	-	-	-	-	-	5,174	776	5,950	5,950	-	-	-	-	-	-	-	-	-	57,200
2f.4.13	Utility Staff Cost	-	-	-	-	-	-	5,456	818	6,274	5,415	860	-	-	-	-	-	-	-	-	80,707
2f.4	Subtotal Period 2f Period-Dependent Costs	-	597	8	2	-	29	24,761	3,754	29,152	24,708	4,443	-	-	355	-	-	-	7,097	12	300,888
2f.0	TOTAL PERIOD 2f COST	-	597	8	2	-	29	33,511	6,194	40,341	35,848	4,493	-	-	355	-	-	-	7,097	96,208	307,128
PERIOD 2 TOTALS		13,170	62,856	20,629	9,399	25,814	56,415	416,166	122,242	726,692	568,562	158,062	68	288,110	174,575	1,481	1,010	-	21,522,450	804,895	3,049,889
PERIOD 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor Building	-	1,881	-	-	-	-	-	282	2,163	-	-	2,163	-	-	-	-	-	-	13,966	-
3b.1.1.2	Condensate Tanks Foundation	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	50	-
3b.1.1.3	Discharge Retention Basin	-	4	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	25	-
3b.1.1.4	HPCI Room	-	18	-	-	-	-	-	3	21	-	-	21	-	-	-	-	-	-	97	-
3b.1.1.5	Hot Shop	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	177	-
3b.1.1.6	Hydrogen & Oxygen Storage	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	19	-
3b.1.1.7	LLRW Storage & Shipping	-	78	-	-	-	-	-	12	90	-	-	90	-	-	-	-	-	-	662	-
3b.1.1.8	MSIV	-	3	-	-	-	-	-	0	4	-	-	4	-	-	-	-	-	-	42	-
3b.1.1.9	Misc Structures 2017	-	759	-	-	-	-	-	114	872	-	-	872	-	-	-	-	-	-	7,919	-
3b.1.1.10	Offgas Stack	-	104	-	-	-	-	-	16	120	-	-	120	-	-	-	-	-	-	544	-
3b.1.1.11	Offgas Storage & Compressor	-	38	-	-	-	-	-	6	44	-	-	44	-	-	-	-	-	-	199	-
3b.1.1.12	Radwaste	-	219	-	-	-	-	-	33	252	-	-	252	-	-	-	-	-	-	1,220	-
3b.1.1.13	Recombiner	-	123	-	-	-	-	-	18	141	-	-	141	-	-	-	-	-	-	713	-
3b.1.1.14	Security Barrier	-	179	-	-	-	-	-	27	206	-	-	206	-	-	-	-	-	-	933	-
3b.1.1.15	Structures Greater than 3' Below Grade	-	2,380	-	-	-	-	-	357	2,738	-	-	2,738	-	-	-	-	-	-	12,649	-
3b.1.1.16	Tank Farm	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	21	-
3b.1.1.17	Turbine	-	1,175	-	-	-	-	-	176	1,351	-	-	1,351	-	-	-	-	-	-	13,091	-
3b.1.1.18	Turbine Building Addition	-	51	-	-	-	-	-	8	58	-	-	58	-	-	-	-	-	-	618	-
3b.1.1.19	Turbine Pedestal	-	175	-	-	-	-	-	26	202	-	-	202	-	-	-	-	-	-	926	-
3b.1.1	Totals	-	7,219	-	-	-	-	-	1,083	8,302	-	-	8,302	-	-	-	-	-	-	53,870	-
Site Closeout Activities																					
3b.1.2	Grade & landscape site	-	864	-	-	-	-	-	130	994	-	-	994	-	-	-	-	-	-	1,841	-
3b.1.3	Final report to NRC	-	-	-	-	-	-	183	27	211	211	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	8,083	-	-	-	-	183	1,240	9,506	211	-	9,295	-	-	-	-	-	-	55,711	1,560
Period 3b Additional Costs																					
3b.2.1	Clean Concrete Disposal	-	3,297	-	-	-	-	11	496	3,805	-	-	3,805	-	-	-	-	-	-	12	-
3b.2.2	Excavation of Underground Services	-	1,380	-	-	-	-	947	349	2,677	-	-	2,677	-	-	-	-	-	-	13,475	-
3b.2.3	Intake Structure Cofferdam	-	320	-	-	-	-	-	48	368	-	-	368	-	-	-	-	-	-	2,584	-
3b.2.4	Construction Debris	-	-	-	-	-	-	350	53	403	-	-	403	-	-	-	-	-	-	-	-
3b.2.5	Backfill	-	5,102	-	-	-	-	-	765	5,868	-	-	5,868	-	-	-	-	-	-	5,422	-
3b.2	Subtotal Period 3b Additional Costs	-	10,100	-	-	-	-	1,309	1,711	13,120	-	-	13,120	-	-	-	-	-	-	21,493	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	97	-	-	-	-	-	15	111	-	-	111	-	-	-	-	-	-	-	-
3b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	100	15	115	-	115	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	97	-	-	-	-	100	30	226	-	115	111	-	-	-	-	-	-	-	-

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix G, Page 10 of 11

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(thousands of 2017 dollars)

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															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	1,251	125	1,376	-	1,376	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	2,737	274	3,011	-	3,011	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	5,455	-	-	-	-	-	818	6,273	-	-	6,273	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	300	45	345	-	-	345	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	386	39	424	-	424	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	237	24	261	-	261	-	-	-	-	-	-	-	-	-
3b.4.7	Fixed Overhead	-	-	-	-	-	-	1,260	189	1,450	-	-	1,450	-	-	-	-	-	-	-	-
3b.4.8	ISFSI Operating Costs	-	-	-	-	-	-	179	27	206	-	206	-	-	-	-	-	-	-	-	-
3b.4.9	Railroad Track Maintenance	-	-	-	-	-	-	497	75	572	-	-	572	-	-	-	-	-	-	-	-
3b.4.10	Security Staff Cost	-	-	-	-	-	-	22,115	3,317	25,432	(0)	7,782	17,650	-	-	-	-	-	-	-	375,152
3b.4.11	DOC Staff Cost	-	-	-	-	-	-	11,290	1,693	12,983	-	-	12,983	-	-	-	-	-	-	-	122,646
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	6,583	987	7,571	-	1,976	5,595	-	-	-	-	-	-	-	98,297
3b.4	Subtotal Period 3b Period-Dependent Costs	-	5,455	-	-	-	-	46,836	7,613	59,904	(0)	15,036	44,868	-	-	-	-	-	-	-	596,095
3b.0	TOTAL PERIOD 3b COST	-	23,734	-	-	-	-	48,428	10,594	82,756	211	15,152	67,394	-	-	-	-	-	-	77,204	597,655
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
Period 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	122,822	18,423	141,246	-	141,246	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	122,822	18,423	141,246	-	141,246	-	-	-	-	-	-	-	-	-
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	28,205	2,821	31,026	-	31,026	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	24,796	2,480	27,276	-	27,276	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	8,697	870	9,567	-	9,567	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	5,348	535	5,883	-	5,883	-	-	-	-	-	-	-	-	-
3c.4.6	Fixed Overhead	-	-	-	-	-	-	9,721	1,458	11,179	-	11,179	-	-	-	-	-	-	-	-	-
3c.4.7	ISFSI Operating Costs	-	-	-	-	-	-	4,037	606	4,643	-	4,643	-	-	-	-	-	-	-	-	-
3c.4.8	Railroad Track Maintenance	-	-	-	-	-	-	4,510	677	5,187	-	5,187	-	-	-	-	-	-	-	-	-
3c.4.9	Security Staff Cost	-	-	-	-	-	-	152,513	22,877	175,389	-	175,389	-	-	-	-	-	-	-	-	2,114,750
3c.4.10	Utility Staff Cost	-	-	-	-	-	-	38,674	5,801	44,475	-	44,475	-	-	-	-	-	-	-	-	549,022
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	276,502	38,123	314,624	-	314,624	-	-	-	-	-	-	-	-	2,663,772
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	399,324	56,546	455,870	-	455,870	-	-	-	-	-	-	-	-	2,663,772
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
3d.1.1	Totals	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	1,331	-	-	6,552	-	1,316	9,199	9,199	-	-	-	-	-	-	1,547	311,184	-	-
Period 3d Collateral Costs																					
3d.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	23,942	3,591	27,533	-	27,533	-	-	-	-	-	-	-	-	-
3d.3	Subtotal Period 3d Collateral Costs	-	-	-	-	-	-	23,942	3,591	27,533	-	27,533	-	-	-	-	-	-	-	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	9,383	938	10,321	-	10,321	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	6,703	670	7,374	-	7,374	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	4,257	426	4,683	-	4,683	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	1,779	178	1,957	-	1,957	-	-	-	-	-	-	-	-	-
3d.4.6	Fixed Overhead	-	-	-	-	-	-	3,234	485	3,719	-	3,719	-	-	-	-	-	-	-	-	-
3d.4.7	ISFSI Operating Costs	-	-	-	-	-	-	1,343	201	1,544	-	1,544	-	-	-	-	-	-	-	-	-
3d.4.8	Railroad Track Maintenance	-	-	-	-	-	-	1,500	225	1,725	-	1,725	-	-	-	-	-	-	-	-	-
3d.4.9	Security Staff Cost	-	-	-	-	-	-	50,734	7,610	58,344	-	58,344	-	-	-	-	-	-	-	-	703,485
3d.4.10	Utility Staff Cost	-	-	-	-	-	-	12,865	1,930	14,795	-	14,795	-	-	-	-	-	-	-	-	182,635
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	91,799	12,664	104,462	-	104,462	-	-	-	-	-	-	-	-	886,120
3d.0	TOTAL PERIOD 3d COST	-	-	1,331	-	-	6,552	115,740	17,571	141,194	9,199	131,995	-	-	-	-	-	1,547	311,184	-	886,120

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table G
Monticello Nuclear Generating Plant
Scenario 5: DECON with 60 Year DFS and Recasking Decommissioning Cost Estimate
(thousands of 2017 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 3e - ISFSI Decontamination																					
Period 3e Direct Decommissioning Activities																					
Period 3e Additional Costs																					
3e.2.1	Decommissioning of ISFSI	30	133	8	788	-	8,077	1,865	2,725	13,626	13,626	-	-	-	27,473	-	-	-	3,877,048	11,519	1,848
3e.2	Subtotal Period 3e Additional Costs	30	133	8	788	-	8,077	1,865	2,725	13,626	13,626	-	-	-	27,473	-	-	-	3,877,048	11,519	1,848
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	110	28	138	138	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	244	61	304	304	-	-	-	-	-	-	-	-	-	-
3e.4.4	Fixed Overhead	-	-	-	-	-	-	82	21	103	103	-	-	-	-	-	-	-	-	-	-
3e.4.5	Railroad Track Maintenance	-	-	-	-	-	-	38	10	48	48	-	-	-	-	-	-	-	-	-	-
3e.4.6	Security Staff Cost	-	-	-	-	-	-	308	77	385	385	-	-	-	-	-	-	-	-	-	4,999
3e.4.7	Utility Staff Cost	-	-	-	-	-	-	260	65	325	325	-	-	-	-	-	-	-	-	-	3,792
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	1,042	261	1,303	1,303	-	-	-	-	-	-	-	-	-	8,792
3e.0	TOTAL PERIOD 3e COST	30	133	8	788	-	8,077	2,907	2,986	14,929	14,929	-	-	-	27,473	-	-	-	3,877,048	11,519	10,640
PERIOD 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
Period 3f Additional Costs																					
3f.2.1	Demolition and Site Restoration of ISFSI	-	1,766	-	-	-	-	185	293	2,244	-	-	2,244	-	-	-	-	-	-	8,537	160
3f.2	Subtotal Period 3f Additional Costs	-	1,766	-	-	-	-	185	293	2,244	-	-	2,244	-	-	-	-	-	-	8,537	160
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	14	-	-	-	-	-	2	16	-	-	16	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	14	-	-	-	-	-	2	16	-	-	16	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.2	Property taxes	-	-	-	-	-	-	123	12	135	-	-	135	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	123	-	-	-	-	-	19	142	-	-	142	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	29	4	33	-	-	33	-	-	-	-	-	-	-	-
3f.4.5	Fixed Overhead	-	-	-	-	-	-	42	6	48	-	-	48	-	-	-	-	-	-	-	-
3f.4.6	Railroad Track Maintenance	-	-	-	-	-	-	19	3	22	-	-	22	-	-	-	-	-	-	-	-
3f.4.7	Security Staff Cost	-	-	-	-	-	-	155	23	179	-	-	179	-	-	-	-	-	-	-	2,520
3f.4.8	Utility Staff Cost	-	-	-	-	-	-	103	16	119	-	-	119	-	-	-	-	-	-	-	1,564
3f.4	Subtotal Period 3f Period-Dependent Costs	-	123	-	-	-	-	471	83	678	-	-	678	-	-	-	-	-	-	-	4,084
3f.0	TOTAL PERIOD 3f COST	-	1,903	-	-	-	-	656	378	2,937	-	-	2,937	-	-	-	-	-	-	8,537	4,244
PERIOD 3 TOTALS		30	25,770	1,339	788	-	14,629	567,055	88,074	697,686	24,338	603,017	70,331	-	27,473	-	-	1,547	4,188,233	97,261	4,162,431
TOTAL COST TO DECOMMISSION		16,519	91,485	22,065	10,360	25,828	72,190	1,130,107	234,106	1,602,660	759,122	772,214	71,324	288,153	203,249	1,711	1,010	1,547	25,773,870	934,006	8,407,016

TOTAL COST TO DECOMMISSION WITH 17.11% CONTINGENCY:	\$1,602,660	thousands of 2017 dollars
TOTAL NRC LICENSE TERMINATION COST IS 47.37% OR:	\$759,122	thousands of 2017 dollars
SPENT FUEL MANAGEMENT COST IS 48.18% OR:	\$772,214	thousands of 2017 dollars
NON-NUCLEAR DEMOLITION COST IS 4.45% OR:	\$71,324	thousands of 2017 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	205,970	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,547	cubic feet
TOTAL SCRAP METAL REMOVED:	22,696	tons
TOTAL CRAFT LABOR REQUIREMENTS:	934,006	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

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-002, Rev. 0
Appendix H, Page 1 of 12***

APPENDIX H

DETAILED COST ANALYSIS

SCENARIO 6: SAFSTOR with 32 Year DFS

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix H, Page 2 of 12

Table H
Monticello Nuclear Generating Plant
Scenario 6: SAFSTOR with 32 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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	SAFSTOR site characterization survey	-	-	-	-	-	-	380	114	494	494	-	-	-	-	-	-	-	-	-	-
1a.1.2	Prepare preliminary decommissioning cost	-	-	-	-	-	-	153	23	175	175	-	-	-	-	-	-	-	-	-	1,300
1a.1.3	Notification of Cessation of Operations									a											
1a.1.4	Remove fuel & source material									n/a											
1a.1.5	Notification of Permanent Defueling									a											
1a.1.6	Deactivate plant systems & process waste									a											
1a.1.7	Prepare and submit PSDAR	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1a.1.8	Review plant dwgs & specs.	-	-	-	-	-	-	153	23	175	175	-	-	-	-	-	-	-	-	-	1,300
1a.1.9	Perform detailed rad survey									a											
1a.1.10	Estimate by-product inventory	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	End product description	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.12	Detailed by-product inventory	-	-	-	-	-	-	176	26	202	202	-	-	-	-	-	-	-	-	-	1,500
1a.1.13	Define major work sequence	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.14	Perform SER and EA	-	-	-	-	-	-	364	55	418	418	-	-	-	-	-	-	-	-	-	3,100
1a.1.15	Prepare/submit Defueled Technical Specifications	-	-	-	-	-	-	880	132	1,012	1,012	-	-	-	-	-	-	-	-	-	7,500
1a.1.16	Perform Site-Specific Cost Study	-	-	-	-	-	-	587	88	675	675	-	-	-	-	-	-	-	-	-	5,000
1a.1.17	Prepare/submit Irradiated Fuel Management Plan	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
Activity Specifications																					
1a.1.18.1	Prepare plant and facilities for SAFSTOR	-	-	-	-	-	-	578	87	664	664	-	-	-	-	-	-	-	-	-	4,920
1a.1.18.2	Plant systems	-	-	-	-	-	-	489	73	562	562	-	-	-	-	-	-	-	-	-	4,167
1a.1.18.3	Plant structures and buildings	-	-	-	-	-	-	366	55	421	421	-	-	-	-	-	-	-	-	-	3,120
1a.1.18.4	Waste management	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1a.1.18.5	Facility and site dormancy	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1a.1.18	Total	-	-	-	-	-	-	1,902	285	2,188	2,188	-	-	-	-	-	-	-	-	-	16,207
Detailed Work Procedures																					
1a.1.19.1	Plant systems	-	-	-	-	-	-	139	21	160	160	-	-	-	-	-	-	-	-	-	1,183
1a.1.19.2	Facility closeout & dormancy	-	-	-	-	-	-	141	21	162	162	-	-	-	-	-	-	-	-	-	1,200
1a.1.19	Total	-	-	-	-	-	-	280	42	322	322	-	-	-	-	-	-	-	-	-	2,383
1a.1.20	Procure vacuum drying system	-	-	-	-	-	-	12	2	13	13	-	-	-	-	-	-	-	-	-	100
1a.1.21	Drain/de-energize non-cont. systems									a											
1a.1.22	Drain & dry NSSS									a											
1a.1.23	Drain/de-energize contaminated systems									a											
1a.1.24	Decon/secure contaminated systems									a											
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	5,590	896	6,486	6,486	-	-	-	-	-	-	-	-	-	44,390
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	7,181	1,077	8,258	-	8,258	-	-	-	-	-	-	-	-	-
1a.3.2	Retention and Severance	-	-	-	-	-	-	9,892	1,484	11,376	11,376	-	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	17,073	2,561	19,634	11,376	8,258	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	2,408	241	2,649	2,649	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	2,242	224	2,466	2,466	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	515	-	-	-	-	-	129	644	644	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	567	-	-	-	-	-	85	652	652	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	4	-	50	-	14	81	81	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	1,730	259	1,989	1,989	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,110	111	1,221	1,221	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	3,166	317	3,482	-	3,482	-	-	-	-	-	-	-	-	-
1a.4.9	Fixed Overhead	-	-	-	-	-	-	2,833	425	3,258	3,258	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	803	120	923	-	923	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	103	15	119	-	119	-	-	-	-	-	-	-	-	-
1a.4.12	Railroad Track Maintenance	-	-	-	-	-	-	115	17	133	133	-	-	-	-	-	-	-	-	-	-
1a.4.13	Security Staff Cost	-	-	-	-	-	-	14,260	2,139	16,399	16,399	-	-	-	-	-	-	-	-	-	245,440
1a.4.14	Utility Staff Cost	-	-	-	-	-	-	25,791	3,869	29,660	29,660	-	-	-	-	-	-	-	-	-	422,240
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,083	13	4	-	50	54,561	7,966	63,676	59,152	4,524	-	-	610	-	-	-	12,190	20	667,680
1a.0	TOTAL PERIOD 1a COST	-	1,083	13	4	-	50	77,224	11,423	89,796	77,014	12,782	-	-	610	-	-	-	12,190	20	712,070

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table H
Monticello Nuclear Generating Plant
Scenario 6: SAFSTOR with 32 Year DFS Decommissioning Cost Estimate
(thousands of 2017 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site	LLRW	Other Costs	Total Contingency	Total Costs	NRC	Spent Fuel	Site	Processed	Burial Volumes				Burial/ Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
						Processing Costs	Disposal Costs				Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
PERIOD 1b - SAFSTOR Limited DECON Activities																					
Period 1b Direct Decommissioning Activities																					
Decontamination of Site Buildings																					
1b.1.1.1	Reactor Building	4,303	-	-	-	-	-	-	2,152	6,455	6,455	-	-	-	-	-	-	-	-	70,157	-
1b.1.1.2	Admin	81	-	-	-	-	-	-	41	122	122	-	-	-	-	-	-	-	-	1,357	-
1b.1.1.3	HPCI Room	21	-	-	-	-	-	-	11	32	32	-	-	-	-	-	-	-	-	350	-
1b.1.1.4	Hot Shop	12	-	-	-	-	-	-	6	19	19	-	-	-	-	-	-	-	-	208	-
1b.1.1.5	LLRW Storage & Shipping	42	-	-	-	-	-	-	21	63	63	-	-	-	-	-	-	-	-	705	-
1b.1.1.6	Offgas Stack	276	-	-	-	-	-	-	138	414	414	-	-	-	-	-	-	-	-	4,575	-
1b.1.1.7	Offgas Storage & Compressor	29	-	-	-	-	-	-	15	44	44	-	-	-	-	-	-	-	-	488	-
1b.1.1.8	Radwaste	88	-	-	-	-	-	-	44	132	132	-	-	-	-	-	-	-	-	1,473	-
1b.1.1.9	Radwaste Material Storage Warehouse	46	-	-	-	-	-	-	23	69	69	-	-	-	-	-	-	-	-	768	-
1b.1.1.10	Recombiner	19	-	-	-	-	-	-	10	29	29	-	-	-	-	-	-	-	-	323	-
1b.1.1.11	Turbine	512	-	-	-	-	-	-	256	768	768	-	-	-	-	-	-	-	-	8,583	-
1b.1.1.12	Turbine Building Addition	42	-	-	-	-	-	-	21	63	63	-	-	-	-	-	-	-	-	709	-
1b.1.1.13	Reactor (Post Fuel)	695	-	-	-	-	-	-	347	1,042	1,042	-	-	-	-	-	-	-	-	11,337	-
1b.1.1	Totals	6,167	-	-	-	-	-	-	3,084	9,251	9,251	-	-	-	-	-	-	-	-	101,033	-
1b.1	Subtotal Period 1b Activity Costs	6,167	-	-	-	-	-	-	3,084	9,251	9,251	-	-	-	-	-	-	-	-	101,033	-
Period 1b Additional Costs																					
1b.2.1	Spent fuel pool isolation	-	-	-	-	-	-	11,691	1,754	13,445	13,445	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	11,691	1,754	13,445	13,445	-	-	-	-	-	-	-	-	-	-
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	973	-	-	-	-	-	-	146	1,119	1,119	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process decommissioning water waste	214	-	138	356	-	566	-	316	1,589	1,589	-	-	-	1,350	-	-	-	81,018	263	-
1b.3.4	Small tool allowance	-	105	-	-	-	-	-	16	121	121	-	-	-	-	-	-	-	-	-	-
1b.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	168	25	193	-	193	-	-	-	-	-	-	-	-	-
1b.3.6	Retention and Severance	-	-	-	-	-	-	3,640	546	4,186	4,186	-	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	1,187	105	138	356	-	566	3,808	1,049	7,209	7,016	193	-	-	1,350	-	-	-	81,018	263	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	1,264	-	-	-	-	-	-	316	1,580	1,580	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	607	61	668	668	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	565	57	622	622	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	614	-	-	-	-	-	153	767	767	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	143	-	-	-	-	-	21	164	164	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	12	4	-	45	-	13	74	74	-	-	-	556	-	-	-	11,126	18	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	436	65	501	501	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	161	16	178	178	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	798	80	878	-	878	-	-	-	-	-	-	-	-	-
1b.4.10	Fixed Overhead	-	-	-	-	-	-	714	107	821	821	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	202	30	233	-	233	-	-	-	-	-	-	-	-	-
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	26	4	30	-	30	-	-	-	-	-	-	-	-	-
1b.4.13	Railroad Track Maintenance	-	-	-	-	-	-	29	4	33	33	-	-	-	-	-	-	-	-	-	-
1b.4.14	Security Staff Cost	-	-	-	-	-	-	3,594	539	4,134	4,134	-	-	-	-	-	-	-	-	-	61,864
1b.4.15	Utility Staff Cost	-	-	-	-	-	-	6,501	975	7,476	7,476	-	-	-	-	-	-	-	-	-	106,428
1b.4	Subtotal Period 1b Period-Dependent Costs	1,264	757	12	4	-	45	13,634	2,442	18,157	17,017	1,140	-	-	556	-	-	-	11,126	18	168,292
1b.0	TOTAL PERIOD 1b COST	8,618	862	150	360	-	611	29,134	8,328	48,062	46,729	1,333	-	-	1,907	-	-	-	92,144	101,314	168,292
PERIOD 1c - Preparations for SAFSTOR Dormancy																					
Period 1c Direct Decommissioning Activities																					
1c.1.1	Prepare support equipment for storage	-	470	-	-	-	-	-	71	541	541	-	-	-	-	-	-	-	-	3,000	-
1c.1.2	Install containment pressure equal. lines	-	44	-	-	-	-	-	7	51	51	-	-	-	-	-	-	-	-	700	-
1c.1.3	Interim survey prior to dormancy	-	-	-	-	-	-	733	220	953	953	-	-	-	-	-	-	-	-	14,124	-
1c.1.4	Secure building accesses	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-	-
1c.1.5	Prepare & submit interim report	-	-	-	-	-	-	68	10	79	79	-	-	-	-	-	-	-	-	-	583
1c.1	Subtotal Period 1c Activity Costs	-	514	-	-	-	-	801	307	1,623	1,623	-	-	-	-	-	-	-	-	17,824	583

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table H
Monticello Nuclear Generating Plant
Scenario 6: SAFSTOR with 32 Year DFS Decommissioning Cost Estimate
(thousands of 2017 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial/ Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 1c Collateral Costs																					
1c.3.1	Process decommissioning water waste	157	-	102	262	-	416	-	232	1,170	1,170	-	-	-	994	-	-	-	59,665	194	-
1c.3.3	Small tool allowance	-	4	-	-	-	-	-	1	5	5	-	-	-	-	-	-	-	-	-	-
1c.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	166	25	191	-	191	-	-	-	-	-	-	-	-	-
1c.3.5	Retention and Severance	-	-	-	-	-	-	2,722	408	3,130	3,130	-	-	-	-	-	-	-	-	-	-
1c.3	Subtotal Period 1c Collateral Costs	157	4	102	262	-	416	2,887	666	4,495	4,304	191	-	-	994	-	-	-	59,665	194	-
Period 1c Period-Dependent Costs																					
1c.4.1	Insurance	-	-	-	-	-	-	600	60	660	660	-	-	-	-	-	-	-	-	-	-
1c.4.2	Property taxes	-	-	-	-	-	-	558	56	614	614	-	-	-	-	-	-	-	-	-	-
1c.4.3	Health physics supplies	-	215	-	-	-	-	-	54	268	268	-	-	-	-	-	-	-	-	-	-
1c.4.4	Heavy equipment rental	-	141	-	-	-	-	-	21	163	163	-	-	-	-	-	-	-	-	-	-
1c.4.5	Disposal of DAW generated	-	-	3	1	-	12	-	4	20	20	-	-	-	152	-	-	-	3,039	5	-
1c.4.6	Plant energy budget	-	-	-	-	-	-	431	65	496	496	-	-	-	-	-	-	-	-	-	-
1c.4.7	NRC Fees	-	-	-	-	-	-	160	16	176	176	-	-	-	-	-	-	-	-	-	-
1c.4.8	Emergency Planning Fees	-	-	-	-	-	-	789	79	868	-	868	-	-	-	-	-	-	-	-	-
1c.4.9	Fixed Overhead	-	-	-	-	-	-	706	106	812	812	-	-	-	-	-	-	-	-	-	-
1c.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	200	30	230	-	230	-	-	-	-	-	-	-	-	-
1c.4.11	ISFSI Operating Costs	-	-	-	-	-	-	26	4	30	-	30	-	-	-	-	-	-	-	-	-
1c.4.12	Railroad Track Maintenance	-	-	-	-	-	-	29	4	33	33	-	-	-	-	-	-	-	-	-	-
1c.4.13	Security Staff Cost	-	-	-	-	-	-	3,555	533	4,089	4,089	-	-	-	-	-	-	-	-	-	61,192
1c.4.14	Utility Staff Cost	-	-	-	-	-	-	6,430	965	7,395	7,395	-	-	-	-	-	-	-	-	-	105,271
1c.4	Subtotal Period 1c Period-Dependent Costs	-	356	3	1	-	12	13,485	1,996	15,853	14,725	1,128	-	-	152	-	-	-	3,039	5	166,463
1c.0	TOTAL PERIOD 1c COST	157	874	105	263	-	429	17,173	2,969	21,971	20,652	1,319	-	-	1,146	-	-	-	62,705	18,023	167,046
PERIOD 1 TOTALS		8,775	2,819	268	627	-	1,089	123,531	22,720	159,829	144,395	15,434	-	-	3,662	-	-	-	167,039	119,357	1,047,408
PERIOD 2a - SAFSTOR Dormancy with Wet Spent Fuel Storage																					
Period 2a Direct Decommissioning Activities																					
2a.1.1	Quarterly Inspection	-	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-
2a.1.2	Semi-annual environmental survey	-	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-
2a.1.3	Prepare reports	-	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-
2a.1.4	Bituminous roof replacement	-	-	-	-	-	-	216	32	248	248	-	-	-	-	-	-	-	-	-	-
2a.1.5	Maintenance supplies	-	-	-	-	-	-	480	120	599	599	-	-	-	-	-	-	-	-	-	-
2a.1	Subtotal Period 2a Activity Costs	-	-	-	-	-	-	695	152	848	848	-	-	-	-	-	-	-	-	-	-
Period 2a Additional Costs																					
2a.2.1	Security Modifications	-	-	-	-	-	-	8,696	1,304	10,000	10,000	-	-	-	-	-	-	-	-	-	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	8,696	1,304	10,000	10,000	-	-	-	-	-	-	-	-	-	-
Period 2a Collateral Costs																					
2a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	77,276	11,591	88,867	-	88,867	-	-	-	-	-	-	-	-	-
2a.3.2	Retention and Severance	-	-	-	-	-	-	21,900	3,285	25,185	25,185	-	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	99,176	14,876	114,052	25,185	88,867	-	-	-	-	-	-	-	-	-
Period 2a Period-Dependent Costs																					
2a.4.1	Insurance	-	-	-	-	-	-	2,526	253	2,778	2,778	-	-	-	-	-	-	-	-	-	-
2a.4.2	Property taxes	-	-	-	-	-	-	7,844	784	8,628	8,628	-	-	-	-	-	-	-	-	-	-
2a.4.3	Health physics supplies	-	724	-	-	-	-	-	181	905	905	-	-	-	-	-	-	-	-	-	-
2a.4.4	Disposal of DAW generated	-	-	17	5	-	66	-	19	107	107	-	-	-	806	-	-	-	16,112	26	-
2a.4.5	Plant energy budget	-	-	-	-	-	-	1,211	182	1,393	1,393	-	-	-	-	-	-	-	-	-	-
2a.4.6	NRC Fees	-	-	-	-	-	-	898	90	988	988	-	-	-	-	-	-	-	-	-	-
2a.4.7	Emergency Planning Fees	-	-	-	-	-	-	8,991	899	9,891	-	9,891	-	-	-	-	-	-	-	-	-
2a.4.8	Fixed Overhead	-	-	-	-	-	-	9,919	1,488	11,407	11,407	-	-	-	-	-	-	-	-	-	-
2a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	2,810	422	3,232	-	3,232	-	-	-	-	-	-	-	-	-
2a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	361	54	416	-	416	-	-	-	-	-	-	-	-	-
2a.4.11	Railroad Track Maintenance	-	-	-	-	-	-	701	105	806	806	-	-	-	-	-	-	-	-	-	-
2a.4.12	Security Staff Cost	-	-	-	-	-	-	46,105	6,916	53,021	37,327	15,694	-	-	-	-	-	-	-	-	786,548
2a.4.13	Utility Staff Cost	-	-	-	-	-	-	17,653	2,648	20,301	16,322	3,979	-	-	-	-	-	-	-	-	287,673
2a.4	Subtotal Period 2a Period-Dependent Costs	-	724	17	5	-	66	99,020	14,040	113,872	80,661	33,211	-	-	806	-	-	-	16,112	26	1,074,220
2a.0	TOTAL PERIOD 2a COST	-	724	17	5	-	66	207,587	30,373	238,772	116,694	122,078	-	-	806	-	-	-	16,112	26	1,074,220

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix H, Page 5 of 12

Table H
Monticello Nuclear Generating Plant
Scenario 6: SAFSTOR with 32 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 2b - SAFSTOR Dormancy with Dry Spent Fuel Storage																					
Period 2b Direct Decommissioning Activities																					
2b.1.1	Quarterly Inspection									a											
2b.1.2	Semi-annual environmental survey									a											
2b.1.3	Prepare reports									a											
2b.1.4	Bituminous roof replacement	-	-	-	-	-	-	1,685	253	1,937	1,937	-	-	-	-	-	-	-	-	-	-
2b.1.5	Maintenance supplies	-	-	-	-	-	-	3,744	936	4,680	4,680	-	-	-	-	-	-	-	-	-	-
2b.1	Subtotal Period 2b Activity Costs	-	-	-	-	-	-	5,428	1,189	6,617	6,617	-	-	-	-	-	-	-	-	-	-
Period 2b Collateral Costs																					
2b.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	50,959	7,644	58,603	-	58,603	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	-	-	-	-	-	-	50,959	7,644	58,603	-	58,603	-	-	-	-	-	-	-	-	-
Period 2b Period-Dependent Costs																					
2b.4.1	Insurance	-	-	-	-	-	-	19,716	1,972	21,688	21,688	-	-	-	-	-	-	-	-	-	-
2b.4.2	Property taxes	-	-	-	-	-	-	61,232	6,123	67,355	67,355	-	-	-	-	-	-	-	-	-	-
2b.4.3	Health physics supplies	-	2,741	-	-	-	-	-	685	3,427	3,427	-	-	-	-	-	-	-	-	-	-
2b.4.4	Disposal of DAW generated	-	-	63	20	-	246	-	71	400	400	-	-	-	3,021	-	-	-	60,421	99	-
2b.4.5	Plant energy budget	-	-	-	-	-	-	4,728	709	5,438	5,438	-	-	-	-	-	-	-	-	-	-
2b.4.6	NRC Fees	-	-	-	-	-	-	6,663	666	7,329	7,329	-	-	-	-	-	-	-	-	-	-
2b.4.7	Emergency Planning Fees	-	-	-	-	-	-	3,738	374	4,112	-	4,112	-	-	-	-	-	-	-	-	-
2b.4.8	Fixed Overhead	-	-	-	-	-	-	6,795	1,019	7,814	7,814	-	-	-	-	-	-	-	-	-	-
2b.4.9	ISFSI Operating Costs	-	-	-	-	-	-	2,822	423	3,245	-	3,245	-	-	-	-	-	-	-	-	-
2b.4.10	Railroad Track Maintenance	-	-	-	-	-	-	3,153	473	3,626	3,626	-	-	-	-	-	-	-	-	-	-
2b.4.11	Security Staff Cost	-	-	-	-	-	-	135,018	20,253	155,271	32,607	122,664	-	-	-	-	-	-	-	-	2,046,789
2b.4.12	Utility Staff Cost	-	-	-	-	-	-	57,735	8,660	66,395	35,322	31,073	-	-	-	-	-	-	-	-	909,684
2b.4	Subtotal Period 2b Period-Dependent Costs	-	2,741	63	20	-	246	301,600	41,429	346,099	185,005	161,094	-	-	3,021	-	-	-	60,421	99	2,956,472
2b.0	TOTAL PERIOD 2b COST	-	2,741	63	20	-	246	357,987	50,261	411,319	191,622	219,697	-	-	3,021	-	-	-	60,421	99	2,956,472
PERIOD 2c - SAFSTOR Dormancy without Spent Fuel Storage																					
Period 2c Direct Decommissioning Activities																					
2c.1.1	Quarterly Inspection									a											
2c.1.2	Semi-annual environmental survey									a											
2c.1.3	Prepare reports									a											
2c.1.4	Bituminous roof replacement	-	-	-	-	-	-	1,359	204	1,563	1,563	-	-	-	-	-	-	-	-	-	-
2c.1.5	Maintenance supplies	-	-	-	-	-	-	3,021	755	3,776	3,776	-	-	-	-	-	-	-	-	-	-
2c.1	Subtotal Period 2c Activity Costs	-	-	-	-	-	-	4,380	959	5,339	5,339	-	-	-	-	-	-	-	-	-	-
Period 2c Period-Dependent Costs																					
2c.4.1	Insurance	-	-	-	-	-	-	15,623	1,562	17,185	17,185	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	49,403	4,940	54,343	54,343	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	2,080	-	-	-	-	-	520	2,601	2,601	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	47	15	-	183	-	53	297	297	-	-	-	2,245	-	-	-	44,899	73	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	3,815	572	4,387	4,387	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	4,905	491	5,396	5,396	-	-	-	-	-	-	-	-	-	-
2c.4.7	Emergency Planning Fees	-	-	-	-	-	-	3,016	302	3,318	-	3,318	-	-	-	-	-	-	-	-	-
2c.4.8	Fixed Overhead	-	-	-	-	-	-	5,483	822	6,305	6,305	-	-	-	-	-	-	-	-	-	-
2c.4.9	ISFSI Operating Costs	-	-	-	-	-	-	2,277	342	2,619	-	2,619	-	-	-	-	-	-	-	-	-
2c.4.10	Railroad Track Maintenance	-	-	-	-	-	-	2,544	382	2,925	2,925	-	-	-	-	-	-	-	-	-	-
2c.4.11	Utility Staff Cost	-	-	-	-	-	-	24,505	3,676	28,181	28,181	-	-	-	-	-	-	-	-	-	401,397
2c.4	Subtotal Period 2c Period-Dependent Costs	-	2,080	47	15	-	183	111,571	13,661	127,557	121,620	5,936	-	-	2,245	-	-	-	44,899	73	401,397
2c.0	TOTAL PERIOD 2c COST	-	2,080	47	15	-	183	115,951	14,620	132,896	126,959	5,936	-	-	2,245	-	-	-	44,899	73	401,397
PERIOD 2 TOTALS		-	5,546	126	40	-	494	681,525	95,254	782,986	435,275	347,711	-	-	6,072	-	-	-	121,431	198	4,432,090
PERIOD 3a - Reactivate Site Following SAFSTOR Dormancy																					
Period 3a Direct Decommissioning Activities																					
3a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	153	23	175	175	-	-	-	-	-	-	-	-	-	1,300
3a.1.2	Review plant dwgs & specs.	-	-	-	-	-	-	540	81	621	621	-	-	-	-	-	-	-	-	-	4,600
3a.1.3	Perform detailed rad survey									a											
3a.1.4	End product description	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
3a.1.5	Detailed by-product inventory	-	-	-	-	-	-	153	23	175	175	-	-	-	-	-	-	-	-	-	1,300
3a.1.6	Define major work sequence	-	-	-	-	-	-	880	132	1,012	1,012	-	-	-	-	-	-	-	-	-	7,500

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table H
Monticello Nuclear Generating Plant
Scenario 6: SAFSTOR with 32 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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			
3a.1.7	Perform SER and EA	-	-	-	-	-	-	364	55	418	418	-	-	-	-	-	-	-	-	-	3,100
3a.1.8	Perform Site-Specific Cost Study	-	-	-	-	-	-	587	88	675	675	-	-	-	-	-	-	-	-	-	5,000
Activity Specifications																					
3a.1.9.1	Re-activate plant & temporary facilities	-	-	-	-	-	-	865	130	995	895	-	99	-	-	-	-	-	-	-	7,370
3a.1.9.2	Plant systems	-	-	-	-	-	-	489	73	562	506	-	56	-	-	-	-	-	-	-	4,167
3a.1.9.3	Reactor internals	-	-	-	-	-	-	833	125	958	958	-	-	-	-	-	-	-	-	-	7,100
3a.1.9.4	Reactor vessel	-	-	-	-	-	-	763	114	877	877	-	-	-	-	-	-	-	-	-	6,500
3a.1.9.5	Sacrificial shield	-	-	-	-	-	-	59	9	67	67	-	-	-	-	-	-	-	-	-	500
3a.1.9.6	Moisture separators/reheaters	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
3a.1.9.7	Reinforced concrete	-	-	-	-	-	-	188	28	216	108	-	108	-	-	-	-	-	-	-	1,600
3a.1.9.8	Main Turbine	-	-	-	-	-	-	245	37	282	282	-	-	-	-	-	-	-	-	-	2,088
3a.1.9.9	Main Condensers	-	-	-	-	-	-	245	37	282	282	-	-	-	-	-	-	-	-	-	2,088
3a.1.9.10	Pressure suppression structure	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
3a.1.9.11	Drywell	-	-	-	-	-	-	188	28	216	216	-	-	-	-	-	-	-	-	-	1,600
3a.1.9.12	Plant structures & buildings	-	-	-	-	-	-	366	55	421	211	-	211	-	-	-	-	-	-	-	3,120
3a.1.9.13	Waste management	-	-	-	-	-	-	540	81	621	621	-	-	-	-	-	-	-	-	-	4,600
3a.1.9.14	Facility & site closeout	-	-	-	-	-	-	106	16	121	61	-	61	-	-	-	-	-	-	-	900
3a.1.9	Total	-	-	-	-	-	-	5,239	786	6,025	5,490	-	535	-	-	-	-	-	-	-	44,633
Planning & Site Preparations																					
3a.1.10	Prepare dismantling sequence	-	-	-	-	-	-	282	42	324	324	-	-	-	-	-	-	-	-	-	2,400
3a.1.11	Plant prep. & temp. svces	-	-	-	-	-	-	3,300	495	3,795	3,795	-	-	-	-	-	-	-	-	-	-
3a.1.12	Design water clean-up system	-	-	-	-	-	-	164	25	189	189	-	-	-	-	-	-	-	-	-	1,400
3a.1.13	Rigging/Cont. Cntrl Envlp/s/tooling/etc.	-	-	-	-	-	-	2,300	345	2,645	2,645	-	-	-	-	-	-	-	-	-	-
3a.1.14	Procure casks/liners & containers	-	-	-	-	-	-	144	22	166	166	-	-	-	-	-	-	-	-	-	1,230
3a.1	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	14,223	2,133	16,357	15,821	-	535	-	-	-	-	-	-	-	73,463
Period 3a Additional Costs																					
3a.2.1	Site Characterization	-	-	-	-	-	-	6,446	1,934	8,380	8,380	-	-	-	-	-	-	-	-	30,500	10,852
3a.2.2	Mixed & RCRA Waste	-	-	29	19	13	-	-	8	69	69	-	-	43	-	-	-	-	5,253	163	-
3a.2	Subtotal Period 3a Additional Costs	-	-	29	19	13	-	6,446	1,942	8,449	8,449	-	-	43	-	-	-	-	5,253	30,663	10,852
Period 3a Period-Dependent Costs																					
3a.4.1	Insurance	-	-	-	-	-	-	708	71	779	779	-	-	-	-	-	-	-	-	-	-
3a.4.2	Property taxes	-	-	-	-	-	-	2,232	223	2,455	2,455	-	-	-	-	-	-	-	-	-	-
3a.4.3	Health physics supplies	-	451	-	-	-	-	-	113	564	564	-	-	-	-	-	-	-	-	-	-
3a.4.4	Heavy equipment rental	-	567	-	-	-	-	-	85	652	652	-	-	-	-	-	-	-	-	-	-
3a.4.5	Disposal of DAW generated	-	-	11	3	-	42	-	12	68	68	-	-	-	514	-	-	-	10,287	17	-
3a.4.6	Plant energy budget	-	-	-	-	-	-	1,730	259	1,989	1,989	-	-	-	-	-	-	-	-	-	-
3a.4.7	NRC Fees	-	-	-	-	-	-	341	34	376	376	-	-	-	-	-	-	-	-	-	-
3a.4.8	Emergency Planning Fees	-	-	-	-	-	-	137	14	150	-	150	-	-	-	-	-	-	-	-	-
3a.4.9	Fixed Overhead	-	-	-	-	-	-	2,833	425	3,258	3,258	-	-	-	-	-	-	-	-	-	-
3a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	103	15	119	-	119	-	-	-	-	-	-	-	-	-
3a.4.11	Railroad Track Maintenance	-	-	-	-	-	-	115	17	133	133	-	-	-	-	-	-	-	-	-	-
3a.4.12	Utility Staff Cost	-	-	-	-	-	-	15,819	2,373	18,191	18,191	-	-	-	-	-	-	-	-	-	257,920
3a.4	Subtotal Period 3a Period-Dependent Costs	-	1,018	11	3	-	42	24,019	3,642	28,735	28,466	269	-	-	514	-	-	-	10,287	17	257,920
3a.0	TOTAL PERIOD 3a COST	-	1,018	39	23	13	42	44,688	7,717	53,540	52,736	269	535	43	514	-	-	-	15,540	30,680	342,235
PERIOD 3b - Decommissioning Preparations																					
Period 3b Direct Decommissioning Activities																					
Detailed Work Procedures																					
3b.1.1.1	Plant systems	-	-	-	-	-	-	556	83	639	575	-	64	-	-	-	-	-	-	-	4,733
3b.1.1.2	Reactor internals	-	-	-	-	-	-	470	70	540	540	-	-	-	-	-	-	-	-	-	4,000
3b.1.1.3	Remaining buildings	-	-	-	-	-	-	158	24	182	46	-	137	-	-	-	-	-	-	-	1,350
3b.1.1.4	CRD housings & NIs	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.5	Incore instrumentation	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.6	Removal primary containment	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
3b.1.1.7	Reactor vessel	-	-	-	-	-	-	426	64	490	490	-	-	-	-	-	-	-	-	-	3,630
3b.1.1.8	Facility closeout	-	-	-	-	-	-	141	21	162	81	-	81	-	-	-	-	-	-	-	1,200
3b.1.1.9	Sacrificial shield	-	-	-	-	-	-	141	21	162	162	-	-	-	-	-	-	-	-	-	1,200
3b.1.1.10	Reinforced concrete	-	-	-	-	-	-	117	18	135	67	-	67	-	-	-	-	-	-	-	1,000
3b.1.1.11	Main Turbine	-	-	-	-	-	-	244	37	281	281	-	-	-	-	-	-	-	-	-	2,080
3b.1.1.12	Main Condensers	-	-	-	-	-	-	245	37	282	282	-	-	-	-	-	-	-	-	-	2,088
3b.1.1.13	Moisture separators & reheaters	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000

TLG Services, Inc.

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix H, Page 7 of 12

Table H
Monticello Nuclear Generating Plant
Scenario 6: SAFSTOR with 32 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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			
Detailed Work Procedures (continued)																					
3b.1.1.14	Radwaste building	-	-	-	-	-	-	320	48	369	332	-	37	-	-	-	-	-	-	-	2,730
3b.1.1.15	Reactor building	-	-	-	-	-	-	320	48	369	332	-	37	-	-	-	-	-	-	-	2,730
3b.1.1	Total	-	-	-	-	-	-	3,843	576	4,420	3,997	-	423	-	-	-	-	-	-	-	32,741
3b.1	Subtotal Period 3b Activity Costs	-	-	-	-	-	-	3,843	576	4,420	3,997	-	423	-	-	-	-	-	-	-	32,741
Period 3b Collateral Costs																					
3b.3.1	Decon equipment	973	-	-	-	-	-	-	146	1,119	1,119	-	-	-	-	-	-	-	-	-	-
3b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,189	178	1,367	1,367	-	-	-	-	-	-	-	-	-	-
3b.3.3	Pipe cutting equipment	-	1,200	-	-	-	-	-	180	1,380	1,380	-	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	973	1,200	-	-	-	-	1,189	504	3,866	3,866	-	-	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Decon supplies	35	-	-	-	-	-	-	9	43	43	-	-	-	-	-	-	-	-	-	-
3b.4.2	Insurance	-	-	-	-	-	-	360	36	396	396	-	-	-	-	-	-	-	-	-	-
3b.4.3	Property taxes	-	-	-	-	-	-	995	99	1,094	1,094	-	-	-	-	-	-	-	-	-	-
3b.4.4	Health physics supplies	-	248	-	-	-	-	-	62	309	309	-	-	-	-	-	-	-	-	-	-
3b.4.5	Heavy equipment rental	-	283	-	-	-	-	-	42	325	325	-	-	-	-	-	-	-	-	-	-
3b.4.6	Disposal of DAW generated	-	-	6	2	-	24	-	7	38	38	-	-	-	290	-	-	-	5,802	9	-
3b.4.7	Plant energy budget	-	-	-	-	-	-	863	129	992	992	-	-	-	-	-	-	-	-	-	-
3b.4.8	NRC Fees	-	-	-	-	-	-	170	17	187	187	-	-	-	-	-	-	-	-	-	-
3b.4.9	Emergency Planning Fees	-	-	-	-	-	-	68	7	75	-	75	-	-	-	-	-	-	-	-	-
3b.4.10	Fixed Overhead	-	-	-	-	-	-	1,413	212	1,625	1,625	-	-	-	-	-	-	-	-	-	-
3b.4.11	ISFSI Operating Costs	-	-	-	-	-	-	51	8	59	-	59	-	-	-	-	-	-	-	-	-
3b.4.12	Railroad Track Maintenance	-	-	-	-	-	-	58	9	66	66	-	-	-	-	-	-	-	-	-	-
3b.4.13	DOC Staff Cost	-	-	-	-	-	-	5,123	769	5,892	5,892	-	-	-	-	-	-	-	-	-	58,080
3b.4.14	Utility Staff Cost	-	-	-	-	-	-	7,888	1,183	9,071	9,071	-	-	-	-	-	-	-	-	-	128,607
3b.4	Subtotal Period 3b Period-Dependent Costs	35	530	6	2	-	24	16,988	2,588	20,173	20,039	134	-	-	290	-	-	-	5,802	9	186,687
3b.0	TOTAL PERIOD 3b COST	1,008	1,730	6	2	-	24	22,020	3,669	28,459	27,902	134	423	-	290	-	-	-	5,802	9	219,428
PERIOD 3 TOTALS		1,008	2,749	45	25	13	65	66,708	11,386	81,999	80,638	403	958	43	804	-	-	-	21,343	30,690	561,663
PERIOD 4a - Large Component Removal																					
Period 4a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
4a.1.1.1	Recirculation System Piping & Valves	20	71	28	22	96	214	-	102	553	553	-	-	676	715	-	-	-	94,867	1,594	-
4a.1.1.2	Recirculation Pumps & Motors	7	47	15	26	130	219	-	95	539	539	-	-	568	473	-	-	-	112,200	1,049	-
4a.1.1.3	CRDMs & NIs Removal	35	674	400	72	-	919	-	466	2,565	2,565	-	-	-	3,741	-	-	-	213,700	12,506	-
4a.1.1.4	Reactor Vessel Internals	102	5,782	8,903	1,187	-	14,647	275	14,274	45,170	45,170	-	-	-	2,943	1,127	643	-	306,123	22,915	1,075
4a.1.1.5	Vessel & Internals GTCC Disposal	-	-	-	-	-	6,552	-	983	7,535	7,535	-	-	-	-	-	-	1,547	311,184	-	-
4a.1.1.6	Reactor Vessel	-	7,999	1,877	606	-	5,622	275	9,472	25,852	25,852	-	-	-	17,823	-	-	-	1,110,260	22,915	1,075
4a.1.1	Totals	163	14,571	11,223	1,914	226	28,174	551	25,392	82,215	82,215	-	-	1,244	25,695	1,127	643	1,547	2,148,335	60,979	2,150
Removal of Major Equipment																					
4a.1.2	Main Turbine/Generator	-	282	1,424	349	3,174	357	-	831	6,417	6,417	-	-	24,835	1,383	-	-	-	1,577,959	4,796	-
4a.1.3	Main Condensers	-	994	378	128	1,667	198	-	605	3,970	3,970	-	-	17,396	727	-	-	-	828,955	16,823	-
Cascading Costs from Clean Building Demolition																					
4a.1.4.1	Reactor Building	-	611	-	-	-	-	-	92	703	703	-	-	-	-	-	-	-	-	6,238	-
4a.1.4.2	Radwaste	-	53	-	-	-	-	-	8	61	61	-	-	-	-	-	-	-	-	569	-
4a.1.4.3	Turbine	-	157	-	-	-	-	-	24	180	180	-	-	-	-	-	-	-	-	1,884	-
4a.1.4	Totals	-	821	-	-	-	-	-	123	944	944	-	-	-	-	-	-	-	-	8,691	-
Disposal of Plant Systems																					
4a.1.5.1	Automatic Press Relief	-	88	2	7	94	-	-	37	228	228	-	-	1,088	-	-	-	-	44,184	1,468	-
4a.1.5.2	Chemistry Sampling	-	20	0	1	18	-	-	8	48	48	-	-	207	-	-	-	-	8,422	356	-
4a.1.5.3	Chemistry Sampling - Insulated	-	1	0	0	0	-	-	0	2	2	-	-	1	-	-	-	-	61	25	-
4a.1.5.4	Circulating Water - RCA	-	172	10	41	576	-	-	136	935	935	-	-	6,656	-	-	-	-	270,307	2,860	-
4a.1.5.5	Combustible Gas Control - Insul - RCA	-	24	0	1	18	-	-	9	53	53	-	-	212	-	-	-	-	8,617	378	-
4a.1.5.6	Combustible Gas Control - RCA	-	15	0	2	25	-	-	8	50	50	-	-	285	-	-	-	-	11,577	245	-
4a.1.5.7	Condensate & Feedwater	-	736	45	184	2,609	-	-	607	4,181	4,181	-	-	30,157	-	-	-	-	1,224,704	12,501	-
4a.1.5.8	Condensate & Feedwater - Insulated	-	368	9	36	506	-	-	174	1,093	1,093	-	-	5,855	-	-	-	-	237,764	6,185	-
4a.1.5.9	Condensate Demin	-	408	7	29	410	-	-	168	1,022	1,022	-	-	4,735	-	-	-	-	192,293	6,784	-
4a.1.5.10	Condensate Storage	-	546	12	50	712	-	-	252	1,573	1,573	-	-	8,237	-	-	-	-	334,489	9,265	-
4a.1.5.11	Control Rod Drive	-	2	0	0	2	-	-	1	5	5	-	-	24	-	-	-	-	976	36	-

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix H, Page 8 of 12

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(thousands of 2017 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site	LLRW	Other Costs	Total Contingency	Total Costs	NRC	Spent Fuel	Site	Processed	Burial Volumes				Burial/		Utility and Contractor Manhours
						Processing Costs	Disposal Costs				Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.	Craft Manhours	
Disposal of Plant Systems (continued)																					
4a.1.5.12	Control Rod Drive Hydraulic	-	309	4	15	211	-	-	112	651	651	-	-	2,440	-	-	-	-	99,094	5,255	-
4a.1.5.13	Core Spray	-	59	8	31	442	-	-	86	626	626	-	-	5,109	-	-	-	-	207,487	1,026	-
4a.1.5.14	Core Spray - Insulated	-	108	2	7	102	-	-	44	263	263	-	-	1,184	-	-	-	-	48,081	1,806	-
4a.1.5.15	Demin Water - Insulated - RCA	-	12	0	1	7	-	-	4	25	25	-	-	85	-	-	-	-	3,445	181	-
4a.1.5.16	Demin Water - RCA	-	34	0	2	22	-	-	12	70	70	-	-	253	-	-	-	-	10,278	508	-
4a.1.5.17	Diesel Oil - RCA	-	2	0	0	2	-	-	1	4	4	-	-	23	-	-	-	-	931	25	-
4a.1.5.18	Drywell Atmosphere Cooling - RCA	-	31	1	3	47	-	-	15	98	98	-	-	548	-	-	-	-	22,244	550	-
4a.1.5.19	EDG Emerg Service Water - Insul - RCA	-	0	0	0	0	-	-	0	1	1	-	-	2	-	-	-	-	84	4	-
4a.1.5.20	Electrical - Clean	-	11	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	182	-
4a.1.5.21	Emergency Service Water - Insul - RCA	-	18	0	1	12	-	-	6	37	37	-	-	137	-	-	-	-	5,544	281	-
4a.1.5.22	Emergency Service Water - RCA	-	1	0	0	1	-	-	1	3	3	-	-	13	-	-	-	-	512	22	-
4a.1.5.23	GEZIP - RCA	-	3	0	1	9	-	-	2	15	15	-	-	103	-	-	-	-	4,184	48	-
4a.1.5.24	Generator Physical Design - RCA	-	4	0	0	3	-	-	1	8	8	-	-	31	-	-	-	-	1,250	67	-
4a.1.5.25	H2-O2 Control Analyzing	-	5	0	0	2	-	-	1	8	8	-	-	23	-	-	-	-	948	72	-
4a.1.5.26	H2-O2 Control Analyzing - Insulated	-	5	0	0	2	-	-	1	8	8	-	-	23	-	-	-	-	948	72	-
4a.1.5.27	High Pressure Coolant Injection	-	50	2	8	109	-	-	30	199	199	-	-	1,262	-	-	-	-	51,257	850	-
4a.1.5.28	High Pressure Coolant Injection - Insula	-	164	3	14	196	-	-	73	450	450	-	-	2,266	-	-	-	-	92,018	2,734	-
4a.1.5.29	Hydrogen Cooling	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	118	-
4a.1.5.30	Hydrogen Cooling - RCA	-	6	0	0	3	-	-	2	11	11	-	-	39	-	-	-	-	1,600	79	-
4a.1.5.31	Hydrogen Seal Oil - RCA	-	14	0	1	16	-	-	6	38	38	-	-	189	-	-	-	-	7,669	212	-
4a.1.5.32	Hydrogen Water Chemistry - RCA	-	20	0	1	12	-	-	7	40	40	-	-	140	-	-	-	-	5,672	304	-
4a.1.5.33	Instrument & Service Air - RCA	-	185	3	11	153	-	-	71	423	423	-	-	1,768	-	-	-	-	71,810	2,733	-
4a.1.5.34	Main Condenser	-	147	3	12	165	-	-	63	389	389	-	-	1,903	-	-	-	-	77,301	2,443	-
4a.1.5.35	Main Steam	-	186	4	18	257	-	-	88	554	554	-	-	2,975	-	-	-	-	120,806	3,122	-
4a.1.5.36	Main Turbine	-	754	48	194	2,758	-	-	636	4,391	4,391	-	-	31,885	-	-	-	-	1,294,866	12,952	-
4a.1.5.37	Main Turbine - Insulated	-	160	5	21	299	-	-	89	574	574	-	-	3,460	-	-	-	-	140,506	2,725	-
4a.1.5.38	Miscellaneous	-	32	0	2	26	-	-	12	72	72	-	-	302	-	-	-	-	12,283	556	-
4a.1.5.39	Off Gas Recombiner	-	140	4	17	247	-	-	75	485	485	-	-	2,861	-	-	-	-	116,194	2,387	-
4a.1.5.40	Off Gas Recombiner - Insulated	-	289	4	14	203	-	-	105	616	616	-	-	2,350	-	-	-	-	95,441	4,785	-
4a.1.5.41	Post Accident Sampling	-	19	0	1	9	-	-	6	34	34	-	-	99	-	-	-	-	4,004	306	-
4a.1.5.42	Post Accident Sampling - Insulated	-	13	0	0	6	-	-	4	23	23	-	-	67	-	-	-	-	2,737	190	-
4a.1.5.43	RHR Service Water - Insulated - RCA	-	69	2	9	128	-	-	38	246	246	-	-	1,485	-	-	-	-	60,293	1,125	-
4a.1.5.44	RHR Service Water - RCA	-	3	0	0	3	-	-	1	8	8	-	-	35	-	-	-	-	1,410	57	-
4a.1.5.45	Reactor Feedwater Pump Seal	-	42	0	2	28	-	-	15	87	87	-	-	327	-	-	-	-	13,295	687	-
4a.1.5.46	Residual Heat Removal	-	187	52	99	1,091	418	-	335	2,181	2,181	-	-	12,609	1,519	-	-	-	609,174	3,282	-
4a.1.5.47	Residual Heat Removal - Insulated	-	415	37	51	440	377	-	275	1,595	1,595	-	-	5,084	1,374	-	-	-	294,206	7,027	-
4a.1.5.48	Rx Core Isolation Cooling	-	36	1	2	31	-	-	14	84	84	-	-	364	-	-	-	-	14,781	609	-
4a.1.5.49	Rx Core Isolation Cooling - Insulated	-	80	1	3	49	-	-	28	161	161	-	-	563	-	-	-	-	22,843	1,315	-
4a.1.5.50	Rx Recirculation	-	44	5	3	8	43	-	24	126	126	-	-	96	152	-	-	-	13,794	691	-
4a.1.5.51	Snubbers	-	126	1	3	43	-	-	39	212	212	-	-	502	-	-	-	-	20,395	2,272	-
4a.1.5.52	Standby Liquid Control - Insul - RCA	-	3	0	0	2	-	-	1	6	6	-	-	22	-	-	-	-	904	48	-
4a.1.5.53	Standby Liquid Control - RCA	-	22	0	1	21	-	-	9	54	54	-	-	245	-	-	-	-	9,969	341	-
4a.1.5.54	Stator Cooling - RCA	-	6	0	1	11	-	-	3	21	21	-	-	126	-	-	-	-	5,135	98	-
4a.1.5.55	Traversing Incore Probe	-	3	0	0	0	1	-	1	5	5	-	-	2	5	-	-	-	379	46	-
4a.1.5	Totals	-	6,203	280	899	12,150	839	-	3,744	24,114	24,094	-	20	140,459	3,050	-	-	-	5,899,167	104,297	-
4a.1.6	Scaffolding in support of decommissioning	-	1,778	23	8	99	25	-	469	2,402	2,402	-	-	1,030	91	-	-	-	52,111	19,968	-
4a.1	Subtotal Period 4a Activity Costs	163	24,648	13,329	3,299	17,316	29,592	551	31,164	120,062	120,042	-	20	184,963	30,945	1,127	643	1,547	10,506,530	215,555	2,150
Period 4a Additional Costs																					
4a.2.1	Remedial Action Surveys	-	-	-	-	-	-	2,161	648	2,809	2,809	-	-	-	-	-	-	-	-	28,247	-
4a.2	Subtotal Period 4a Additional Costs	-	-	-	-	-	-	2,161	648	2,809	2,809	-	-	-	-	-	-	-	-	28,247	-
Period 4a Collateral Costs																					
4a.3.1	Process decommissioning water waste	4	-	7	17	-	27	-	12	66	66	-	-	-	64	-	-	-	3,860	13	-
4a.3.3	Small tool allowance	-	240	-	-	-	-	-	36	276	248	-	28	-	-	-	-	-	-	-	-
4a.3	Subtotal Period 4a Collateral Costs	4	240	7	17	-	27	-	48	342	314	-	28	-	64	-	-	-	3,860	13	-
Period 4a Period-Dependent Costs																					
4a.4.1	Decon supplies	94	-	-	-	-	-	-	24	118	118	-	-	-	-	-	-	-	-	-	-
4a.4.2	Insurance	-	-	-	-	-	-	980	98	1,078	1,078	-	-	-	-	-	-	-	-	-	-
4a.4.3	Property taxes	-	-	-	-	-	-	2,674	267	2,942	2,942	-	-	-	-	-	-	-	-	-	-
4a.4.4	Health physics supplies	-	1,855	-	-	-	-	-	464	2,318	2,318	-	-	-	-	-	-	-	-	-	-
4a.4.5	Heavy equipment rental	-	2,984	-	-	-	-	-	448	3,431	3,431	-	-	-	-	-	-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	97	31	-	378	-	109	614	614	-	-	-	4,639	-	-	-	92,777	151	-
4a.4.7	Plant energy budget	-	-	-	-	-	-	2,233	335	2,568	2,568	-	-	-	-	-	-	-	-	-	-

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix H, Page 9 of 12

Table H
Monticello Nuclear Generating Plant
Scenario 6: SAFSTOR with 32 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 4a Period-Dependent Costs (continued)																					
4a.4.8	NRC Fees	-	-	-	-	-	-	757	76	833	833	-	-	-	-	-	-	-	-	-	-
4a.4.9	Emergency Planning Fees	-	-	-	-	-	-	186	19	204	-	204	-	-	-	-	-	-	-	-	-
4a.4.10	Fixed Overhead	-	-	-	-	-	-	3,150	473	3,623	3,623	-	-	-	-	-	-	-	-	-	-
4a.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	550	82	632	632	-	-	-	-	-	-	-	-	-	-
4a.4.12	ISFSI Operating Costs	-	-	-	-	-	-	140	21	161	-	161	-	-	-	-	-	-	-	-	-
4a.4.13	Railroad Track Maintenance	-	-	-	-	-	-	157	24	180	180	-	-	-	-	-	-	-	-	-	-
4a.4.14	DOC Staff Cost	-	-	-	-	-	-	16,810	2,522	19,332	19,332	-	-	-	-	-	-	-	-	-	195,030
4a.4.15	Utility Staff Cost	-	-	-	-	-	-	21,650	3,247	24,897	24,897	-	-	-	-	-	-	-	-	-	353,315
4a.4	Subtotal Period 4a Period-Dependent Costs	94	4,838	97	31	-	378	49,288	8,207	62,932	62,567	366	-	-	4,639	-	-	-	92,777	151	548,345
4a.0	TOTAL PERIOD 4a COST	262	29,726	13,432	3,346	17,316	29,997	51,999	40,067	186,146	185,732	366	48	184,963	35,648	1,127	643	1,547	10,603,160	243,966	550,495
PERIOD 4b - Site Decontamination																					
Period 4b Direct Decommissioning Activities																					
4b.1.1	Remove spent fuel racks	504	49	108	109	-	2,091	-	814	3,675	3,675	-	-	-	7,653	-	-	-	486,170	906	-
Disposal of Plant Systems																					
4b.1.2.1	ALARA/Radiological	-	14	0	0	4	-	-	4	22	22	-	-	49	-	-	-	-	1,987	247	-
4b.1.2.2	Alternate N2 - RCA	-	13	0	1	8	-	-	5	27	27	-	-	93	-	-	-	-	3,765	185	-
4b.1.2.3	Cranes/Heavy Loads/Rigging - RCA	-	3	0	1	9	-	-	2	15	15	-	-	103	-	-	-	-	4,184	48	-
4b.1.2.4	Decontamination Projects	-	1	0	0	0	-	-	0	1	1	-	-	3	-	-	-	-	125	15	-
4b.1.2.5	Electrical - Contaminated	-	328	4	15	217	-	-	117	682	682	-	-	2,514	-	-	-	-	102,112	5,633	-
4b.1.2.6	Electrical - Contaminated Fuel Pool	-	34	0	2	22	-	-	12	70	70	-	-	253	-	-	-	-	10,272	592	-
4b.1.2.7	Electrical - Decontam. Fuel Pool Area	-	242	4	15	213	-	-	95	568	568	-	-	2,457	-	-	-	-	99,783	4,090	-
4b.1.2.8	Electrical - Decontaminated	-	2,195	36	142	2,019	-	-	877	5,269	5,269	-	-	23,344	-	-	-	-	948,013	37,107	-
4b.1.2.9	Fire - RCA	-	84	1	4	53	-	-	30	171	171	-	-	614	-	-	-	-	24,917	1,324	-
4b.1.2.10	Fire - RCA - Fuel Pool Area	-	9	0	0	5	-	-	3	18	18	-	-	62	-	-	-	-	2,499	143	-
4b.1.2.11	Fuel Pool Cooling & Cleanup	-	319	19	23	177	196	-	161	895	895	-	-	2,051	712	-	-	-	128,918	5,363	-
4b.1.2.12	Fuel Pool Cooling & Cleanup - Insulated	-	31	2	2	11	20	-	15	80	80	-	-	130	71	-	-	-	9,830	514	-
4b.1.2.13	HVAC Ductwork	-	238	4	17	243	-	-	99	601	601	-	-	2,805	-	-	-	-	113,913	3,539	-
4b.1.2.14	HVAC Ductwork - Fuel Pool Area	-	26	0	2	27	-	-	11	67	67	-	-	312	-	-	-	-	12,657	393	-
4b.1.2.15	HVAC/Chilled Water - RCA	-	267	4	17	238	-	-	105	631	631	-	-	2,752	-	-	-	-	111,779	3,985	-
4b.1.2.16	HVAC/Chilled Water - RCA Fuel Pool Area	-	27	0	1	19	-	-	10	58	58	-	-	223	-	-	-	-	9,072	397	-
4b.1.2.17	Heating & Ventilation	-	359	10	39	548	-	-	179	1,134	1,134	-	-	6,334	-	-	-	-	257,243	6,340	-
4b.1.2.18	Heating Boiler - Insulated - RCA	-	2	0	0	2	-	-	1	6	6	-	-	26	-	-	-	-	1,058	35	-
4b.1.2.19	Instrument & Service Air-RCA-Fuel Pool	-	24	0	2	23	-	-	10	58	58	-	-	267	-	-	-	-	10,841	357	-
4b.1.2.20	Liquid Radwaste	-	515	28	39	364	253	-	255	1,453	1,453	-	-	4,203	915	-	-	-	229,422	8,550	-
4b.1.2.21	Makeup Demin - RCA	-	86	2	9	127	-	-	42	266	266	-	-	1,471	-	-	-	-	59,747	1,412	-
4b.1.2.22	Non-Essential Diesel Generator - RCA	-	23	2	9	123	-	-	26	183	183	-	-	1,424	-	-	-	-	57,832	395	-
4b.1.2.23	Off Gas Holdup	-	257	5	22	314	-	-	115	713	713	-	-	3,629	-	-	-	-	147,355	4,256	-
4b.1.2.24	Primary Containment	-	341	13	51	718	-	-	202	1,324	1,324	-	-	8,302	-	-	-	-	337,148	5,729	-
4b.1.2.25	Process Radiation Monitors	-	34	0	1	18	-	-	12	66	66	-	-	213	-	-	-	-	8,667	577	-
4b.1.2.26	Rx Bldg Closed ClnG Water - Insul - RCA	-	93	2	6	85	-	-	37	222	222	-	-	977	-	-	-	-	39,675	1,484	-
4b.1.2.27	Rx Bldg Closed ClnG Water - RCA	-	152	11	43	614	-	-	138	957	957	-	-	7,093	-	-	-	-	288,031	2,489	-
4b.1.2.28	Rx Component Handling Equip	-	105	11	16	150	113	-	81	477	477	-	-	1,737	415	-	-	-	96,901	1,839	-
4b.1.2.29	Rx Pressure Vessel	-	35	4	3	14	47	-	24	127	127	-	-	161	169	-	-	-	17,375	578	-
4b.1.2.30	Rx Water Cleanup	-	198	16	11	24	174	-	100	523	523	-	-	278	630	-	-	-	51,819	3,264	-
4b.1.2.31	Secondary Containment	-	93	2	8	119	-	-	42	264	264	-	-	1,372	-	-	-	-	55,702	1,569	-
4b.1.2.32	Service & Seal Water - Insulated - RCA	-	99	2	7	102	-	-	41	252	252	-	-	1,180	-	-	-	-	47,917	1,565	-
4b.1.2.33	Service & Seal Water - RCA	-	131	3	11	156	-	-	58	360	360	-	-	1,809	-	-	-	-	73,453	2,016	-
4b.1.2.34	Service Air Blower - RCA	-	13	0	1	18	-	-	6	38	38	-	-	206	-	-	-	-	8,364	206	-
4b.1.2.35	Solid Radwaste	-	369	20	30	293	181	-	188	1,081	1,081	-	-	3,390	659	-	-	-	179,772	6,270	-
4b.1.2.36	Structures & Buildings	-	58	1	3	41	-	-	21	124	124	-	-	477	-	-	-	-	19,351	1,005	-
4b.1.2.37	Wells & Domestic Water	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	144	-
4b.1.2.38	Wells & Domestic Water - RCA	-	43	1	2	30	-	-	16	91	91	-	-	342	-	-	-	-	13,874	633	-
4b.1.2	Totals	-	6,869	208	555	7,150	984	-	3,139	18,904	18,894	-	9	82,654	3,571	-	-	-	3,585,374	114,290	-
4b.1.3	Scaffolding in support of decommissioning	-	2,667	35	12	148	37	-	704	3,603	3,603	-	-	1,545	136	-	-	-	78,166	29,953	-
Decontamination of Site Buildings																					
4b.1.4.1	Reactor Building	3,881	2,049	138	314	4,159	765	-	3,329	14,634	14,634	-	-	48,077	4,434	-	-	-	2,195,768	98,722	-
4b.1.4.2	Admin	82	2	0	1	-	7	-	43	135	135	-	-	-	72	-	-	-	3,420	1,389	-
4b.1.4.3	HPCI Room	22	19	0	1	10	7	-	19	78	78	-	-	118	65	-	-	-	7,927	664	-
4b.1.4.4	Hot Shop	13	2	0	1	-	5	-	8	28	28	-	-	-	51	-	-	-	2,430	231	-
4b.1.4.5	LLRW Storage & Shipping	43	11	1	3	3	21	-	30	111	111	-	-	31	217	-	-	-	11,532	875	-
4b.1.4.6	Offgas Stack	280	127	4	12	116	44	-	202	786	786	-	-	1,343	361	-	-	-	72,483	6,692	-

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix H, Page 10 of 12

Table H
Monticello Nuclear Generating Plant
Scenario 6: SAFSTOR with 32 Year DFS Decommissioning Cost Estimate
(thousands of 2017 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site	LLRW	Other Costs	Total Contingency	Total Costs	NRC	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial/ Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
						Processing Costs	Disposal Costs				Lic. Term. Costs				Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Decontamination of Site Buildings (continued)																					
4b.1.4.7	Offgas Storage & Compressor	30	7	0	2	2	15	-	21	79	79	-	-	25	159	-	-	-	8,502	603	-
4b.1.4.8	Radwaste	91	30	2	7	15	44	-	67	255	255	-	-	172	460	-	-	-	28,679	1,960	-
4b.1.4.9	Radwaste Material Storage Warehouse	48	9	1	3	-	23	-	32	116	116	-	-	-	248	-	-	-	11,700	915	-
4b.1.4.10	Recombiner	20	15	1	3	17	12	-	20	87	87	-	-	199	112	-	-	-	13,491	554	-
4b.1.4.11	Turbine	528	172	9	42	111	260	-	396	1,517	1,517	-	-	1,283	2,675	-	-	-	179,172	11,286	-
4b.1.4.12	Turbine Building Addition	44	8	1	3	-	20	-	29	105	105	-	-	-	217	-	-	-	10,248	838	-
4b.1.4.13	Reactor (Post Fuel)	703	1,924	129	656	170	4,681	-	2,140	10,403	10,403	-	-	1,969	49,647	-	-	-	2,426,544	39,766	-
4b.1.4	Totals	5,783	4,375	286	1,047	4,603	5,903	-	6,337	28,334	28,334	-	-	53,216	58,718	-	-	-	4,971,896	164,495	
4b.1.5	Prepare/submit License Termination Plan	-	-	-	-	-	-	481	72	553	553	-	-	-	-	-	-	-	-	-	4,096
4b.1.6	Receive NRC approval of termination plan									a											
4b.1	Subtotal Period 4b Activity Costs	6,287	13,960	637	1,723	11,901	9,015	481	11,066	55,069	55,060	-	9	137,414	70,078	-	-	-	9,121,606	309,644	4,096
Period 4b Additional Costs																					
4b.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,291	387	1,678	1,678	-	-	-	-	-	-	-	-	-	12,480
4b.2.2	Remedial Action Surveys	-	-	-	-	-	-	3,241	972	4,213	4,213	-	-	-	-	-	-	-	-	42,370	
4b.2.3	Operational Equipment	-	-	19	60	624	-	-	104	807	807	-	-	11,710	-	-	-	-	292,750	32	-
4b.2	Subtotal Period 4b Additional Costs			19	60	624	-	4,532	1,464	6,698	6,698	-	-	11,710	-	-	-	-	292,750	42,402	12,480
Period 4b Collateral Costs																					
4b.3.1	Process decommissioning water waste	12	-	21	53	-	84	-	37	207	207	-	-	-	201	-	-	-	12,055	39	-
4b.3.3	Small tool allowance	-	314	-	-	-	-	-	47	361	361	-	-	-	-	-	-	-	-	-	-
4b.3.4	Decommissioning Equipment Disposition	-	-	137	55	575	145	-	144	1,055	1,055	-	-	6,000	529	-	-	-	303,608	147	-
4b.3	Subtotal Period 4b Collateral Costs	12	314	157	108	575	229	-	228	1,622	1,622	-	-	6,000	730	-	-	-	315,663	186	-
Period 4b Period-Dependent Costs																					
4b.4.1	Decon supplies	1,388	-	-	-	-	-	-	347	1,735	1,735	-	-	-	-	-	-	-	-	-	-
4b.4.2	Insurance	-	-	-	-	-	-	1,470	147	1,617	1,617	-	-	-	-	-	-	-	-	-	-
4b.4.3	Property taxes	-	-	-	-	-	-	3,786	379	4,165	4,165	-	-	-	-	-	-	-	-	-	-
4b.4.4	Health physics supplies	-	2,702	-	-	-	-	-	676	3,378	3,378	-	-	-	-	-	-	-	-	-	-
4b.4.5	Heavy equipment rental	-	4,602	-	-	-	-	-	690	5,292	5,292	-	-	-	-	-	-	-	-	-	-
4b.4.6	Disposal of DAW generated	-	-	121	39	-	472	-	136	767	767	-	-	-	5,798	-	-	-	115,951	189	-
4b.4.7	Plant energy budget	-	-	-	-	-	-	2,645	397	3,041	3,041	-	-	-	-	-	-	-	-	-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	1,136	114	1,250	1,250	-	-	-	-	-	-	-	-	-	-
4b.4.9	Emergency Planning Fees	-	-	-	-	-	-	279	28	307	-	307	-	-	-	-	-	-	-	-	-
4b.4.10	Fixed Overhead	-	-	-	-	-	-	4,725	709	5,434	5,434	-	-	-	-	-	-	-	-	-	-
4b.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	825	124	949	949	-	-	-	-	-	-	-	-	-	-
4b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	210	32	242	-	242	-	-	-	-	-	-	-	-	-
4b.4.13	Railroad Track Maintenance	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	-
4b.4.14	DOC Staff Cost	-	-	-	-	-	-	24,690	3,704	28,394	28,394	-	-	-	-	-	-	-	-	-	284,065
4b.4.15	Utility Staff Cost	-	-	-	-	-	-	30,782	4,617	35,399	35,399	-	-	-	-	-	-	-	-	-	500,294
4b.4	Subtotal Period 4b Period-Dependent Costs	1,388	7,304	121	39	-	472	70,783	12,133	92,240	91,691	549	-	-	5,798	-	-	-	115,951	189	784,360
4b.0	TOTAL PERIOD 4b COST	7,687	21,578	934	1,929	13,100	9,715	75,796	24,891	155,630	155,072	549	9	155,124	76,605	-	-	-	9,845,969	352,420	800,936
PERIOD 4f - License Termination																					
Period 4f Direct Decommissioning Activities																					
4f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	159	48	207	207	-	-	-	-	-	-	-	-	-	-
4f.1.2	Terminate license	-	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-
4f.1	Subtotal Period 4f Activity Costs	-	-	-	-	-	-	159	48	207	207	-	-	-	-	-	-	-	-	-	-
Period 4f Additional Costs																					
4f.2.1	License Termination Survey	-	-	-	-	-	-	7,341	2,202	9,544	9,544	-	-	-	-	-	-	-	-	96,197	6,240
4f.2.2	License Termination ISFSI	-	131	3	784	-	8,058	2,875	2,963	14,815	14,815	-	-	-	27,284	-	-	-	3,860,412	11,022	10,640
4f.2	Subtotal Period 4f Additional Costs	-	131	3	784	-	8,058	10,217	5,165	24,358	24,358	-	-	-	27,284	-	-	-	3,860,412	107,218	16,880
Period 4f Collateral Costs																					
4f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,189	178	1,367	1,367	-	-	-	-	-	-	-	-	-	-
4f.3.2	Small tool allowance	-	1	-	-	-	-	-	0	1	1	-	-	-	-	-	-	-	-	-	-
4f.3	Subtotal Period 4f Collateral Costs	-	1	-	-	-	-	1,189	178	1,368	1,368	-	-	-	-	-	-	-	-	-	-
Period 4f Period-Dependent Costs																					
4f.4.1	Insurance	-	-	-	-	-	-	543	54	598	598	-	-	-	-	-	-	-	-	-	-
4f.4.2	Property taxes	-	-	-	-	-	-	1,265	127	1,392	1,392	-	-	-	-	-	-	-	-	-	-
4f.4.3	Health physics supplies	-	648	-	-	-	-	-	162	809	809	-	-	-	-	-	-	-	-	-	-

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table H
Monticello Nuclear Generating Plant
Scenario 6: SAFSTOR with 32 Year DFS Decommissioning Cost Estimate
(thousands of 2017 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site	LLRW	Other Costs	Total Contingency	Total Costs	NRC	Spent Fuel	Site	Processed	Burial Volumes				Burial/ Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
						Processing Costs	Disposal Costs				Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 4f Period-Dependent Costs (continued)																					
4f.4.4	Disposal of DAW generated	-	-	7	2	-	29	-	8	46	46	-	-	-	351	-	-	-	7,025	11	-
4f.4.5	Plant energy budget	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	-
4f.4.6	NRC Fees	-	-	-	-	-	-	420	42	463	463	-	-	-	-	-	-	-	-	-	-
4f.4.7	Emergency Planning Fees	-	-	-	-	-	-	103	10	113	-	113	-	-	-	-	-	-	-	-	-
4f.4.8	Fixed Overhead	-	-	-	-	-	-	1,747	262	2,009	2,009	-	-	-	-	-	-	-	-	-	-
4f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	78	12	89	-	89	-	-	-	-	-	-	-	-	-
4f.4.10	Railroad Track Maintenance	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	-
4f.4.11	DOC Staff Cost	-	-	-	-	-	-	5,174	776	5,950	5,950	-	-	-	-	-	-	-	-	-	57,200
4f.4.12	Utility Staff Cost	-	-	-	-	-	-	5,003	750	5,754	5,754	-	-	-	-	-	-	-	-	-	74,438
4f.4	Subtotal Period 4f Period-Dependent Costs	-	648	7	2	-	29	14,681	2,256	17,623	17,420	203	-	-	351	-	-	-	7,025	11	131,638
4f.0	TOTAL PERIOD 4f COST	-	779	11	787	-	8,087	26,246	7,647	43,556	43,354	203	-	-	27,635	-	-	-	3,867,437	107,230	148,518
PERIOD 4 TOTALS		7,949	52,083	14,377	6,063	30,416	47,799	154,041	72,605	385,332	384,157	1,117	57	340,088	139,889	1,127	643	1,547	24,316,570	703,616	1,499,949
PERIOD 5b - Site Restoration																					
Period 5b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
5b.1.1.1	Reactor Building	-	3,541	-	-	-	-	-	531	4,073	-	-	4,073	-	-	-	-	-	-	36,752	-
5b.1.1.2	Condensate Tanks Foundation	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	219	-
5b.1.1.3	Discharge Retention Basin	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	110	-
5b.1.1.4	HPCI Room	-	44	-	-	-	-	-	7	50	-	-	50	-	-	-	-	-	-	401	-
5b.1.1.5	Hot Shop	-	21	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	298	-
5b.1.1.6	Hydrogen & Oxygen Storage	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	21	-
5b.1.1.7	LLRW Storage & Shipping	-	140	-	-	-	-	-	21	161	-	-	161	-	-	-	-	-	-	1,794	-
5b.1.1.8	MSIV	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	59	-
5b.1.1.9	Misc Structures 2017	-	1,075	-	-	-	-	-	161	1,236	-	-	1,236	-	-	-	-	-	-	13,787	-
5b.1.1.10	Offgas Stack	-	232	-	-	-	-	-	35	267	-	-	267	-	-	-	-	-	-	2,668	-
5b.1.1.11	Offgas Storage & Compressor	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	963	-
5b.1.1.12	Radwaste	-	482	-	-	-	-	-	72	554	-	-	554	-	-	-	-	-	-	5,196	-
5b.1.1.13	Recombiner	-	258	-	-	-	-	-	39	297	-	-	297	-	-	-	-	-	-	2,490	-
5b.1.1.14	Security Barrier	-	362	-	-	-	-	-	54	416	-	-	416	-	-	-	-	-	-	4,083	-
5b.1.1.15	Structures Greater than 3' Below Grade	-	4,946	-	-	-	-	-	742	5,688	-	-	5,688	-	-	-	-	-	-	46,737	-
5b.1.1.16	Tank Farm	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	121	-
5b.1.1.17	Turbine	-	1,514	-	-	-	-	-	227	1,741	-	-	1,741	-	-	-	-	-	-	18,764	-
5b.1.1.18	Turbine Building Addition	-	67	-	-	-	-	-	10	77	-	-	77	-	-	-	-	-	-	971	-
5b.1.1.19	Turbine Pedestal	-	415	-	-	-	-	-	62	478	-	-	478	-	-	-	-	-	-	3,762	-
5b.1.1	Totals	-	13,228	-	-	-	-	-	1,984	15,212	-	-	15,212	-	-	-	-	-	-	139,199	-
Site Closeout Activities																					
5b.1.2	Grade & landscape site	-	864	-	-	-	-	-	130	994	-	-	994	-	-	-	-	-	-	1,841	-
5b.1.3	Final report to NRC	-	-	-	-	-	-	183	27	211	211	-	-	-	-	-	-	-	-	-	1,560
5b.1	Subtotal Period 5b Activity Costs	-	14,092	-	-	-	-	183	2,141	16,417	211	-	16,206	-	-	-	-	-	-	141,040	1,560
Period 5b Additional Costs																					
5b.2.1	Clean Concrete Disposal	-	3,297	-	-	-	-	11	496	3,805	-	-	3,805	-	-	-	-	-	-	12	-
5b.2.2	Cofferdam	-	320	-	-	-	-	-	48	368	368	-	-	-	-	-	-	-	-	2,584	-
5b.2.3	Excavation of Underground Services	-	1,380	-	-	-	-	947	349	2,677	-	-	2,677	-	-	-	-	-	-	13,475	-
5b.2.4	Constrution Debris	-	-	-	-	-	-	350	53	403	-	-	403	-	-	-	-	-	-	-	-
5b.2.5	Backfill	-	5,102	-	-	-	-	-	765	5,868	-	-	5,868	-	-	-	-	-	-	5,422	-
5b.2.6	Demolition and Site Restoration ISFSI	-	1,733	-	-	-	-	185	288	2,205	-	-	2,205	-	-	-	-	-	-	8,390	160
5b.2	Subtotal Period 5b Additional Costs	-	11,833	-	-	-	-	1,493	1,999	15,325	368	-	14,957	-	-	-	-	-	-	29,883	160
Period 5b Collateral Costs																					
5b.3.1	Small tool allowance	-	192	-	-	-	-	-	29	221	-	-	221	-	-	-	-	-	-	-	-
5b.3	Subtotal Period 5b Collateral Costs	-	192	-	-	-	-	-	29	221	-	-	221	-	-	-	-	-	-	-	-

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix H, Page 12 of 12

Table H
Monticello Nuclear Generating Plant
Scenario 6: SAFSTOR with 32 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 5b Period-Dependent Costs																					
5b.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5b.4.2	Property taxes	-	-	-	-	-	-	2,419	242	2,661	-	-	2,661	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	5,455	-	-	-	-	-	818	6,273	-	-	6,273	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	300	45	345	-	-	345	-	-	-	-	-	-	-	-
5b.4.5	Fixed Overhead	-	-	-	-	-	-	1,260	189	1,450	-	-	1,450	-	-	-	-	-	-	-	-
5b.4.6	Railroad Track Maintenance	-	-	-	-	-	-	200	30	230	-	-	230	-	-	-	-	-	-	-	-
5b.4.7	Security Staff Cost	-	-	-	-	-	-	2,739	411	3,150	-	-	3,150	-	-	-	-	-	-	-	43,287
Period 5b Period-Dependent Costs (continued)																					
5b.4.8	DOC Staff Cost	-	-	-	-	-	-	11,290	1,693	12,983	-	-	12,983	-	-	-	-	-	-	-	122,646
5b.4.9	Utility Staff Cost	-	-	-	-	-	-	4,718	708	5,426	-	-	5,426	-	-	-	-	-	-	-	70,341
5b.4	Subtotal Period 5b Period-Dependent Costs	-	5,455	-	-	-	-	22,927	4,136	32,517	-	-	32,517	-	-	-	-	-	-	-	236,274
5b.0	TOTAL PERIOD 5b COST	-	31,572	-	-	-	-	24,603	8,305	64,481	578	-	63,902	-	-	-	-	-	-	170,923	237,994
PERIOD 5 TOTALS		-	31,572	-	-	-	-	24,603	8,305	64,481	578	-	63,902	-	-	-	-	-	-	170,923	237,994
TOTAL COST TO DECOMMISSION		17,731	94,769	14,816	6,755	30,429	49,448	1,050,409	210,270	1,474,626	1,045,043	364,666	64,917	340,130	150,427	1,127	643	1,547	24,626,380	1,024,783	7,779,103

TOTAL COST TO DECOMMISSION WITH 16.63% CONTINGENCY:	\$1,474,626	thousands of 2017 dollars
TOTAL NRC LICENSE TERMINATION COST IS 70.87% OR:	\$1,045,043	thousands of 2017 dollars
SPENT FUEL MANAGEMENT COST IS 24.73% OR:	\$364,666	thousands of 2017 dollars
NON-NUCLEAR DEMOLITION COST IS 4.4% OR:	\$64,917	thousands of 2017 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	152,197	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,547	cubic feet
TOTAL SCRAP METAL REMOVED:	22,696	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,024,783	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

***Monticello Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-002, Rev. 0
Appendix I, Page 1 of 12***

APPENDIX I

DETAILED COST ANALYSIS

SCENARIO 7: SAFSTOR with 60 Year DFS

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix I, Page 2 of 12

Table I
Monticello Nuclear Generating Plant
Scenario 7: SAFSTOR with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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	SAFSTOR site characterization survey	-	-	-	-	-	-	380	114	494	494	-	-	-	-	-	-	-	-	-	-
1a.1.2	Prepare preliminary decommissioning cost	-	-	-	-	-	-	153	23	175	175	-	-	-	-	-	-	-	-	-	1,300
1a.1.3	Notification of Cessation of Operations									a											
1a.1.4	Remove fuel & source material									n/a											
1a.1.5	Notification of Permanent Defueling									a											
1a.1.6	Deactivate plant systems & process waste									a											
1a.1.7	Prepare and submit PSDAR	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1a.1.8	Review plant dwgs & specs.	-	-	-	-	-	-	153	23	175	175	-	-	-	-	-	-	-	-	-	1,300
1a.1.9	Perform detailed rad survey									a											
1a.1.10	Estimate by-product inventory	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	End product description	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.12	Detailed by-product inventory	-	-	-	-	-	-	176	26	202	202	-	-	-	-	-	-	-	-	-	1,500
1a.1.13	Define major work sequence	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
1a.1.14	Perform SER and EA	-	-	-	-	-	-	364	55	418	418	-	-	-	-	-	-	-	-	-	3,100
1a.1.15	Prepare/submit Defueled Technical Specifications	-	-	-	-	-	-	880	132	1,012	1,012	-	-	-	-	-	-	-	-	-	7,500
1a.1.16	Perform Site-Specific Cost Study	-	-	-	-	-	-	587	88	675	675	-	-	-	-	-	-	-	-	-	5,000
1a.1.17	Prepare/submit Irradiated Fuel Management Plan	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	1,000
Activity Specifications																					
1a.1.18.1	Prepare plant and facilities for SAFSTOR	-	-	-	-	-	-	578	87	664	664	-	-	-	-	-	-	-	-	-	4,920
1a.1.18.2	Plant systems	-	-	-	-	-	-	489	73	562	562	-	-	-	-	-	-	-	-	-	4,167
1a.1.18.3	Plant structures and buildings	-	-	-	-	-	-	366	55	421	421	-	-	-	-	-	-	-	-	-	3,120
1a.1.18.4	Waste management	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1a.1.18.5	Facility and site dormancy	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	2,000
1a.1.18	Total	-	-	-	-	-	-	1,902	285	2,188	2,188	-	-	-	-	-	-	-	-	-	16,207
Detailed Work Procedures																					
1a.1.19.1	Plant systems	-	-	-	-	-	-	139	21	160	160	-	-	-	-	-	-	-	-	-	1,183
1a.1.19.2	Facility closeout & dormancy	-	-	-	-	-	-	141	21	162	162	-	-	-	-	-	-	-	-	-	1,200
1a.1.19	Total	-	-	-	-	-	-	280	42	322	322	-	-	-	-	-	-	-	-	-	2,383
1a.1.20	Procure vacuum drying system	-	-	-	-	-	-	12	2	13	13	-	-	-	-	-	-	-	-	-	100
1a.1.21	Drain/de-energize non-cont. systems									a											
1a.1.22	Drain & dry NSSS									a											
1a.1.23	Drain/de-energize contaminated systems									a											
1a.1.24	Decon/secure contaminated systems									a											
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	5,590	896	6,486	6,486	-	-	-	-	-	-	-	-	-	44,390
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	1,221	183	1,404	-	1,404	-	-	-	-	-	-	-	-	-
1a.3.2	Retention and Severance	-	-	-	-	-	-	9,892	1,484	11,376	11,376	-	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	11,113	1,667	12,779	11,376	1,404	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	2,408	241	2,649	2,649	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	2,242	224	2,466	2,466	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	515	-	-	-	-	-	129	644	644	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	567	-	-	-	-	-	85	652	652	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	4	-	50	-	14	81	81	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	1,730	259	1,989	1,989	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,110	111	1,221	1,221	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	3,166	317	3,482	-	3,482	-	-	-	-	-	-	-	-	-
1a.4.9	Fixed Overhead	-	-	-	-	-	-	2,833	425	3,258	3,258	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	803	120	923	-	923	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	103	15	119	-	119	-	-	-	-	-	-	-	-	-
1a.4.12	Railroad Track Maintenance	-	-	-	-	-	-	115	17	133	133	-	-	-	-	-	-	-	-	-	-
1a.4.13	Security Staff Cost	-	-	-	-	-	-	14,260	2,139	16,399	16,399	-	-	-	-	-	-	-	-	-	245,440
1a.4.14	Utility Staff Cost	-	-	-	-	-	-	25,791	3,869	29,660	29,660	-	-	-	-	-	-	-	-	-	422,240
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,083	13	4	-	50	54,561	7,966	63,676	59,152	4,524	-	-	610	-	-	-	12,190	20	667,680
1a.0	TOTAL PERIOD 1a COST	-	1,083	13	4	-	50	71,264	10,528	82,941	77,014	5,927	-	-	610	-	-	-	12,190	20	712,070

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table I
Monticello Nuclear Generating Plant
Scenario 7: SAFSTOR with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 - SAFSTOR Limited DECON Activities																					
Period 1b Direct Decommissioning Activities																					
Decontamination of Site Buildings																					
1b.1.1.1	Reactor Building	4,303	-	-	-	-	-	-	2,152	6,455	6,455	-	-	-	-	-	-	-	-	70,157	-
1b.1.1.2	Admin	81	-	-	-	-	-	-	41	122	122	-	-	-	-	-	-	-	-	1,357	-
1b.1.1.3	HPCI Room	21	-	-	-	-	-	-	11	32	32	-	-	-	-	-	-	-	-	350	-
1b.1.1.4	Hot Shop	12	-	-	-	-	-	-	6	19	19	-	-	-	-	-	-	-	-	208	-
1b.1.1.5	LLRW Storage & Shipping	42	-	-	-	-	-	-	21	63	63	-	-	-	-	-	-	-	-	705	-
1b.1.1.6	Offgas Stack	276	-	-	-	-	-	-	138	414	414	-	-	-	-	-	-	-	-	4,575	-
1b.1.1.7	Offgas Storage & Compressor	29	-	-	-	-	-	-	15	44	44	-	-	-	-	-	-	-	-	488	-
1b.1.1.8	Radwaste	88	-	-	-	-	-	-	44	132	132	-	-	-	-	-	-	-	-	1,473	-
1b.1.1.9	Radwaste Material Storage Warehouse	46	-	-	-	-	-	-	23	69	69	-	-	-	-	-	-	-	-	768	-
1b.1.1.10	Recombiner	19	-	-	-	-	-	-	10	29	29	-	-	-	-	-	-	-	-	323	-
1b.1.1.11	Turbine	512	-	-	-	-	-	-	256	768	768	-	-	-	-	-	-	-	-	8,583	-
1b.1.1.12	Turbine Building Addition	42	-	-	-	-	-	-	21	63	63	-	-	-	-	-	-	-	-	709	-
1b.1.1.13	Reactor (Post Fuel)	695	-	-	-	-	-	-	347	1,042	1,042	-	-	-	-	-	-	-	-	11,337	-
1b.1.1	Totals	6,167	-	-	-	-	-	-	3,084	9,251	9,251	-	-	-	-	-	-	-	-	101,033	-
1b.1	Subtotal Period 1b Activity Costs	6,167	-	-	-	-	-	-	3,084	9,251	9,251	-	-	-	-	-	-	-	-	101,033	-
Period 1b Additional Costs																					
1b.2.1	Spent fuel pool isolation	-	-	-	-	-	-	11,691	1,754	13,445	13,445	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	11,691	1,754	13,445	13,445	-	-	-	-	-	-	-	-	-	-
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	973	-	-	-	-	-	-	146	1,119	1,119	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process decommissioning water waste	214	-	138	356	-	566	-	316	1,589	1,589	-	-	-	1,350	-	-	-	81,018	263	-
1b.3.4	Small tool allowance	-	105	-	-	-	-	-	16	121	121	-	-	-	-	-	-	-	-	-	-
1b.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	183	27	210	-	210	-	-	-	-	-	-	-	-	-
1b.3.6	Retention and Severance	-	-	-	-	-	-	3,640	546	4,186	4,186	-	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	1,187	105	138	356	-	566	3,823	1,051	7,226	7,016	210	-	-	1,350	-	-	-	81,018	263	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	1,264	-	-	-	-	-	-	316	1,580	1,580	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	607	61	668	668	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	565	57	622	622	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	614	-	-	-	-	-	153	767	767	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	143	-	-	-	-	-	21	164	164	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	12	4	-	45	-	13	74	74	-	-	-	556	-	-	-	11,126	18	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	436	65	501	501	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	161	16	178	178	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	798	80	878	-	878	-	-	-	-	-	-	-	-	-
1b.4.10	Fixed Overhead	-	-	-	-	-	-	714	107	821	821	-	-	-	-	-	-	-	-	-	-
1b.4.11	Spent Fuel Pool O&M	-	-	-	-	-	-	202	30	233	-	233	-	-	-	-	-	-	-	-	-
1b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	26	4	30	-	30	-	-	-	-	-	-	-	-	-
1b.4.13	Railroad Track Maintenance	-	-	-	-	-	-	29	4	33	33	-	-	-	-	-	-	-	-	-	-
1b.4.14	Security Staff Cost	-	-	-	-	-	-	3,594	539	4,134	4,134	-	-	-	-	-	-	-	-	-	61,864
1b.4.15	Utility Staff Cost	-	-	-	-	-	-	6,501	975	7,476	7,476	-	-	-	-	-	-	-	-	-	106,428
1b.4	Subtotal Period 1b Period-Dependent Costs	1,264	757	12	4	-	45	13,634	2,442	18,157	17,017	1,140	-	-	556	-	-	-	11,126	18	168,292
1b.0	TOTAL PERIOD 1b COST	8,618	862	150	360	-	611	29,148	8,330	48,079	46,729	1,350	-	-	1,907	-	-	-	92,144	101,314	168,292
PERIOD 1c - Preparations for SAFSTOR Dormancy																					
Period 1c Direct Decommissioning Activities																					
1c.1.1	Prepare support equipment for storage	-	470	-	-	-	-	-	71	541	541	-	-	-	-	-	-	-	-	3,000	-
1c.1.2	Install containment pressure equal. lines	-	44	-	-	-	-	-	7	51	51	-	-	-	-	-	-	-	-	700	-
1c.1.3	Interim survey prior to dormancy	-	-	-	-	-	-	733	220	953	953	-	-	-	-	-	-	-	-	14,124	-
1c.1.4	Secure building accesses	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-	-
1c.1.5	Prepare & submit interim report	-	-	-	-	-	-	68	10	79	79	-	-	-	-	-	-	-	-	-	583
1c.1	Subtotal Period 1c Activity Costs	-	514	-	-	-	-	801	307	1,623	1,623	-	-	-	-	-	-	-	-	17,824	583

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix I, Page 4 of 12

Table I
Monticello Nuclear Generating Plant
Scenario 7: SAFSTOR with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 1c Collateral Costs																					
1c.3.1	Process decommissioning water waste	157	-	102	262	-	416	-	232	1,170	1,170	-	-	-	994	-	-	-	59,665	194	-
1c.3.3	Small tool allowance	-	4	-	-	-	-	-	1	5	5	-	-	-	-	-	-	-	-	-	-
1c.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	180	27	207	-	207	-	-	-	-	-	-	-	-	-
1c.3.5	Retention and Severance	-	-	-	-	-	-	2,722	408	3,130	3,130	-	-	-	-	-	-	-	-	-	-
1c.3	Subtotal Period 1c Collateral Costs	157	4	102	262	-	416	2,902	668	4,512	4,304	207	-	-	994	-	-	-	59,665	194	-
Period 1c Period-Dependent Costs																					
1c.4.1	Insurance	-	-	-	-	-	-	600	60	660	660	-	-	-	-	-	-	-	-	-	-
1c.4.2	Property taxes	-	-	-	-	-	-	558	56	614	614	-	-	-	-	-	-	-	-	-	-
1c.4.3	Health physics supplies	-	215	-	-	-	-	-	54	268	268	-	-	-	-	-	-	-	-	-	-
1c.4.4	Heavy equipment rental	-	141	-	-	-	-	-	21	163	163	-	-	-	-	-	-	-	-	-	-
1c.4.5	Disposal of DAW generated	-	-	3	1	-	12	-	4	20	20	-	-	-	152	-	-	-	3,039	5	-
1c.4.6	Plant energy budget	-	-	-	-	-	-	431	65	496	496	-	-	-	-	-	-	-	-	-	-
1c.4.7	NRC Fees	-	-	-	-	-	-	160	16	176	176	-	-	-	-	-	-	-	-	-	-
1c.4.8	Emergency Planning Fees	-	-	-	-	-	-	789	79	868	-	868	-	-	-	-	-	-	-	-	-
1c.4.9	Fixed Overhead	-	-	-	-	-	-	706	106	812	812	-	-	-	-	-	-	-	-	-	-
1c.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	200	30	230	-	230	-	-	-	-	-	-	-	-	-
1c.4.11	ISFSI Operating Costs	-	-	-	-	-	-	26	4	30	-	30	-	-	-	-	-	-	-	-	-
1c.4.12	Railroad Track Maintenance	-	-	-	-	-	-	29	4	33	33	-	-	-	-	-	-	-	-	-	-
1c.4.13	Security Staff Cost	-	-	-	-	-	-	3,555	533	4,089	4,089	-	-	-	-	-	-	-	-	-	61,192
1c.4.14	Utility Staff Cost	-	-	-	-	-	-	6,430	965	7,395	7,395	-	-	-	-	-	-	-	-	-	105,271
1c.4	Subtotal Period 1c Period-Dependent Costs	-	356	3	1	-	12	13,485	1,996	15,853	14,725	1,128	-	-	152	-	-	-	3,039	5	166,463
1c.0	TOTAL PERIOD 1c COST	157	874	105	263	-	429	17,188	2,971	21,987	20,652	1,335	-	-	1,146	-	-	-	62,705	18,023	167,046
PERIOD 1 TOTALS		8,775	2,819	268	627	-	1,089	117,600	21,830	153,007	144,395	8,613	-	-	3,662	-	-	-	167,039	119,357	1,047,408
PERIOD 2a - SAFSTOR Dormancy with Wet Spent Fuel Storage																					
Period 2a Direct Decommissioning Activities																					
2a.1.1	Quarterly Inspection									a											
2a.1.2	Semi-annual environmental survey									a											
2a.1.3	Prepare reports									a											
2a.1.4	Bituminous roof replacement	-	-	-	-	-	-	216	32	248	248	-	-	-	-	-	-	-	-	-	-
2a.1.5	Maintenance supplies	-	-	-	-	-	-	480	120	599	599	-	-	-	-	-	-	-	-	-	-
2a.1	Subtotal Period 2a Activity Costs	-	-	-	-	-	-	695	152	848	848	-	-	-	-	-	-	-	-	-	-
Period 2a Additional Costs																					
2a.2.1	Security Modifications	-	-	-	-	-	-	8,696	1,304	10,000	10,000	-	-	-	-	-	-	-	-	-	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	8,696	1,304	10,000	10,000	-	-	-	-	-	-	-	-	-	-
Period 2a Collateral Costs																					
2a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	79,478	11,922	91,399	-	91,399	-	-	-	-	-	-	-	-	-
2a.3.2	Retention and Severance	-	-	-	-	-	-	21,900	3,285	25,185	25,185	-	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	101,378	15,207	116,584	25,185	91,399	-	-	-	-	-	-	-	-	-
Period 2a Period-Dependent Costs																					
2a.4.1	Insurance	-	-	-	-	-	-	2,526	253	2,778	2,778	-	-	-	-	-	-	-	-	-	-
2a.4.2	Property taxes	-	-	-	-	-	-	7,844	784	8,628	8,628	-	-	-	-	-	-	-	-	-	-
2a.4.3	Health physics supplies	-	724	-	-	-	-	-	181	905	905	-	-	-	-	-	-	-	-	-	-
2a.4.4	Disposal of DAW generated	-	-	17	5	-	66	-	19	107	107	-	-	-	806	-	-	-	16,112	26	-
2a.4.5	Plant energy budget	-	-	-	-	-	-	1,211	182	1,393	1,393	-	-	-	-	-	-	-	-	-	-
2a.4.6	NRC Fees	-	-	-	-	-	-	898	90	988	988	-	-	-	-	-	-	-	-	-	-
2a.4.7	Emergency Planning Fees	-	-	-	-	-	-	8,991	899	9,891	-	9,891	-	-	-	-	-	-	-	-	-
2a.4.8	Fixed Overhead	-	-	-	-	-	-	9,919	1,488	11,407	11,407	-	-	-	-	-	-	-	-	-	-
2a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	2,810	422	3,232	-	3,232	-	-	-	-	-	-	-	-	-
2a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	361	54	416	-	416	-	-	-	-	-	-	-	-	-
2a.4.11	Railroad Track Maintenance	-	-	-	-	-	-	701	105	806	806	-	-	-	-	-	-	-	-	-	-
2a.4.12	Security Staff Cost	-	-	-	-	-	-	46,105	6,916	53,021	37,327	15,694	-	-	-	-	-	-	-	-	786,548
2a.4.13	Utility Staff Cost	-	-	-	-	-	-	17,653	2,648	20,301	16,322	3,979	-	-	-	-	-	-	-	-	287,673
2a.4	Subtotal Period 2a Period-Dependent Costs	-	724	17	5	-	66	99,020	14,040	113,872	80,661	33,211	-	-	806	-	-	-	16,112	26	1,074,220
2a.0	TOTAL PERIOD 2a COST	-	724	17	5	-	66	209,789	30,703	241,304	116,694	124,610	-	-	806	-	-	-	16,112	26	1,074,220

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix I, Page 6 of 12

Table I
Monticello Nuclear Generating Plant
Scenario 7: SAFSTOR with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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			
3a.1	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	14,223	2,133	16,357	15,821	-	535	-	-	-	-	-	-	-	73,463
Period 3a Additional Costs																					
3a.2.1	Site Characterization	-	-	-	-	-	-	6,446	1,934	8,380	8,380	-	-	-	-	-	-	-	30,500	10,852	
3a.2.2	Mixed & RCRA Waste	-	-	29	19	13	-	-	8	69	69	-	-	43	-	-	-	-	5,253	163	
3a.2	Subtotal Period 3a Additional Costs	-	-	29	19	13	-	6,446	1,942	8,449	8,449	-	-	43	-	-	-	-	5,253	30,663	10,852
Period 3a Collateral Costs																					
3a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	1,664	250	1,914	-	1,914	-	-	-	-	-	-	-	-	
3a.3	Subtotal Period 3a Collateral Costs	-	-	-	-	-	-	1,664	250	1,914	-	1,914	-	-	-	-	-	-	-	-	
Period 3a Period-Dependent Costs																					
3a.4.1	Insurance	-	-	-	-	-	-	708	71	779	779	-	-	-	-	-	-	-	-	-	
3a.4.2	Property taxes	-	-	-	-	-	-	2,232	223	2,455	2,455	-	-	-	-	-	-	-	-	-	
3a.4.3	Health physics supplies	-	-	-	-	-	-	-	113	565	565	-	-	-	-	-	-	-	-	-	
3a.4.4	Heavy equipment rental	-	452	-	-	-	-	-	85	652	652	-	-	-	-	-	-	-	-	-	
3a.4.5	Disposal of DAW generated	-	-	11	3	-	42	-	12	68	68	-	-	-	516	-	-	-	10,311	17	
3a.4.6	Plant energy budget	-	-	-	-	-	-	1,730	259	1,989	1,989	-	-	-	-	-	-	-	-	-	
3a.4.7	NRC Fees	-	-	-	-	-	-	341	34	376	376	-	-	-	-	-	-	-	-	-	
3a.4.8	Emergency Planning Fees	-	-	-	-	-	-	137	14	150	-	150	-	-	-	-	-	-	-	-	
3a.4.9	Fixed Overhead	-	-	-	-	-	-	2,833	425	3,258	3,258	-	-	-	-	-	-	-	-	-	
3a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	103	15	119	-	119	-	-	-	-	-	-	-	-	
3a.4.11	Railroad Track Maintenance	-	-	-	-	-	-	115	17	133	133	-	-	-	-	-	-	-	-	-	
3a.4.12	Security Staff Cost	-	-	-	-	-	-	3,900	585	4,485	4,485	-	-	-	-	-	-	-	-	54,080	
3a.4.13	Utility Staff Cost	-	-	-	-	-	-	16,027	2,404	18,431	18,431	-	-	-	-	-	-	-	-	260,000	
3a.4	Subtotal Period 3a Period-Dependent Costs	-	1,019	11	3	-	42	28,127	4,258	33,461	33,192	269	-	-	516	-	-	-	10,311	17	314,080
3a.0	TOTAL PERIOD 3a COST	-	1,019	39	23	13	42	50,461	8,583	60,180	57,462	2,183	535	43	516	-	-	-	15,565	30,680	398,395
PERIOD 3b - Decommissioning Preparations																					
Period 3b Direct Decommissioning Activities																					
Detailed Work Procedures																					
3b.1.1.1	Plant systems	-	-	-	-	-	-	556	83	639	575	-	64	-	-	-	-	-	-	4,733	
3b.1.1.2	Reactor internals	-	-	-	-	-	-	470	70	540	540	-	-	-	-	-	-	-	-	4,000	
3b.1.1.3	Remaining buildings	-	-	-	-	-	-	158	24	182	46	-	137	-	-	-	-	-	-	1,350	
3b.1.1.4	CRD housings & NIs	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	1,000	
3b.1.1.5	Incore instrumentation	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	1,000	
3b.1.1.6	Removal primary containment	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	2,000	
3b.1.1.7	Reactor vessel	-	-	-	-	-	-	426	64	490	490	-	-	-	-	-	-	-	-	3,630	
3b.1.1.8	Facility closeout	-	-	-	-	-	-	141	21	162	81	-	81	-	-	-	-	-	-	1,200	
3b.1.1.9	Sacrificial shield	-	-	-	-	-	-	141	21	162	162	-	-	-	-	-	-	-	-	1,200	
3b.1.1.10	Reinforced concrete	-	-	-	-	-	-	117	18	135	67	-	67	-	-	-	-	-	-	1,000	
3b.1.1.11	Main Turbine	-	-	-	-	-	-	244	37	281	281	-	-	-	-	-	-	-	-	2,080	
3b.1.1.12	Main Condensers	-	-	-	-	-	-	245	37	282	282	-	-	-	-	-	-	-	-	2,088	
3b.1.1.13	Moisture separators & reheaters	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	2,000	
3b.1.1.14	Radwaste building	-	-	-	-	-	-	320	48	369	332	-	37	-	-	-	-	-	-	2,730	
3b.1.1.15	Reactor building	-	-	-	-	-	-	320	48	369	332	-	37	-	-	-	-	-	-	2,730	
3b.1.1	Total	-	-	-	-	-	-	3,843	576	4,420	3,997	-	423	-	-	-	-	-	-	32,741	
3b.1	Subtotal Period 3b Activity Costs	-	-	-	-	-	-	3,843	576	4,420	3,997	-	423	-	-	-	-	-	-	32,741	
Period 3b Collateral Costs																					
3b.3.1	Decon equipment	973	-	-	-	-	-	-	146	1,119	1,119	-	-	-	-	-	-	-	-	-	
3b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,189	178	1,367	1,367	-	-	-	-	-	-	-	-	-	
3b.3.3	Pipe cutting equipment	-	1,200	-	-	-	-	-	180	1,380	1,380	-	-	-	-	-	-	-	-	-	
3b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	830	124	954	-	954	-	-	-	-	-	-	-	-	
3b.3	Subtotal Period 3b Collateral Costs	973	1,200	-	-	-	-	2,018	629	4,820	3,866	954	-	-	-	-	-	-	-	-	

Xcel Energy

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Table I
Monticello Nuclear Generating Plant
Scenario 7: SAFSTOR with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 Period-Dependent Costs																					
3b.4.1	Decon supplies	35	-	-	-	-	-	-	9	43	43	-	-	-	-	-	-	-	-	-	-
3b.4.2	Insurance	-	-	-	-	-	-	360	36	396	396	-	-	-	-	-	-	-	-	-	-
3b.4.3	Property taxes	-	-	-	-	-	-	995	99	1,094	1,094	-	-	-	-	-	-	-	-	-	-
3b.4.4	Health physics supplies	-	248	-	-	-	-	-	62	310	310	-	-	-	-	-	-	-	-	-	-
3b.4.5	Heavy equipment rental	-	283	-	-	-	-	-	42	325	325	-	-	-	-	-	-	-	-	-	-
3b.4.6	Disposal of DAW generated	-	-	6	2	-	24	-	7	38	38	-	-	-	291	-	-	-	5,814	9	-
3b.4.7	Plant energy budget	-	-	-	-	-	-	863	129	992	992	-	-	-	-	-	-	-	-	-	-
3b.4.8	NRC Fees	-	-	-	-	-	-	170	17	187	187	-	-	-	-	-	-	-	-	-	-
3b.4.9	Emergency Planning Fees	-	-	-	-	-	-	68	7	75	-	75	-	-	-	-	-	-	-	-	-
3b.4.10	Fixed Overhead	-	-	-	-	-	-	1,413	212	1,625	1,625	-	-	-	-	-	-	-	-	-	-
3b.4.11	ISFSI Operating Costs	-	-	-	-	-	-	51	8	59	-	59	-	-	-	-	-	-	-	-	-
3b.4.12	Railroad Track Maintenance	-	-	-	-	-	-	58	9	66	66	-	-	-	-	-	-	-	-	-	-
3b.4.13	Security Staff Cost	-	-	-	-	-	-	1,945	292	2,236	2,236	-	-	-	-	-	-	-	-	-	26,966
3b.4.14	DOC Staff Cost	-	-	-	-	-	-	5,123	769	5,892	5,892	-	-	-	-	-	-	-	-	-	58,080
3b.4.15	Utility Staff Cost	-	-	-	-	-	-	7,992	1,199	9,190	9,190	-	-	-	-	-	-	-	-	-	129,644
3b.4	Subtotal Period 3b Period-Dependent Costs	35	531	6	2	-	24	19,037	2,896	22,530	22,396	134	-	-	291	-	-	-	5,814	9	214,690
3b.0	TOTAL PERIOD 3b COST	1,008	1,731	6	2	-	24	24,898	4,101	31,769	30,258	1,088	423	-	291	-	-	-	5,814	9	247,431
PERIOD 3 TOTALS		1,008	2,750	45	25	13	66	75,359	12,684	91,949	87,720	3,271	958	43	806	-	-	-	21,379	30,690	645,826
PERIOD 4a - Large Component Removal																					
Period 4a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
4a.1.1.1	Recirculation System Piping & Valves	20	71	28	22	96	214	-	102	553	553	-	-	676	715	-	-	-	94,867	1,594	-
4a.1.1.2	Recirculation Pumps & Motors	7	47	15	26	130	219	-	95	539	539	-	-	568	473	-	-	-	112,200	1,049	-
4a.1.1.3	CRDMs & NIs Removal	35	674	400	72	-	919	-	466	2,565	2,565	-	-	-	3,741	-	-	-	213,700	12,506	-
4a.1.1.4	Reactor Vessel Internals	102	5,782	8,903	1,187	-	14,647	275	14,274	45,170	45,170	-	-	-	2,943	1,127	643	-	306,123	22,915	1,075
4a.1.1.5	Vessel & Internals GTCC Disposal	-	-	-	-	-	6,552	-	983	7,535	7,535	-	-	-	-	-	-	1,547	311,184	-	-
4a.1.1.6	Reactor Vessel	-	7,999	1,877	606	-	5,622	275	9,472	25,852	25,852	-	-	-	17,823	-	-	-	1,110,260	22,915	1,075
4a.1.1	Totals	163	14,571	11,223	1,914	226	28,174	551	25,392	82,215	82,215	-	-	1,244	25,695	1,127	643	1,547	2,148,335	60,979	2,150
Removal of Major Equipment																					
4a.1.2	Main Turbine/Generator	-	282	1,424	349	3,174	357	-	831	6,417	6,417	-	-	24,835	1,383	-	-	-	1,577,959	4,796	-
4a.1.3	Main Condensers	-	994	378	128	1,667	198	-	605	3,970	3,970	-	-	17,396	727	-	-	-	828,955	16,823	-
Cascading Costs from Clean Building Demolition																					
4a.1.4.1	Reactor Building	-	611	-	-	-	-	-	92	703	703	-	-	-	-	-	-	-	-	6,238	-
4a.1.4.2	Radwaste	-	53	-	-	-	-	-	8	61	61	-	-	-	-	-	-	-	-	569	-
4a.1.4.3	Turbine	-	157	-	-	-	-	-	24	180	180	-	-	-	-	-	-	-	-	1,884	-
4a.1.4	Totals	-	821	-	-	-	-	-	123	944	944	-	-	-	-	-	-	-	-	8,691	-
Disposal of Plant Systems																					
4a.1.5.1	Automatic Press Relief	-	88	2	7	94	-	-	37	228	228	-	-	1,088	-	-	-	-	44,184	1,468	-
4a.1.5.2	Chemistry Sampling	-	20	0	1	18	-	-	8	48	48	-	-	207	-	-	-	-	8,422	356	-
4a.1.5.3	Chemistry Sampling - Insulated	-	1	0	0	0	-	-	0	2	2	-	-	1	-	-	-	-	61	25	-
4a.1.5.4	Circulating Water - RCA	-	172	10	41	576	-	-	136	935	935	-	-	6,656	-	-	-	-	270,307	2,860	-
4a.1.5.5	Combustible Gas Control - Insul - RCA	-	24	0	1	18	-	-	9	53	53	-	-	212	-	-	-	-	8,617	378	-
4a.1.5.6	Combustible Gas Control - RCA	-	15	0	2	25	-	-	8	50	50	-	-	285	-	-	-	-	11,577	245	-
4a.1.5.7	Condensate & Feedwater	-	736	45	184	2,609	-	-	607	4,181	4,181	-	-	30,157	-	-	-	-	1,224,704	12,501	-
4a.1.5.8	Condensate & Feedwater - Insulated	-	368	9	36	506	-	-	174	1,093	1,093	-	-	5,855	-	-	-	-	237,764	6,185	-
4a.1.5.9	Condensate Demin	-	408	7	29	410	-	-	168	1,022	1,022	-	-	4,735	-	-	-	-	192,293	6,784	-
4a.1.5.10	Condensate Storage	-	546	12	50	712	-	-	252	1,573	1,573	-	-	8,237	-	-	-	-	334,489	9,265	-
4a.1.5.11	Control Rod Drive	-	2	0	0	2	-	-	1	5	5	-	-	24	-	-	-	-	976	36	-
4a.1.5.12	Control Rod Drive Hydraulic	-	309	4	15	211	-	-	112	651	651	-	-	2,440	-	-	-	-	99,094	5,255	-

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix I, Page 8 of 12

Table I
Monticello Nuclear Generating Plant
Scenario 7: SAFSTOR with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site	LLRW	Other Costs	Total Contingency	Total Costs	NRC	Spent Fuel	Site	Processed	Burial Volumes				Burial /	Craft Manhours	Utility and
						Processing Costs	Disposal Costs				Lic. Term. Costs	Management Costs	Restoration Costs	Volume Cu. Feet	Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Processed Wt., Lbs.		Contractor Manhours
Disposal of Plant Systems (continued)																					
4a.1.5.13	Core Spray	-	59	8	31	442	-	-	86	626	626	-	-	5,109	-	-	-	-	207,487	1,026	-
4a.1.5.14	Core Spray - Insulated	-	108	2	7	102	-	-	44	263	263	-	-	1,184	-	-	-	-	48,081	1,806	-
4a.1.5.15	Demin Water - Insulated - RCA	-	12	0	1	7	-	-	4	25	25	-	-	85	-	-	-	-	3,445	181	-
4a.1.5.16	Demin Water - RCA	-	34	0	2	22	-	-	12	70	70	-	-	253	-	-	-	-	10,278	508	-
4a.1.5.17	Diesel Oil - RCA	-	2	0	0	2	-	-	1	4	4	-	-	23	-	-	-	-	931	25	-
4a.1.5.18	Drywell Atmosphere Cooling - RCA	-	31	1	3	47	-	31	15	98	98	-	-	548	-	-	-	-	22,244	550	-
4a.1.5.19	EDG Emerg Service Water - Insul - RCA	-	0	0	0	0	-	-	0	1	1	-	-	2	-	-	-	-	84	4	-
4a.1.5.20	Electrical - Clean	-	11	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	182	-
4a.1.5.21	Emergency Service Water - Insul - RCA	-	18	0	1	12	-	-	6	37	37	-	-	137	-	-	-	-	5,544	281	-
4a.1.5.22	Emergency Service Water - RCA	-	1	0	0	1	-	-	1	3	3	-	-	13	-	-	-	-	512	22	-
4a.1.5.23	GEZIP - RCA	-	3	0	1	9	-	-	2	15	15	-	-	103	-	-	-	-	4,184	48	-
4a.1.5.24	Generator Physical Design - RCA	-	4	0	0	3	-	-	1	8	8	-	-	31	-	-	-	-	1,250	67	-
4a.1.5.25	H2-O2 Control Analyzing	-	5	0	0	2	-	-	1	8	8	-	-	23	-	-	-	-	948	72	-
4a.1.5.26	H2-O2 Control Analyzing - Insulated	-	5	0	0	2	-	-	1	8	8	-	-	23	-	-	-	-	948	72	-
4a.1.5.27	High Pressure Coolant Injection	-	50	2	8	109	-	-	30	199	199	-	-	1,262	-	-	-	-	51,257	850	-
4a.1.5.28	High Pressure Coolant Injection - Insula	-	164	3	14	196	-	-	73	450	450	-	-	2,266	-	-	-	-	92,018	2,734	-
4a.1.5.29	Hydrogen Cooling	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	118	-
4a.1.5.30	Hydrogen Cooling - RCA	-	6	0	0	3	-	-	2	11	11	-	-	39	-	-	-	-	1,600	79	-
4a.1.5.31	Hydrogen Seal Oil - RCA	-	14	0	1	16	-	-	6	38	38	-	-	189	-	-	-	-	7,669	212	-
4a.1.5.32	Hydrogen Water Chemistry - RCA	-	20	0	1	12	-	-	7	40	40	-	-	140	-	-	-	-	5,672	304	-
4a.1.5.33	Instrument & Service Air - RCA	-	185	3	11	153	-	-	71	423	423	-	-	1,768	-	-	-	-	71,810	2,733	-
4a.1.5.34	Main Condenser	-	147	3	12	165	-	-	63	389	389	-	-	1,903	-	-	-	-	77,301	2,443	-
4a.1.5.35	Main Steam	-	186	4	18	257	-	-	88	554	554	-	-	2,975	-	-	-	-	120,806	3,122	-
4a.1.5.36	Main Turbine	-	754	48	194	2,758	-	-	636	4,391	4,391	-	-	31,885	-	-	-	-	1,294,866	12,952	-
4a.1.5.37	Main Turbine - Insulated	-	160	5	21	299	-	-	89	574	574	-	-	3,460	-	-	-	-	140,506	2,725	-
4a.1.5.38	Miscellaneous	-	32	0	2	26	-	-	12	72	72	-	-	302	-	-	-	-	12,283	556	-
4a.1.5.39	Off Gas Recombiner	-	140	4	17	247	-	-	75	485	485	-	-	2,861	-	-	-	-	116,194	2,387	-
4a.1.5.40	Off Gas Recombiner - Insulated	-	289	4	14	203	-	-	105	616	616	-	-	2,350	-	-	-	-	95,441	4,785	-
4a.1.5.41	Post Accident Sampling	-	19	0	1	9	-	-	6	34	34	-	-	99	-	-	-	-	4,004	306	-
4a.1.5.42	Post Accident Sampling - Insulated	-	13	0	0	6	-	-	4	23	23	-	-	67	-	-	-	-	2,737	190	-
4a.1.5.43	RHR Service Water - Insulated - RCA	-	69	2	9	128	-	-	38	246	246	-	-	1,485	-	-	-	-	60,293	1,125	-
4a.1.5.44	RHR Service Water - RCA	-	3	0	0	3	-	-	1	8	8	-	-	35	-	-	-	-	1,410	57	-
4a.1.5.45	Reactor Feedwater Pump Seal	-	42	0	2	28	-	-	15	87	87	-	-	327	-	-	-	-	13,295	687	-
4a.1.5.46	Residual Heat Removal	-	187	52	99	1,091	418	-	335	2,181	2,181	-	-	12,609	1,519	-	-	-	609,174	3,282	-
4a.1.5.47	Residual Heat Removal - Insulated	-	415	37	51	440	377	-	275	1,595	1,595	-	-	5,084	1,374	-	-	-	294,206	7,027	-
4a.1.5.48	Rx Core Isolation Cooling	-	36	1	2	31	-	-	14	84	84	-	-	364	-	-	-	-	14,781	609	-
4a.1.5.49	Rx Core Isolation Cooling - Insulated	-	80	1	3	49	-	-	28	161	161	-	-	563	-	-	-	-	22,843	1,315	-
4a.1.5.50	Rx Recirculation	-	44	5	3	8	43	-	24	126	126	-	-	96	152	-	-	-	13,794	691	-
4a.1.5.51	Snubbers	-	126	1	3	43	-	-	39	212	212	-	-	502	-	-	-	-	20,395	2,272	-
4a.1.5.52	Standby Liquid Control - Insul - RCA	-	3	0	0	2	-	-	1	6	6	-	-	22	-	-	-	-	904	48	-
4a.1.5.53	Standby Liquid Control - RCA	-	22	0	1	21	-	-	9	54	54	-	-	245	-	-	-	-	9,969	341	-
4a.1.5.54	Stator Cooling - RCA	-	6	0	1	11	-	-	3	21	21	-	-	126	-	-	-	-	5,135	98	-
4a.1.5.55	Traversing Incore Probe	-	3	0	0	0	1	-	1	5	5	-	-	2	5	-	-	-	379	46	-
4a.1.5	Totals	-	6,203	280	899	12,150	839	-	3,744	24,114	24,094	-	20	140,459	3,050	-	-	-	5,899,167	104,297	-
4a.1.6	Scaffolding in support of decommissioning	-	1,778	23	8	99	25	-	469	2,402	2,402	-	-	1,030	91	-	-	-	52,111	19,968	-
4a.1	Subtotal Period 4a Activity Costs	163	24,648	13,329	3,299	17,316	29,592	551	31,164	120,062	120,042	-	20	184,963	30,945	1,127	643	1,547	10,506,530	215,555	2,150
Period 4a Additional Costs																					
4a.2.1	Remedial Action Surveys	-	-	-	-	-	-	2,161	648	2,809	2,809	-	-	-	-	-	-	-	-	28,247	-
4a.2	Subtotal Period 4a Additional Costs	-	-	-	-	-	-	2,161	648	2,809	2,809	-	-	-	-	-	-	-	-	28,247	-
Period 4a Collateral Costs																					
4a.3.1	Process decommissioning water waste	4	-	7	17	-	27	-	12	66	66	-	-	-	64	-	-	-	3,860	13	-
4a.3.3	Small tool allowance	-	240	-	-	-	-	-	36	276	248	-	28	-	-	-	-	-	-	-	-
4a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	2,560	384	2,943	-	2,943	-	-	-	-	-	-	-	-	-
4a.3	Subtotal Period 4a Collateral Costs	4	240	7	17	-	27	2,560	432	3,285	314	2,943	28	-	64	-	-	-	3,860	13	-

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix I, Page 9 of 12

Table I
Monticello Nuclear Generating Plant
Scenario 7: SAFSTOR with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 4a Period-Dependent Costs																					
4a.4.1	Decon supplies	94	-	-	-	-	-	-	24	118	118	-	-	-	-	-	-	-	-	-	-
4a.4.2	Insurance	-	-	-	-	-	-	980	98	1,078	1,078	-	-	-	-	-	-	-	-	-	-
4a.4.3	Property taxes	-	-	-	-	-	-	2,674	267	2,942	2,942	-	-	-	-	-	-	-	-	-	-
4a.4.4	Health physics supplies	-	1,856	-	-	-	-	-	464	2,320	2,320	-	-	-	-	-	-	-	-	-	-
4a.4.5	Heavy equipment rental	-	2,984	-	-	-	-	-	448	3,431	3,431	-	-	-	-	-	-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	97	31	-	378	-	109	614	614	-	-	-	4,640	-	-	-	92,810	151	-
4a.4.7	Plant energy budget	-	-	-	-	-	-	2,233	335	2,568	2,568	-	-	-	-	-	-	-	-	-	-
4a.4.8	NRC Fees	-	-	-	-	-	-	757	76	833	833	-	-	-	-	-	-	-	-	-	-
4a.4.9	Emergency Planning Fees	-	-	-	-	-	-	186	19	204	-	204	-	-	-	-	-	-	-	-	-
4a.4.10	Fixed Overhead	-	-	-	-	-	-	3,150	473	3,623	3,623	-	-	-	-	-	-	-	-	-	-
4a.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	550	82	632	632	-	-	-	-	-	-	-	-	-	-
4a.4.12	ISFSI Operating Costs	-	-	-	-	-	-	140	21	161	-	161	-	-	-	-	-	-	-	-	-
4a.4.13	Railroad Track Maintenance	-	-	-	-	-	-	157	24	180	180	-	-	-	-	-	-	-	-	-	-
4a.4.14	Security Staff Cost	-	-	-	-	-	-	5,300	795	6,095	6,095	-	-	-	-	-	-	-	-	-	73,490
4a.4.15	DOC Staff Cost	-	-	-	-	-	-	16,810	2,522	19,332	19,332	-	-	-	-	-	-	-	-	-	195,030
4a.4.16	Utility Staff Cost	-	-	-	-	-	-	21,933	3,290	25,223	25,223	-	-	-	-	-	-	-	-	-	356,142
4a.4	Subtotal Period 4a Period-Dependent Costs	94	4,839	97	31	-	378	54,871	9,045	69,355	68,989	366	-	-	4,640	-	-	-	92,810	151	624,661
4a.0	TOTAL PERIOD 4a COST	262	29,727	13,432	3,346	17,316	29,997	60,142	41,289	195,511	192,155	3,309	48	184,963	35,649	1,127	643	1,547	10,603,200	243,966	626,811
PERIOD 4b - Site Decontamination																					
Period 4b Direct Decommissioning Activities																					
4b.1.1	Remove spent fuel racks	504	49	108	109	-	2,091	-	814	3,675	3,675	-	-	-	7,653	-	-	-	486,170	906	-
Disposal of Plant Systems																					
4b.1.2.1	ALARA/Radiological	-	14	0	0	4	-	-	4	22	22	-	-	49	-	-	-	-	1,987	247	-
4b.1.2.2	Alternate N2 - RCA	-	13	0	1	8	-	-	5	27	27	-	-	93	-	-	-	-	3,765	185	-
4b.1.2.3	Cranes/Heavy Loads/Rigging - RCA	-	3	0	1	9	-	-	2	15	15	-	-	103	-	-	-	-	4,184	48	-
4b.1.2.4	Decontamination Projects	-	1	0	0	0	-	-	0	1	1	-	-	3	-	-	-	-	125	15	-
4b.1.2.5	Electrical - Contaminated	-	328	4	15	217	-	-	117	682	682	-	-	2,514	-	-	-	-	102,112	5,633	-
4b.1.2.6	Electrical - Contaminated Fuel Pool	-	34	0	2	22	-	-	12	70	70	-	-	253	-	-	-	-	10,272	592	-
4b.1.2.7	Electrical - Decontam. Fuel Pool Area	-	242	4	15	213	-	-	95	568	568	-	-	2,457	-	-	-	-	99,783	4,090	-
4b.1.2.8	Electrical - Decontaminated	-	2,195	36	142	2,019	-	-	877	5,269	5,269	-	-	23,344	-	-	-	-	948,013	37,107	-
4b.1.2.9	Fire - RCA	-	84	1	4	53	-	-	30	171	171	-	-	614	-	-	-	-	24,917	1,324	-
4b.1.2.10	Fire - RCA - Fuel Pool Area	-	9	0	0	5	-	-	3	18	18	-	-	62	-	-	-	-	2,499	143	-
4b.1.2.11	Fuel Pool Cooling & Cleanup	-	319	19	23	177	196	-	161	895	895	-	-	2,051	712	-	-	-	128,918	5,363	-
4b.1.2.12	Fuel Pool Cooling & Cleanup - Insulated	-	31	2	2	11	20	-	15	80	80	-	-	130	71	-	-	-	9,830	514	-
4b.1.2.13	HVAC Ductwork	-	238	4	17	243	-	-	99	601	601	-	-	2,805	-	-	-	-	113,913	3,539	-
4b.1.2.14	HVAC Ductwork - Fuel Pool Area	-	26	0	2	27	-	-	11	67	67	-	-	312	-	-	-	-	12,657	393	-
4b.1.2.15	HVAC/Chilled Water - RCA	-	267	4	17	238	-	-	105	631	631	-	-	2,752	-	-	-	-	111,779	3,985	-
4b.1.2.16	HVAC/Chilled Water - RCA Fuel Pool Area	-	27	0	1	19	-	-	10	58	58	-	-	223	-	-	-	-	9,072	397	-
4b.1.2.17	Heating & Ventilation	-	359	10	39	548	-	-	179	1,134	1,134	-	-	6,334	-	-	-	-	257,243	6,340	-
4b.1.2.18	Heating Boiler - Insulated - RCA	-	2	0	0	2	-	-	1	6	6	-	-	26	-	-	-	-	1,058	35	-
4b.1.2.19	Instrument & Service Air-RCA-Fuel Pool	-	24	0	2	23	-	-	10	58	58	-	-	267	-	-	-	-	10,841	357	-
4b.1.2.20	Liquid Radwaste	-	515	28	39	364	253	-	255	1,453	1,453	-	-	4,203	915	-	-	-	229,422	8,550	-
4b.1.2.21	Makeup Demin - RCA	-	86	2	9	127	-	-	42	266	266	-	-	1,471	-	-	-	-	59,747	1,412	-
4b.1.2.22	Non-Essential Diesel Generator - RCA	-	23	2	9	123	-	-	26	183	183	-	-	1,424	-	-	-	-	57,832	395	-
4b.1.2.23	Off Gas Holdup	-	257	5	22	314	-	-	115	713	713	-	-	3,629	-	-	-	-	147,355	4,256	-
4b.1.2.24	Primary Containment	-	341	13	51	718	-	-	202	1,324	1,324	-	-	8,302	-	-	-	-	337,148	5,729	-
4b.1.2.25	Process Radiation Monitors	-	34	0	1	18	-	-	12	66	66	-	-	213	-	-	-	-	8,667	577	-
4b.1.2.26	Rx Bldg Closed Clngr Water - Insul - RCA	-	93	2	6	85	-	-	37	222	222	-	-	977	-	-	-	-	39,675	1,484	-
4b.1.2.27	Rx Bldg Closed Clngr Water - RCA	-	152	11	43	614	-	-	138	957	957	-	-	7,093	-	-	-	-	288,031	2,489	-
4b.1.2.28	Rx Component Handling Equip	-	105	11	16	150	113	-	81	477	477	-	-	1,737	415	-	-	-	96,901	1,839	-
4b.1.2.29	Rx Pressure Vessel	-	35	4	3	14	47	-	24	127	127	-	-	161	169	-	-	-	17,375	578	-
4b.1.2.30	Rx Water Cleanup	-	198	16	11	24	174	-	100	523	523	-	-	278	630	-	-	-	51,819	3,264	-
4b.1.2.31	Secondary Containment	-	93	2	8	119	-	-	42	264	264	-	-	1,372	-	-	-	-	55,702	1,569	-
4b.1.2.32	Service & Seal Water - Insulated - RCA	-	99	2	7	102	-	-	41	252	252	-	-	1,180	-	-	-	-	47,917	1,565	-
4b.1.2.33	Service & Seal Water - RCA	-	131	3	11	156	-	-	58	360	360	-	-	1,809	-	-	-	-	73,453	2,016	-
4b.1.2.34	Service Air Blower - RCA	-	13	0	1	18	-	-	6	38	38	-	-	206	-	-	-	-	8,364	206	-
4b.1.2.35	Solid Radwaste	-	369	20	30	293	181	-	188	1,081	1,081	-	-	3,390	659	-	-	-	179,772	6,270	-
4b.1.2.36	Structures & Buildings	-	58	1	3	41	-	-	21	124	124	-	-	477	-	-	-	-	19,351	1,005	-
4b.1.2.37	Wells & Domestic Water	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	144	-
4b.1.2.38	Wells & Domestic Water - RCA	-	43	1	2	30	-	-	16	91	91	-	-	342	-	-	-	-	13,874	633	-
4b.1.2	Totals	-	6,869	208	555	7,150	984	-	3,139	18,904	18,894	-	9	82,654	3,571	-	-	-	3,585,374	114,290	-
4b.1.3	Scaffolding in support of decommissioning	-	2,667	35	12	148	37	-	704	3,603	3,603	-	-	1,545	136	-	-	-	78,166	29,953	-

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix I, Page 10 of 12

Table I
Monticello Nuclear Generating Plant
Scenario 7: SAFSTOR with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site	LLRW	Other Costs	Total Contingency	Total Costs	NRC	Spent Fuel	Site	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
						Processing Costs	Disposal Costs				Lic. Term. Costs	Management Costs	Restoration Costs		Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Decontamination of Site Buildings																					
4b.1.4.1	Reactor Building	3,881	2,049	138	314	4,159	765	-	3,329	14,634	14,634	-	-	48,077	4,434	-	-	-	2,195,768	98,722	-
4b.1.4.2	Admin	82	2	0	1	-	7	-	43	135	135	-	-	-	72	-	-	-	3,420	1,389	-
4b.1.4.3	HPCI Room	22	19	0	1	10	7	-	19	78	78	-	-	118	65	-	-	-	7,927	664	-
4b.1.4.4	Hot Shop	13	2	0	1	-	5	-	8	28	28	-	-	-	51	-	-	-	2,430	231	-
4b.1.4.5	LLRW Storage & Shipping	43	11	1	3	3	21	-	30	111	111	-	-	31	217	-	-	-	11,532	875	-
4b.1.4.6	Offgas Stack	280	127	4	12	116	44	-	202	786	786	-	-	1,343	361	-	-	-	72,483	6,692	-
4b.1.4.7	Offgas Storage & Compressor	30	7	0	2	2	15	-	21	79	79	-	-	25	159	-	-	-	8,502	603	-
4b.1.4.8	Radwaste	91	30	2	7	15	44	-	67	255	255	-	-	172	460	-	-	-	28,679	1,960	-
4b.1.4.9	Radwaste Material Storage Warehouse	48	9	1	3	-	23	-	32	116	116	-	-	-	248	-	-	-	11,700	915	-
4b.1.4.10	Recombiner	20	15	1	3	17	12	-	20	87	87	-	-	199	112	-	-	-	13,491	554	-
4b.1.4.11	Turbine	528	172	9	42	111	260	-	396	1,517	1,517	-	-	1,283	2,675	-	-	-	179,172	11,286	-
4b.1.4.12	Turbine Building Addition	44	8	1	3	-	20	-	29	105	105	-	-	-	217	-	-	-	10,248	838	-
4b.1.4.13	Reactor (Post Fuel)	703	1,924	129	656	170	4,681	-	2,140	10,403	10,403	-	-	1,969	49,647	-	-	-	2,426,544	39,766	-
4b.1.4	Totals	5,783	4,375	286	1,047	4,603	5,903	-	6,337	28,334	28,334	-	-	53,216	58,718	-	-	-	4,971,896	164,495	-
4b.1.5	Prepare/submit License Termination Plan	-	-	-	-	-	-	481	72	553	553	-	-	-	-	-	-	-	-	-	4,096
4b.1.6	Receive NRC approval of termination plan									a											
4b.1	Subtotal Period 4b Activity Costs	6,287	13,960	637	1,723	11,901	9,015	481	11,066	55,069	55,060	-	9	137,414	70,078	-	-	-	9,121,606	309,644	4,096
Period 4b Additional Costs																					
4b.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,291	387	1,678	1,678	-	-	-	-	-	-	-	-	-	12,480
4b.2.2	Remedial Action Surveys	-	-	-	-	-	-	3,241	972	4,213	4,213	-	-	-	-	-	-	-	-	42,370	-
4b.2.3	Operational Equipment	-	-	19	60	624	-	-	104	807	807	-	-	11,710	-	-	-	-	292,750	32	-
4b.2	Subtotal Period 4b Additional Costs	-	-	19	60	624	-	4,532	1,464	6,698	6,698	-	-	11,710	-	-	-	-	292,750	42,402	12,480
Period 4b Collateral Costs																					
4b.3.1	Process decommissioning water waste	12	-	21	53	-	84	-	37	207	207	-	-	-	201	-	-	-	12,055	39	-
4b.3.3	Small tool allowance	-	314	-	-	-	-	-	47	361	361	-	-	-	-	-	-	-	-	-	-
4b.3.4	Decommissioning Equipment Disposition	-	-	137	55	575	145	-	144	1,055	1,055	-	-	6,000	529	-	-	-	303,608	147	-
4b.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	5,730	860	6,590	-	6,590	-	-	-	-	-	-	-	-	-
4b.3	Subtotal Period 4b Collateral Costs	12	314	157	108	575	229	5,730	1,088	8,212	1,622	6,590	-	6,000	730	-	-	-	315,663	186	-
Period 4b Period-Dependent Costs																					
4b.4.1	Decon supplies	1,388	-	-	-	-	-	-	347	1,735	1,735	-	-	-	-	-	-	-	-	-	-
4b.4.2	Insurance	-	-	-	-	-	-	1,470	147	1,617	1,617	-	-	-	-	-	-	-	-	-	-
4b.4.3	Property taxes	-	-	-	-	-	-	3,786	379	4,165	4,165	-	-	-	-	-	-	-	-	-	-
4b.4.4	Health physics supplies	-	2,704	-	-	-	-	-	676	3,380	3,380	-	-	-	-	-	-	-	-	-	-
4b.4.5	Heavy equipment rental	-	4,602	-	-	-	-	-	690	5,292	5,292	-	-	-	-	-	-	-	-	-	-
4b.4.6	Disposal of DAW generated	-	-	121	39	-	472	-	136	767	767	-	-	-	5,800	-	-	-	116,000	189	-
4b.4.7	Plant energy budget	-	-	-	-	-	-	2,645	397	3,041	3,041	-	-	-	-	-	-	-	-	-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	1,136	114	1,250	1,250	-	-	-	-	-	-	-	-	-	-
4b.4.9	Emergency Planning Fees	-	-	-	-	-	-	279	28	307	-	307	-	-	-	-	-	-	-	-	-
4b.4.10	Fixed Overhead	-	-	-	-	-	-	4,725	709	5,434	5,434	-	-	-	-	-	-	-	-	-	-
4b.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	825	124	949	949	-	-	-	-	-	-	-	-	-	-
4b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	210	32	242	-	242	-	-	-	-	-	-	-	-	-
4b.4.13	Railroad Track Maintenance	-	-	-	-	-	-	235	35	270	270	-	-	-	-	-	-	-	-	-	-
4b.4.14	Security Staff Cost	-	-	-	-	-	-	7,950	1,192	9,142	9,142	-	-	-	-	-	-	-	-	-	110,234
4b.4.15	DOC Staff Cost	-	-	-	-	-	-	24,690	3,704	28,394	28,394	-	-	-	-	-	-	-	-	-	284,065
4b.4.16	Utility Staff Cost	-	-	-	-	-	-	31,207	4,681	35,888	35,888	-	-	-	-	-	-	-	-	-	504,534
4b.4	Subtotal Period 4b Period-Dependent Costs	1,388	7,306	121	39	-	472	79,158	13,389	101,873	101,325	549	-	-	5,800	-	-	-	116,000	189	898,834
4b.0	TOTAL PERIOD 4b COST	7,687	21,579	934	1,929	13,100	9,716	89,901	27,007	171,853	164,705	7,139	9	155,124	76,608	-	-	-	9,846,018	352,420	915,410
PERIOD 4f - License Termination																					
Period 4f Direct Decommissioning Activities																					
4f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	159	48	207	207	-	-	-	-	-	-	-	-	-	-
4f.1.2	Terminate license								a												
4f.1	Subtotal Period 4f Activity Costs	-	-	-	-	-	-	159	48	207	207	-	-	-	-	-	-	-	-	-	-

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix I, Page 11 of 12

Table I
Monticello Nuclear Generating Plant
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(thousands of 2017 dollars)

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															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 4f Additional Costs																					
4f.2.1	License Termination Survey	-	-	-	-	-	-	7,341	2,202	9,544	9,544	-	-	-	-	-	-	-	-	96,197	6,240
4f.2.2	License Termination ISFSI	-	131	3	784	-	8,058	2,907	2,971	14,854	14,854	-	-	-	27,284	-	-	-	3,860,412	11,160	10,640
4f.2	Subtotal Period 4f Additional Costs	-	131	3	784	-	8,058	10,248	5,173	24,398	24,398	-	-	-	27,284	-	-	-	3,860,412	107,357	16,880
Period 4f Collateral Costs																					
4f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,189	178	1,367	1,367	-	-	-	-	-	-	-	-	-	-
4f.3.2	Small tool allowance	-	1	-	-	-	-	-	0	1	1	-	-	-	-	-	-	-	-	-	-
4f.3.3	Spent Fuel Capital and Transfer	-	-	-	-	-	-	570	85	655	-	655	-	-	-	-	-	-	-	-	-
4f.3	Subtotal Period 4f Collateral Costs	-	1	-	-	-	-	1,758	264	2,024	1,368	655	-	-	-	-	-	-	-	-	-
Period 4f Period-Dependent Costs																					
4f.4.1	Insurance	-	-	-	-	-	-	543	54	598	598	-	-	-	-	-	-	-	-	-	-
4f.4.2	Property taxes	-	-	-	-	-	-	1,265	127	1,392	1,392	-	-	-	-	-	-	-	-	-	-
4f.4.3	Health physics supplies	-	651	-	-	-	-	-	163	813	813	-	-	-	-	-	-	-	-	-	-
4f.4.4	Disposal of DAW generated	-	-	7	2	-	29	-	8	47	47	-	-	-	355	-	-	-	7,097	12	-
4f.4.5	Plant energy budget	-	-	-	-	-	-	261	39	300	300	-	-	-	-	-	-	-	-	-	-
4f.4.6	NRC Fees	-	-	-	-	-	-	420	42	463	463	-	-	-	-	-	-	-	-	-	-
4f.4.7	Emergency Planning Fees	-	-	-	-	-	-	103	10	113	-	113	-	-	-	-	-	-	-	-	-
4f.4.8	Fixed Overhead	-	-	-	-	-	-	1,747	262	2,009	2,009	-	-	-	-	-	-	-	-	-	-
4f.4.9	ISFSI Operating Costs	-	-	-	-	-	-	78	12	89	-	89	-	-	-	-	-	-	-	-	-
4f.4.10	Railroad Track Maintenance	-	-	-	-	-	-	87	13	100	100	-	-	-	-	-	-	-	-	-	-
4f.4.11	Security Staff Cost	-	-	-	-	-	-	2,938	441	3,379	3,379	-	-	-	-	-	-	-	-	-	40,745
4f.4.12	DOC Staff Cost	-	-	-	-	-	-	5,174	776	5,950	5,950	-	-	-	-	-	-	-	-	-	57,200
4f.4.13	Utility Staff Cost	-	-	-	-	-	-	5,456	818	6,274	6,274	-	-	-	-	-	-	-	-	-	80,707
4f.4	Subtotal Period 4f Period-Dependent Costs	-	651	7	2	-	29	18,072	2,765	21,527	21,324	203	-	-	355	-	-	-	7,097	12	178,652
4f.0	TOTAL PERIOD 4f COST	-	782	11	787	-	8,087	30,238	8,250	48,155	47,297	858	-	-	27,639	-	-	-	3,867,510	107,369	195,532
PERIOD 4 TOTALS		7,949	52,089	14,377	6,063	30,416	47,800	180,282	76,546	415,520	404,157	11,306	57	340,088	139,896	1,127	643	1,547	24,316,720	703,755	1,737,752
PERIOD 5b - Site Restoration																					
Period 5b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
5b.1.1.1	Reactor Building	-	3,541	-	-	-	-	-	531	4,073	-	-	4,073	-	-	-	-	-	-	36,752	-
5b.1.1.2	Condensate Tanks Foundation	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	219	-
5b.1.1.3	Discharge Retention Basin	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	110	-
5b.1.1.4	HPCI Room	-	44	-	-	-	-	-	7	50	-	-	50	-	-	-	-	-	-	401	-
5b.1.1.5	Hot Shop	-	21	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	298	-
5b.1.1.6	Hydrogen & Oxygen Storage	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	21	-
5b.1.1.7	LLRW Storage & Shipping	-	140	-	-	-	-	-	21	161	-	-	161	-	-	-	-	-	-	1,794	-
5b.1.1.8	MSIV	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	59	-
5b.1.1.9	Misc Structures 2017	-	1,075	-	-	-	-	-	161	1,236	-	-	1,236	-	-	-	-	-	-	13,787	-
5b.1.1.10	Offgas Stack	-	232	-	-	-	-	-	35	267	-	-	267	-	-	-	-	-	-	2,668	-
5b.1.1.11	Offgas Storage & Compressor	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	963	-
5b.1.1.12	Radwaste	-	482	-	-	-	-	-	72	554	-	-	554	-	-	-	-	-	-	5,196	-
5b.1.1.13	Recombiner	-	258	-	-	-	-	-	39	297	-	-	297	-	-	-	-	-	-	2,490	-
5b.1.1.14	Security Barrier	-	362	-	-	-	-	-	54	416	-	-	416	-	-	-	-	-	-	4,083	-
5b.1.1.15	Structures Greater than 3' Below Grade	-	4,946	-	-	-	-	-	742	5,688	-	-	5,688	-	-	-	-	-	-	46,737	-
5b.1.1.16	Tank Farm	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	121	-
5b.1.1.17	Turbine	-	1,514	-	-	-	-	-	227	1,741	-	-	1,741	-	-	-	-	-	-	18,764	-
5b.1.1.18	Turbine Building Addition	-	67	-	-	-	-	-	10	77	-	-	77	-	-	-	-	-	-	971	-
5b.1.1.19	Turbine Pedestal	-	415	-	-	-	-	-	62	478	-	-	478	-	-	-	-	-	-	3,762	-
5b.1.1	Totals	-	13,228	-	-	-	-	-	1,984	15,212	-	-	15,212	-	-	-	-	-	-	139,199	-
Site Closeout Activities																					
5b.1.2	Grade & landscape site	-	864	-	-	-	-	-	130	994	-	-	994	-	-	-	-	-	-	1,841	-
5b.1.3	Final report to NRC	-	-	-	-	-	-	183	27	211	211	-	-	-	-	-	-	-	-	-	1,560
5b.1	Subtotal Period 5b Activity Costs	-	14,092	-	-	-	-	183	2,141	16,417	211	-	16,206	-	-	-	-	-	-	141,040	1,560

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix I, Page 12 of 12

Table I
Monticello Nuclear Generating Plant
Scenario 7: SAFSTOR with 60 Year DFS Decommissioning Cost Estimate
(thousands of 2017 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 5b Additional Costs																					
5b.2.1	Clean Concrete Disposal	-	3,297	-	-	-	-	11	496	3,805	-	-	3,805	-	-	-	-	-	-	12	-
5b.2.2	Cofferdam	-	320	-	-	-	-	-	48	368	368	-	-	-	-	-	-	-	-	2,584	-
5b.2.3	Excavation of Underground Services	-	1,380	-	-	-	-	947	349	2,677	-	-	2,677	-	-	-	-	-	-	13,475	-
5b.2.4	Constrution Debris	-	-	-	-	-	-	350	53	403	-	-	403	-	-	-	-	-	-	-	-
5b.2.5	Backfill	-	5,102	-	-	-	-	-	765	5,868	-	-	5,868	-	-	-	-	-	-	5,422	-
5b.2.6	Demolition and Site Restoration ISFSI	-	1,766	-	-	-	-	185	293	2,244	-	-	2,244	-	-	-	-	-	-	8,537	160
5b.2	Subtotal Period 5b Additional Costs	-	11,866	-	-	-	-	1,493	2,004	15,364	368	-	14,996	-	-	-	-	-	-	30,030	160
Period 5b Collateral Costs																					
5b.3.1	Small tool allowance	-	193	-	-	-	-	-	29	222	-	-	222	-	-	-	-	-	-	-	-
5b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	210	31	241	-	241	-	-	-	-	-	-	-	-	-
5b.3	Subtotal Period 5b Collateral Costs	-	193	-	-	-	-	210	60	463	-	241	222	-	-	-	-	-	-	-	-
Period 5b Period-Dependent Costs																					
5b.4.2	Property taxes	-	-	-	-	-	-	2,419	242	2,661	-	-	2,661	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	5,455	-	-	-	-	-	818	6,273	-	-	6,273	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	300	45	345	-	-	345	-	-	-	-	-	-	-	-
5b.4.5	Fixed Overhead	-	-	-	-	-	-	1,260	189	1,450	-	-	1,450	-	-	-	-	-	-	-	-
5b.4.6	Railroad Track Maintenance	-	-	-	-	-	-	200	30	230	-	-	230	-	-	-	-	-	-	-	-
5b.4.7	Security Staff Cost	-	-	-	-	-	-	2,739	411	3,150	-	-	3,150	-	-	-	-	-	-	-	43,287
5b.4.8	DOC Staff Cost	-	-	-	-	-	-	11,290	1,693	12,983	-	-	12,983	-	-	-	-	-	-	-	122,646
5b.4.9	Utility Staff Cost	-	-	-	-	-	-	4,718	708	5,426	-	-	5,426	-	-	-	-	-	-	-	70,341
5b.4	Subtotal Period 5b Period-Dependent Costs	-	5,455	-	-	-	-	22,927	4,136	32,517	-	-	32,517	-	-	-	-	-	-	-	236,274
5b.0	TOTAL PERIOD 5b COST	-	31,606	-	-	-	-	24,813	8,342	64,761	578	241	63,941	-	-	-	-	-	-	171,070	237,994
PERIOD 5 TOTALS		-	31,606	-	-	-	-	24,813	8,342	64,761	578	241	63,941	-	-	-	-	-	-	171,070	237,994
TOTAL COST TO DECOMMISSION		17,731	94,941	14,820	6,756	30,429	49,464	1,261,386	241,927	1,717,454	1,099,775	552,724	64,956	340,130	150,629	1,127	643	1,547	24,630,430	1,025,076	10,085,120

TOTAL COST TO DECOMMISSION WITH 16.4% CONTINGENCY:	\$1,717,454	thousands of 2017 dollars
TOTAL NRC LICENSE TERMINATION COST IS 64.04% OR:	\$1,099,775	thousands of 2017 dollars
SPENT FUEL MANAGEMENT COST IS 32.18% OR:	\$552,724	thousands of 2017 dollars
NON-NUCLEAR DEMOLITION COST IS 3.78% OR:	\$64,956	thousands of 2017 dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	152,399	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,547	cubic feet
TOTAL SCRAP METAL REMOVED:	22,696	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,025,076	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 J

ISFSI DECOMMISSIONING

	<u>Page</u>
Monticello Nuclear Generating Plant – Scenarios 1 and 6	J-2
Monticello Nuclear Generating Plant – Scenarios 2 and 7	J-3
Monticello Nuclear Generating Plant – Scenarios 3 and 4	J-4
Monticello Nuclear Generating Plant – Scenario 5	J-5

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix J, Page 2 of 5

Table J-1
Monticello Nuclear Generating Plant
ISFSI Decommissioning Cost Estimate
Scenarios 1 and 6
(thousands of 2017 dollars)

Activity Description	Decon 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)	-	-	-	-	-	241	241	-	-	1,072
Decontamination (activated disposition)	-	131	3	784	8,058	-	8,976	27,284	965	-
License Termination (radiological surveys)	-	-	-	-	-	1,245	1,245	-	10,057	-
Subtotal	-	131	3	784	8,058	1,486	10,462	27,284	11,022	1,072
Supporting Costs										
NRC and NRC Contractor Fees and Costs	-	-	-	-	-	364	364	-	-	776
Insurance	-	-	-	-	-	110	110	-	-	-
Property taxes	-	-	-	-	-	226	226	-	-	-
Plant energy budget	-	-	-	-	-	-	-	-	-	-
Fixed Overhead	-	-	-	-	-	82	82	-	-	-
Railroad Track Maintenance	-	-	-	-	-	38	38	-	-	-
Security Staff Cost	-	-	-	-	-	308	308	-	-	4,999
Oversight Staff	-	-	-	-	-	260	260	-	-	3,792
Subtotal	-	-	-	-	-	1,389	1,389	-	-	9,568
Total (w/o contingency)	-	131	3	784	8,058	2,875	11,852	27,284	11,022	10,640
Total (w/25% contingency)							14,815			

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)

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix J, Page 3 of 5

Table J-2
Monticello Nuclear Generating Plant
ISFSI Decommissioning Cost Estimate
Scenarios 2 and 7
(thousands of 2017 dollars)

Activity Description	Decon 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)	-	-	-	-	-	241	241	-	-	1,072
Decontamination (activated disposition)	-	131	3	784	8,058	-	8,976	27,284	965	-
License Termination (radiological surveys)	-	-	-	-	-	1,259	1,259	-	10,196	-
Subtotal	-	131	3	784	8,058	1,500	10,476	27,284	11,160	1,072
Supporting Costs										
NRC and NRC Contractor Fees and Costs	-	-	-	-	-	364	364	-	-	776
Insurance	-	-	-	-	-	110	110	-	-	-
Property taxes	-	-	-	-	-	244	244	-	-	-
Plant energy budget	-	-	-	-	-	-	-	-	-	-
Fixed Overhead	-	-	-	-	-	82	82	-	-	-
Railroad Track Maintenance	-	-	-	-	-	38	38	-	-	-
Security Staff Cost	-	-	-	-	-	308	308	-	-	4,999
Oversight Staff	-	-	-	-	-	260	260	-	-	3,792
Subtotal	-	-	-	-	-	1,407	1,407	-	-	9,568
Total (w/o contingency)	-	131	3	784	8,058	2,907	11,883	27,284	11,160	10,640
Total (w/25% contingency)							14,854			

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)

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix J, Page 4 of 5

Table J-3
Monticello Nuclear Generating Plant
ISFSI Decommissioning Cost Estimate
Scenarios 3 and 4
(thousands of 2017 dollars)

Activity Description	Decon 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)	-	-	-	-	-	241	241	-	-	1,072
Decontamination (activated disposition)	30	2	6	14	208	-	260	834	365	-
License Termination (radiological surveys)	-	-	-	-	-	1,262	1,262	-	10,268	-
Subtotal	30	2	6	14	208	1,503	1,763	834	10,633	1,072
Supporting Costs										
NRC and NRC Contractor Fees and Costs	-	-	-	-	-	364	364	-	-	776
Insurance	-	-	-	-	-	110	110	-	-	-
Property taxes	-	-	-	-	-	244	244	-	-	-
Plant energy budget	-	-	-	-	-	-	-	-	-	-
Fixed Overhead	-	-	-	-	-	82	82	-	-	-
Railroad Track Maintenance	-	-	-	-	-	38	38	-	-	-
Security Staff Cost	-	-	-	-	-	308	308	-	-	4,999
Oversight Staff	-	-	-	-	-	260	260	-	-	3,792
Subtotal	-	-	-	-	-	1,407	1,407	-	-	9,568
Total (w/o contingency)	30	2	6	14	208	2,909	3,170	834	10,633	10,640
Total (w/25% contingency)							3,962			

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)

Monticello Nuclear Generating Plant
Decommissioning Cost Analysis

Document X01-1725-002, Rev. 0
Appendix J, Page 5 of 5

Table J-4
Monticello Nuclear Generating Plant
ISFSI Decommissioning Cost Estimate
Scenario 5
(thousands of 2017 dollars)

Activity Description	Decon 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)	-	-	-	-	-	241	241	-	-	1,072
Decontamination (activated disposition)	30	133	8	788	8,078	-	9,036	27,473	1,324	-
License Termination (radiological surveys)	-	-	-	-	-	1,259	1,259	-	10,196	-
Subtotal	30	133	8	788	8,078	1,500	10,536	27,473	11,519	1,072
Supporting Costs										
NRC and NRC Contractor Fees and Costs	-	-	-	-	-	364	364	-	-	776
Insurance	-	-	-	-	-	110	110	-	-	-
Property taxes	-	-	-	-	-	244	244	-	-	-
Plant energy budget	-	-	-	-	-	-	-	-	-	-
Fixed Overhead	-	-	-	-	-	82	82	-	-	-
Railroad Track Maintenance	-	-	-	-	-	38	38	-	-	-
Security Staff Cost	-	-	-	-	-	308	308	-	-	4,999
Oversight Staff	-	-	-	-	-	260	260	-	-	3,792
Subtotal	-	-	-	-	-	1,407	1,407	-	-	9,568
Total (w/o contingency)	30	133	8	788	8,078	2,907	11,943	27,473	11,519	10,640
Total (w/25% contingency)							14,929			

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)

CERTIFICATE OF SERVICE

I, Lynnette Sweet, hereby certify that I have this day served copies or summaries of the foregoing document on the attached list of persons.

xx by depositing a true and correct copy thereof, properly enveloped with postage paid in the United States Mail at Minneapolis, Minnesota

xx electronic filing

Docket No. E002/M-14-761
Xcel Energy's Miscellaneous Electric Service List

Dated this 1st day of December 2017

/s/

Lynnette Sweet
Regulatory Administrator

Appendix N9: Triennial Filing: Nuclear Decommissioning

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
David	Aafedt	daafedt@winthrop.com	Winthrop & Weinstine, P.A.	Suite 3500, 225 South Sixth Street Minneapolis, MN 554024629	Electronic Service	No	OFF_SL_14-761_Official
Sigurd W.	Anderson	mariner@eldinc.com	Engineering Lab Design	30910 716th St Lake City, MN 55041	Electronic Service	No	OFF_SL_14-761_Official
Generic Notice	Commerce Attorneys	commerce.attorneys@ag.state.mn.us	Office of the Attorney General-DOC	445 Minnesota Street Suite 1800 St. Paul, MN 55101	Electronic Service	Yes	OFF_SL_14-761_Official
Carl	Cronin	Regulatory.records@xcelenergy.com	Xcel Energy	414 Nicollet Mall FL 7 Minneapolis, MN 554011993	Electronic Service	No	OFF_SL_14-761_Official
Ian	Dobson	Residential.Utilities@ag.state.mn.us	Office of the Attorney General-RUD	1400 BRM Tower 445 Minnesota St St. Paul, MN 551012130	Electronic Service	Yes	OFF_SL_14-761_Official
Kristen	Eide Tollefson	N/A	R-CURE	28477 N Lake Ave Frontenac, MN 55026-1044	Paper Service	No	OFF_SL_14-761_Official
Sharon	Ferguson	sharon.ferguson@state.mn.us	Department of Commerce	85 7th Place E Ste 280 Saint Paul, MN 551012198	Electronic Service	No	OFF_SL_14-761_Official
Thomas P.	Harlan	harlan@mdh-law.com	Madigan, Dahl & Harlan, P.A.	222 South Ninth Street Suite 3150 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_14-761_Official
Kimberly	Hellwig	kimberly.hellwig@stoel.com	Stoel Rives LLP	33 South Sixth Street Suite 4200 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_14-761_Official
Philip	Mahowald	pmahowald@thejacobsongroup.com	Jacobson Law Group	180 East Fifth Street Suite 940 St. Paul, MN 55101	Electronic Service	No	OFF_SL_14-761_Official

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Andrew	Moratzka	andrew.moratzka@stoel.com	Stoel Rives LLP	33 South Sixth St Ste 4200 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_14-761_Official
Jeff	O'Neill	jeff.oneill@ci.monticello.mn.us	City of Monticello	505 Walnut Street Suite 1 Monticello, Minnesota 55362	Electronic Service	No	OFF_SL_14-761_Official
Carol A.	Overland	overland@legalelectric.org	Legalelectric - Overland Law Office	1110 West Avenue Red Wing, MN 55066	Electronic Service	No	OFF_SL_14-761_Official
Lisa	Perkett	lisa.h.perkett@xcelenergy.com	Xcel Energy Inc.	Capital Asset Acctg Dept 7th Floor 414 Nicollet Mall Minneapolis, MN 554011993	Electronic Service	No	OFF_SL_14-761_Official
Laureen	Ross McCalib	lrossmccalib@greenergy.com	Great River Energy	12300 Elm Creek Boulevard Maple Grove, MN 55369-4718	Electronic Service	No	OFF_SL_14-761_Official
Daniel P	Wolf	dan.wolf@state.mn.us	Public Utilities Commission	121 7th Place East Suite 350 St. Paul, MN 551012147	Electronic Service	Yes	OFF_SL_14-761_Official

Appendix N9: Triennial Filing: Nuclear Decommissioning

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
David	Aafedt	daafedt@winthrop.com	Winthrop & Weinstine, P.A.	Suite 3500, 225 South Sixth Street Minneapolis, MN 554024629	Electronic Service	No	GEN_SL_Northern States Power Company dba Xcel Energy-Elec_Xcel Misl Electric
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Document X01-1725-001, Rev. 0

DECOMMISSIONING COST ANALYSIS
for the
PRAIRIE ISLAND NUCLEAR GENERATING PLANT



prepared for

Xcel Energy

prepared by

TLG Services, Inc.
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October 2017

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page ii of xxviii***

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***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page iii of xxviii***

TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
EXECUTIVE SUMMARY	viii
1. INTRODUCTION	1-1
1.1 Objectives of Study	1-1
1.2 Site Description.....	1-2
1.3 Regulatory Guidance	1-3
1.3.1 High-Level Radioactive Waste Management.....	1-5
1.3.2 Low-Level Radioactive Waste Disposal	1-9
1.3.3 Radiological Criteria for License Termination.....	1-10
2. DECOMMISSIONING ALTERNATIVES.....	2-1
2.1 DECON.....	2-3
2.1.1 Period 0 (Pre-shutdown) and Period 1 - Preparations.....	2-3
2.1.2 Period 2 - Decommissioning Operations.....	2-5
2.1.3 Period 3 - Site Restoration	2-9
2.1.4 ISFSI Operations and Decommissioning	2-10
2.2 SAFSTOR	2-11
2.2.1 Period 0 (Pre-shutdown) and Period 1 - Preparations.....	2-11
2.2.2 Period 2 - Dormancy.....	2-12
2.2.3 Periods 3 and 4 - Delayed Decommissioning.....	2-13
2.2.4 Period 5 - Site Restoration	2-14
3. COST ESTIMATES	3-1
3.1 Basis of Estimates	3-1
3.2 Methodology	3-1
3.3 Impact of Decommissioning Multiple Reactor Units	3-3
3.4 Financial Components of the Cost Model	3-4
3.4.1 Contingency	3-4
3.4.2 Financial Risk.....	3-7
3.5 Site-Specific Considerations.....	3-8
3.5.1 Spent Fuel Management.....	3-8
3.5.2 Reactor Vessel and Internal Components	3-13
3.5.3 Primary System Components.....	3-14
3.5.4 Main Turbine and Condenser.....	3-15
3.5.5 Transportation Methods	3-15
3.5.6 Low-Level Radioactive Waste Disposal	3-17
3.5.7 Site Conditions Following Decommissioning	3-18

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page iv of xxviii***

TABLE OF CONTENTS
(continued)

<u>SECTION</u>	<u>PAGE</u>
3.6 Assumptions	3-18
3.6.1 Estimating Basis	3-18
3.6.2 Labor Costs	3-19
3.6.3 Design Conditions	3-20
3.6.4 General	3-21
3.7 Cost Estimate Summary	3-25
4. SCHEDULE ESTIMATE	4-1
4.1 Schedule Estimate Assumptions	4-1
4.2 Project Schedule	4-2
5. RADIOACTIVE WASTES	5-1
6. RESULTS	6-1
7. REFERENCES	7-1

TABLES

Scenario 1, Decommissioning Cost Elements	xxii
Scenario 2, Decommissioning Cost Elements	xxiii
Scenario 3, Decommissioning Cost Elements	xxiv
Scenario 4, Decommissioning Cost Elements	xxv
Scenario 5, Decommissioning Cost Elements	xxvi
Scenario 6, Decommissioning Cost Elements	xxvii
Scenario 7, Decommissioning Cost Elements	xxviii
3.1 Scenario 1, Schedule of Total Annual Expenditures, Unit 1	3-27
3.2 Scenario 1, Schedule of Total Annual Expenditures, Unit 2	3-29
3.3 Scenario 2, Schedule of Total Annual Expenditures, Unit 1	3-31
3.4 Scenario 2, Schedule of Total Annual Expenditures, Unit 2	3-33
3.5 Scenario 3, Schedule of Total Annual Expenditures, Unit 1	3-35
3.6 Scenario 2, Schedule of Total Annual Expenditures, Unit 2	3-38
3.7 Scenario 4 Schedule of Total Annual Expenditures, Unit 1	3-41
3.8 Scenario 4 Schedule of Total Annual Expenditures, Unit 2	3-48

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page v of xxviii***

TABLE OF CONTENTS

(continued)

SECTION

PAGE

TABLES

(continued)

3.9	Scenario 5 Schedule of Total Annual Expenditures, Unit 1	3-55
3.10	Scenario 5 Schedule of Total Annual Expenditures, Unit 2	3-57
3.11	Scenario 6, Schedule of Total Annual Expenditures, Unit 1	3-59
3.12	Scenario 6, Schedule of Total Annual Expenditures, Unit 2	3-62
3.13	Scenario 7, Schedule of Total Annual Expenditures, Unit 1	3-65
3.14	Scenario 7, Schedule of Total Annual Expenditures, Unit 2	3-68
5.1	Scenario 1 Decommissioning Waste Summary	5-5
5.2	Scenario 2 Decommissioning Waste Summary	5-6
5.3	Scenario 3 Decommissioning Waste Summary	5-7
5.4	Scenario 4 Decommissioning Waste Summary	5-8
5.5	Scenario 5 Decommissioning Waste Summary	5-9
5.6	Scenario 6 Decommissioning Waste Summary	5-10
5.7	Scenario 7 Decommissioning Waste Summary	5-11
6.1	Scenario 1, Cost Summary, Decommissioning Cost Elements	6-4
6.2	Scenario 2, Cost Summary, Decommissioning Cost Elements	6-5
6.3	Scenario 3, Cost Summary, Decommissioning Cost Elements	6-6
6.4	Scenario 4, Cost Summary, Decommissioning Cost Elements	6-7
6.5	Scenario 5, Cost Summary, Decommissioning Cost Elements	6-8
6.6	Scenario 6, Cost Summary, Decommissioning Cost Elements	6-9
6.7	Scenario 7, Cost Summary, Decommissioning Cost Elements	6-10

FIGURES

1.1	Prairie Island Nuclear Generating Plant General Plan.....	1-12
1.2	Prairie Island Nuclear Generating Plant Aerial View	1-13
1.3	Prairie Island Nuclear Generating Plant Reactor Building Section	1-14
3.1	Prairie Island Nuclear Generating Plant Scenario 2 Manpower Levels	3-71
3.2	Prairie Island Nuclear Generating Plant Scenario 7 Manpower Levels	3-72
4.1	DECON Activity Schedule.....	4-3
4.2	Decommissioning Timelines, Scenario 1.....	4-6
4.3	Decommissioning Timelines, Scenario 2.....	4-7
4.4	Decommissioning Timelines, Scenario 3.....	4-8
4.5	Decommissioning Timelines, Scenario 4.....	4-9
4.6	Decommissioning Timelines, Scenario 5.....	4-10
4.7	Decommissioning Timelines, Scenario 6.....	4-11

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page vi of xxviii***

TABLE OF CONTENTS
(continued)

<u>SECTION</u>	<u>PAGE</u>
-----------------------	--------------------

FIGURES (continued)

4.8 Decommissioning Timelines, Scenario 7.....	4-12
5.1 Radioactive Waste Disposition	5-3
5.2 Decommissioning Waste Destinations, Radiological.....	5-4

APPENDICES

A. Unit Cost Factor Development.....	A-1
B. Unit Cost Factor Listing.....	B-1
C. Detailed Cost Analysis, Scenario 1	C-1
D. Detailed Cost Analysis, Scenario 2	D-1
E. Detailed Cost Analysis, Scenario 3	E-1
F. Detailed Cost Analysis, Scenario 4	F-1
G. Detailed Cost Analysis, Scenario 5	G-1
H. Detailed Cost Analysis, Scenario 6	H-1
I. Detailed Cost Analysis, Scenario 7	I-1
J. Detailed Cost Analysis, ISFSI.....	J-1

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page vii of xxviii***

REVISION LOG

No.	Date	Item Revised	Reason for Revision
0	10-17-2017		Original Issue

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page viii of xxviii***

EXECUTIVE SUMMARY

This report presents estimates of the cost to decommission the Prairie Island Nuclear Generating Plant (Prairie Island) for the identified decommissioning scenarios following a cessation of plant operations and the operation and eventual decommissioning of the on-site Independent Spent Fuel Storage Installation (ISFSI). The estimates are designed to provide Xcel Energy with the information to assess its current decommissioning liability, as it relates to Prairie Island.

The analysis relies upon site-specific, technical information from an evaluation prepared in 2014,^[1] updated to reflect current assumptions pertaining to the disposition of the nuclear plant and relevant industry experience in undertaking such projects. The costs are based on several key assumptions in areas of regulation, component characterization, high-level radioactive waste management, low-level radioactive waste disposal, performance uncertainties (contingency) and site restoration requirements.

The analysis is not a detailed engineering evaluation, but an estimate prepared in advance of the detailed engineering required to carry out the decommissioning of the nuclear units. It may also not reflect the actual plan to decommission Prairie Island; 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 the decommissioning is the removal and disposal of the contaminated systems and structures so that the plant's operating licenses can be terminated. The analysis recognizes that spent fuel will be stored at the site in the plant's storage pool and/or in an Independent Spent Fuel Storage Installation (ISFSI) until such time that it can be transferred to a Department of Energy (DOE) facility. Consequently, the estimates also include those costs to manage and subsequently decommission these storage facilities.

The current cost estimates assume that Prairie Island Unit 1 ceases operations in 2033, and 2034 for Unit 2. The cost estimates assume that the shutdown dates of the nuclear units are 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.). This estimate includes additional resources to support the engineering, planning, and licensing efforts for the station; this is done to support a decommissioning schedule similar to the prior estimate. The estimates include the continued operation of the auxiliary building as an interim wet fuel storage facility for

¹ "Decommissioning Cost Analysis for the Prairie Island Nuclear Generating Plant," Document No. X01-1617-007, Rev. 0, TLG Services, Inc., September 2014

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page ix of xxviii***

approximately five years after operations cease. The spent fuel will remain in the ISFSI until the DOE is able to complete the transfer of the fuel to a federal facility (e.g., a monitored retrievable storage facility).^[2] The estimates also include the dismantling of non-essential structures and limited restoration of the site.

The costs to decommission Prairie Island, for the scenarios evaluated, are tabulated at the end of this section. Costs are reported in 2017 dollars and include monies anticipated to be spent for radiological remediation and operating license termination, spent fuel management, and site restoration activities.

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

Alternatives and Regulations

The ultimate objective of the decommissioning process is to reduce the inventory of contaminated and activated material so that the licenses can be terminated. The Nuclear Regulatory Commission (NRC or Commission) provided initial 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 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]

² Projected expenditures for spent fuel management identified in the cost analysis do not consider any compensation for damages with regard to the delays incurred by Xcel Energy in the timely removal of spent fuel by the DOE.

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, 53 Fed. Reg. 24018, June 27, 1988

⁴ Ibid. Page FR24022, Column 3

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page x of xxviii***

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 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 radioactivity 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 also 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 based upon several factors (e.g., no licensee has committed to pursuing the entombment option, the unresolved issues associated with the disposition of greater-than-Class C material (GTCC), and the NRC's current priorities) at least until after the additional research studies are complete. The Commission concurred with the staff's recommendation. In a draft regulatory basis document published in March 2017 in support of rulemaking that would amend NRC regulations concerning nuclear plant decommissioning, the NRC staff proposes removing any discussion of the ENTOMB option from existing guidance documents since the method is not deemed practically feasible.

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 amendments allow for greater public participation and better define the transition

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, 61 Fed. Reg. 39278, July 29, 1996

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Page xi of xxviii***

process from operations to decommissioning. Regulatory Guide 1.184 Revision 1, issued in October 2013, 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 in the amended regulations. The format and content of the estimates is also consistent with the recommendations of Regulatory Guide 1.202, issued 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 are included in this analysis, including the ISFSI decommissioning estimate (Appendix J).

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 licenses expires in 2033 and 2034 for Units 1 and 2, respectively. The scenarios consist of five DECON scenarios, with differing spent fuel management assumptions, but essentially no changes to the decommissioning costs and timing of the power block. There are also two SAFSTOR scenarios (Scenarios 6 and 7) each corresponding to the first two DECON scenario spent fuel management assumptions. The spent fuel in the plant's spent fuel storage pool is transferred to the ISFSI within the first five 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 (2064 in Scenarios 1 & 6, 2077 in Scenarios 2, 5 & 7, 2117 in Scenario 3, and 2217 in Scenario 4).

⁸ "Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors," Regulatory Guide 1.202, 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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page xii of xxviii***

Scenario	1 st Spent Fuel Canister Replacement	1 st Spent Fuel Assembly Removed from Prairie Island	Last Spent Fuel Assembly Removed from Prairie Island	Scenario Identification
1	n/a	2027	2064	DECON with 32 Year DFS ⁺
2	n/a	2053	2077	DECON with 60 Year DFS
3	2045	2093	2117	DECON with 100 Year DFS
4	2045	2193	2217	DECON with 200 Year DFS
5	2045	2053	2077	DECON with 60 Year DFS and recasking
6	n/a	2027	2064	SAFSTOR with 32 Year DFS
7	n/a	2053	2077	SAFSTOR with 60 Year DFS

⁺ Dry Fuel Storage

For Scenarios 1 and 6, although they only provide a total fuel storage period of 32 years following plant shutdown, some of the Prairie Island casks have been in storage since 1995. Xcel Energy directed TLG Services to not include the cost of transferring the spent fuel in dry storage to new canisters for those casks that exceed 50 years. The assumption to not transfer spent fuel at 50 years total storage duration for these two scenarios was premised on the likelihood that the life of the canisters could be successfully managed for the additional years.

For Scenarios 2 and 7, although they provide 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.

In Scenarios 3, 4 and 5, the DSCs are assumed to be replaced after fifty years of use. Since the auxiliary building spent fuel storage pool and fuel handling facilities are removed by the year 2040, a dry fuel transfer facility is assumed to be constructed on site to perform the transfers from the old to the new DSCs. For Scenarios 3 and 5, only one such transfer is needed over the time frame assumed (some fuel canisters in Scenario 5 will not require recasking). For Scenario 4, the spent fuel will be transferred three times following initial placement in the ISFSI.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Page xiii of xxviii*****Methodology**

The methodology used to develop the estimates 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 is required for calculating the carrying costs, which include program management, administration, field engineering, equipment rental, quality assurance, and security. This systematic approach for assembling decommissioning estimates ensures a high degree of confidence in the reliability of the resulting costs.

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

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

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

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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Page xiv of xxviii***

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.

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

Disposition of the various waste streams produced by the decommissioning process considered all options and services currently available to Xcel Energy. The majority of the low-level radioactive waste designated for direct disposal (Class A^[14]) can be sent to EnergySolutions’ facility in Clive, Utah. Therefore, disposal costs for Class A waste were based upon representative rates. This facility is not licensed to receive the higher activity portion (Classes B and C) of the decommissioning waste stream.

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.

¹² “Low-Level Radioactive Waste Policy Act,” Public Law 96-573, 1980

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

¹⁴ Waste is classified in accordance with U.S. Code of Federal Regulations, Title 10, Part 61.55

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Page xv of xxviii***

The dismantling of the components residing closest to the reactor core generates radioactive waste considered unsuitable for shallow-land disposal (i.e., low-level radioactive waste with concentrations of radionuclides that exceed the limits established by the NRC for Class C radioactive waste (GTCC)). The Low-Level Radioactive Waste Policy Amendments Act of 1985 assigned the federal government the responsibility for the disposal of this material. The Act also stated that the beneficiaries of the activities resulting in the generation of such radioactive waste bear all reasonable costs of disposing of such waste. 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 DOE facility as it is generated (depending upon the timing of the decommissioning and whether the spent fuel has been removed from the site prior to the start of decommissioning).

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 isolate the portion of waste that does not require disposal as radioactive waste, compaction, incineration or metal melt. The estimates reflect the savings from waste recovery/volume reduction.

High-Level Radioactive Waste Management

Congress passed the “Nuclear Waste Policy Act”^[15] (NWP) 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 NWP 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. NWP, along with the individual contracts with the utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

¹⁵ “Nuclear Waste Policy Act of 1982 and Amendments,” DOE’s Office of Civilian Radioactive Management, 1982

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Page xvi of xxviii***

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.

In 2010 the Obama 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."^[16]

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"^[17]
- "[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."^[18]

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..."^[19] This document states:

"With the appropriate authorizations from Congress, the Obama Administration planned to implement a program over the next 10 years that would have:

¹⁶ Charter of the Blue Ribbon Commission on America's Nuclear Future, "Objectives and Scope of Activities," 2010

¹⁷ "Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy," p. 32, January 2012

¹⁸ Ibid., p.27

¹⁹ "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," U.S. DOE, January 11, 2013

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page xvii of xxviii***

- 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.”^[20]

The NRC’s review of DOE’s license application to construct a geologic repository at Yucca Mountain was suspended in 2011 when the Obama Administration slashed the budget for completing that work. However, the US Court of Appeals for the District of Columbia Circuit issued a writ of mandamus (in August 2013) ^[21] 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 complete with the publication of the five-volume safety evaluation report. A supplement to DOE’s environmental impact statement and an adjudicatory hearing on the contentions filed by interested parties must be completed before a licensing decision can be made.

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.”^[22]

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

²⁰ Ibid., p.2

²¹ United States Court of Appeals for the District Of Columbia Circuit, In Re: Aiken County, et al, August 2013

²² Minnesota Statute 216B.1614, “Nuclear Power Plant Decommissioning and Storage of Used Nuclear Fuel”

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page xviii of xxviii***

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.”^[23]

Xcel Energy’s current spent fuel management plan for the Prairie Island spent fuel is based in general upon:

- 1) Fuel transferred from the pool to the ISFSI within 5 years of shutdown;
- 2) Exchange of Prairie Island 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, 2, 6, and 7); the canisters and NUHOMS are periodically replaced in Scenarios 3, 4 and 5. Canisters that are unloaded in the spent fuel transfer operation will be surveyed for neutron activation.
- 4) As an allowance, some of these canisters and NUHOMS modules from the first off-load operation are assumed to be mildly neutron activated and therefore must be disposed of as radioactive waste.

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).^[24] 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. The assemblies are packaged into dry shielded canisters (DSCs) over the first five years after shutdown for transfer to the ISFSI for interim storage. It is assumed that this period provides the necessary cooling for the final cores to meet the transport and/or storage requirements for decay heat.

An ISFSI, operated under a Part 72 Site Specific License (in accordance with 10 CFR 72^[25]), 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.

²³ Ibid.

²⁴ U.S. Code of Federal Regulations, Title 10, Part 50, “Domestic Licensing of Production and Utilization Facilities,” Subpart 54 (bb), “Conditions of Licenses”

²⁵ U.S. Code of Federal Regulations, Title 10, Part 72.40

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Page xix of xxviii***

DOE has breached its obligations to remove fuel from reactor sites, and has also failed to provide the plant owners with information about how it will ultimately perform. DOE officials have stated that DOE does not have an obligation to accept already-canistered fuel without an amendment to DOE's contracts with plant licensees to remove the fuel (the "Standard Contract"), but DOE has not explained what any such amendment would involve. Consequently, Xcel Energy has no information or expectations on how DOE will remove fuel from the site in the future. In the absence of information about how DOE will perform, and for purposes of this analysis only, it is assumed that DOE will accept already-canistered fuel. If this assumption is incorrect, it is assumed that DOE will have liability for costs incurred to transfer the fuel to DOE-supplied containers.

Xcel Energy's position is that the DOE has a contractual obligation to accept Prairie Island'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, 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. The cost for the interim storage of spent fuel has been calculated and is separately presented as "Spent Fuel Management" expenditures in this report.

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. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The cost to dismantle site structures with a work force already mobilized is more efficient and less costly than if the process were deferred. Experience at shutdown generating stations has shown that plant facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public and the demolition work force.

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 will also be left intact.

Consequently, non-essential site structures addressed by this analysis are completely removed (including foundations) as required by Minnesota statute ^[26].

²⁶ Minnesota Administrative Rule part 7035.0400 "General Requirements"

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Page xx of xxviii***

The site is then graded and stabilized. The cost for the site restoration of non-essential and/or non-contaminated structures has been calculated and is separately presented as "Site Restoration" expenditures in this report.

Summary

The costs to decommission the Prairie Island station were evaluated for several decommissioning scenarios, based upon the DECON and SAFSTOR decommissioning alternatives. Regardless of the timing of the decommissioning activities, the estimates to decommission Prairie Island assume the removal of all contaminated and activated plant components and structural materials such that Xcel Energy may then have unrestricted use of the site with no further requirements for any operating license. In most of the scenarios, spent fuel remains on site following the decommissioning and site restoration of the power block structures. The spent fuel remains in storage at the site until such time that the transfer to a DOE facility can be completed. Once the transfer is complete, the storage facilities are also decommissioned.

The alternatives evaluated in this analysis 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 J. The major cost components are also identified in the cost summary provided at the end of this section.

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

The cost elements in the estimates for the five DECON and two SAFSTOR alternatives are assigned to one of three subcategories: NRC License Termination (radiological remediation), Spent Fuel Management, and Site Restoration. The subcategory "NRC License Termination" is used to accumulate costs that are consistent with "decommissioning" as defined by the NRC in its financial assurance regulations (i.e., 10 CFR §50.75). The cost reported for this subcategory is generally sufficient to terminate the unit's operating license, recognizing that there may be some additional cost impact from spent fuel management. The License Termination cost subcategory also includes costs to decommission the ISFSI (as required by 10 CFR §72.30). Section 3.4.1 provides the basis for the ISFSI decommissioning cost.

The "Spent Fuel Management" subcategory contains costs associated with the containerization and transfer of spent fuel from the wet storage pool to a DOE

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Page xxi of xxviii***

transport cask or to the ISFSI for interim storage, as well as the transfer of the spent fuel in storage at the ISFSI to the DOE. Costs are included for the operation of the storage pool and the management of the ISFSI until such time that the transfer is complete. It does not include any spent fuel management expenses incurred prior to the cessation of plant operations, nor does it include any costs related to the final disposal of the spent fuel.

“Site Restoration” is used to capture costs associated with the dismantling and demolition of buildings and facilities demonstrated to be free from contamination. This includes structures never exposed to radioactive materials, as well as those facilities that have been decontaminated to appropriate levels. Structures are completely removed (including foundations) and backfilled to conform to local surface elevation.

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

As noted within this document, the estimates were developed and costs are presented in 2017 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.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page xxii of xxviii***

**SCENARIO 1: DECON WITH 32 YEARS DFS
DECOMMISSIONING COST ELEMENTS**
(thousands of 2017 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	11,899	18,712	30,611
Removal	103,458	132,270	235,727
Packaging	37,613	37,981	75,594
Transportation	8,386	8,908	17,294
Waste Disposal	65,232	68,234	133,465
Off-site Waste Processing	13,548	16,016	29,565
Program Management [1]	224,195	206,995	431,191
Site Security	116,834	106,450	223,284
Spent Fuel Pool Isolation	13,445	8,963	22,409
Spent Fuel Management	120,903	118,936	239,839
Insurance and Regulatory Fees	17,840	15,425	33,266
Energy	9,248	8,349	17,597
Characterization and Licensing Surveys	17,216	19,157	36,374
Property Taxes	54,492	51,594	106,086
Miscellaneous	7,188	7,147	14,335
Railroad Track Maintenance	2,598	2,517	5,116
Retention and Severance	28,423	28,423	56,845
Security Modifications	5,000	5,000	10,000
Prairie Island Indian Community Payments	40,000	38,750	78,750
Total [3]	897,520	899,828	1,797,347

Cost Element	Unit 1	Unit 2	Total
NRC License Termination	571,980	561,832	1,133,812
Spent Fuel Management	274,479	271,262	545,741
Site Restoration	51,061	66,733	117,795
Total [3]	897,520	899,828	1,797,347

[1] Includes engineering costs

[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

[3] Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page xxiii of xxviii***

**SCENARIO 2: DECON WITH 60 YEAR DFS
DECOMMISSIONING COST ELEMENTS**
(thousands of 2017 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	11,899	18,711	30,610
Removal	103,561	132,372	235,933
Packaging	37,613	37,981	75,594
Transportation	8,386	8,908	17,294
Waste Disposal	65,232	68,234	133,465
Off-site Waste Processing	13,548	16,016	29,565
Program Management [1]	233,817	216,617	450,434
Site Security	146,769	136,385	283,153
Spent Fuel Pool Isolation	13,445	8,963	22,409
Spent Fuel Management	144,710	142,743	287,453
Insurance and Regulatory Fees	21,494	19,079	40,573
Energy	9,246	8,347	17,593
Characterization and Licensing Surveys	17,216	19,157	36,374
Property Taxes	69,785	66,180	135,965
Miscellaneous	7,187	7,145	14,332
Railroad Track Maintenance	3,461	3,380	6,841
Retention and Severance	28,423	28,423	56,845
Security Modifications	5,000	5,000	10,000
Prairie Island Indian Community Payments	56,250	55,000	111,250
Total [3]	997,041	998,643	1,995,684

Cost Element	Unit 1	Unit 2	Total
NRC License Termination	572,618	561,764	1,134,382
Spent Fuel Management	373,251	370,034	743,284
Site Restoration	51,173	66,845	118,017
Total [3]	997,041	998,643	1,995,684

[1] Includes engineering costs

[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

[3] Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page xxiv of xxviii***

**SCENARIO 3: DECON WITH 100 YEAR DFS
DECOMMISSIONING COST ELEMENTS**
(thousands of 2017 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	11,918	18,730	30,648
Removal	104,039	132,850	236,889
Packaging	37,611	37,979	75,590
Transportation	8,270	8,792	17,061
Waste Disposal	64,469	67,471	131,940
Off-site Waste Processing	13,548	16,016	29,565
Program Management [1]	294,495	277,295	571,790
Site Security	236,616	226,232	462,847
Spent Fuel Pool Isolation	13,445	8,963	22,409
Spent Fuel Management	592,003	590,037	1,182,040
Insurance and Regulatory Fees	32,742	30,327	63,069
Energy	9,246	8,347	17,593
Characterization and Licensing Surveys	17,216	19,157	36,374
Property Taxes	112,875	109,977	222,852
Miscellaneous	7,187	7,145	14,332
Railroad Track Maintenance	6,115	6,034	12,150
Retention and Severance	28,423	28,423	56,845
Security Modifications	5,000	5,000	10,000
Prairie Island Indian Community Payments	106,250	105,000	211,250
Total [3]	1,701,468	1,703,777	3,405,245

Cost Element	Unit 1	Unit 2	Total
NRC License Termination	568,261	558,114	1,126,374
Spent Fuel Management	1,082,353	1,079,137	2,161,490
Site Restoration	50,855	66,527	117,381
Total [3]	1,701,468	1,703,777	3,405,245

[1] Includes engineering costs

[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

[3] Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page xxv of xxviii***

**SCENARIO 4: DECON WITH 200 YEAR DFS
DECOMMISSIONING COST ELEMENTS**
(thousands of 2017 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	11,918	18,730	30,648
Removal	104,037	132,849	236,887
Packaging	37,611	37,979	75,590
Transportation	8,270	8,792	17,061
Waste Disposal	64,469	67,471	131,940
Off-site Waste Processing	13,548	16,016	29,565
Program Management [1]	430,976	413,776	844,751
Site Security	466,998	456,614	923,613
Spent Fuel Pool Isolation	13,445	8,963	22,409
Spent Fuel Management	1,229,254	1,227,287	2,456,541
Insurance and Regulatory Fees	60,862	58,448	119,310
Energy	9,246	8,347	17,593
Characterization and Licensing Surveys	17,216	19,157	36,374
Property Taxes	225,076	222,177	447,253
Miscellaneous	7,187	7,145	14,332
Railroad Track Maintenance	12,752	12,671	25,422
Retention and Severance	28,423	28,423	56,845
Security Modifications	5,000	5,000	10,000
Prairie Island Indian Community Payments	231,250	230,000	461,250
Total [3]	2,977,539	2,979,847	5,957,385

Cost Element	Unit 1	Unit 2	Total
NRC License Termination	568,259	558,112	1,126,371
Spent Fuel Management	2,358,425	2,355,208	4,713,633
Site Restoration	50,855	66,527	117,381
Total [3]	2,977,539	2,979,847	5,957,385

[1] Includes engineering costs

[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

[3] Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page xxvi of xxviii***

**SCENARIO 5: DECON WITH 60 YEAR DFS WITH RECASKING
DECOMMISSIONING COST ELEMENTS**
(thousands of 2017 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	11,918	18,730	30,648
Removal	103,830	132,642	236,472
Packaging	37,614	37,982	75,596
Transportation	8,389	8,911	17,300
Waste Disposal	65,396	68,398	133,795
Off-site Waste Processing	13,548	16,016	29,565
Program Management [1]	233,817	216,617	450,434
Site Security	146,769	136,385	283,153
Spent Fuel Pool Isolation	13,445	8,963	22,409
Spent Fuel Management	230,141	228,174	458,315
Insurance and Regulatory Fees	21,494	19,079	40,573
Energy	9,246	8,347	17,593
Characterization and Licensing Surveys	17,216	19,157	36,374
Property Taxes	69,078	66,180	135,258
Miscellaneous	7,187	7,145	14,332
Railroad Track Maintenance	3,461	3,380	6,841
Retention and Severance	28,423	28,423	56,845
Security Modifications	5,000	5,000	10,000
Prairie Island Indian Community Payments	56,250	55,000	111,250
Total [3]	1,082,223	1,084,531	2,166,754

Cost Element	Unit 1	Unit 2	Total
NRC License Termination	572,323	562,164	1,134,487
Spent Fuel Management	458,457	455,241	913,698
Site Restoration	51,443	67,126	118,569
Total [3]	1,082,223	1,084,531	2,166,754

[1] Includes engineering costs

[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

[3] Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page xxvii of xxviii***

**SCENARIO 6: SAFSTOR WITH 32 YEAR DFS
DECOMMISSIONING COST ELEMENTS**
(thousands of 2017 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	7,828	16,467	24,295
Removal	108,449	137,038	245,487
Packaging	34,003	34,343	68,345
Transportation	6,683	7,171	13,854
Waste Disposal	53,612	55,346	108,959
Off-site Waste Processing	13,846	16,314	30,160
Program Management [1]	312,153	278,025	590,178
Site Security	194,238	129,474	323,713
Spent Fuel Pool Isolation	13,445	8,963	22,409
Spent Fuel Management	117,316	114,954	232,270
Insurance and Regulatory Fees	53,753	50,594	104,346
Energy	20,162	19,753	39,915
Characterization and Licensing Surveys	18,118	20,359	38,478
Property Taxes	156,602	156,387	312,989
Miscellaneous	17,651	21,979	39,630
Railroad Track Maintenance	4,362	4,281	8,644
Retention and Severance	28,423	28,423	56,845
Security Modifications	5,000	5,000	10,000
Prairie Island Indian Community Payments	40,000	38,750	78,750
Total [3]	1,205,645	1,143,621	2,349,266

Cost Element	Unit 1	Unit 2	Total
NRC License Termination	908,226	841,160	1,749,386
Spent Fuel Management	242,850	233,483	476,333
Site Restoration	54,569	68,978	123,547
Total [3]	1,205,645	1,143,621	2,349,266

[1] Includes engineering costs

[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

[3] Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Page xxviii of xxviii***

**SCENARIO 7: SAFSTOR WITH 60 YEAR DFS
DECOMMISSIONING COST ELEMENTS**
(thousands of 2017 dollars)

Cost Element	Unit 1	Unit 2	Total
Decontamination	7,825	16,452	24,276
Removal	108,474	136,691	245,165
Packaging	34,003	34,343	68,346
Transportation	6,683	7,171	13,854
Waste Disposal	53,613	55,347	108,960
Off-site Waste Processing	13,846	16,314	30,160
Program Management [1]	313,922	284,127	598,049
Site Security	200,143	166,411	366,553
Spent Fuel Pool Isolation	13,445	8,963	22,409
Spent Fuel Management	138,784	136,422	275,207
Insurance and Regulatory Fees	54,180	50,827	105,007
Energy	20,134	19,489	39,623
Characterization and Licensing Surveys	18,118	20,359	38,478
Property Taxes	161,296	156,387	317,682
Miscellaneous	17,668	21,945	39,613
Railroad Track Maintenance	4,362	4,281	8,644
Retention and Severance	28,423	28,423	56,845
Security Modifications	5,000	5,000	10,000
Prairie Island Indian Community Payments	56,250	55,000	111,250
Total [3]	1,256,169	1,223,951	2,480,120

Cost Element	Unit 1	Unit 2	Total
NRC License Termination	883,602	846,342	1,729,944
Spent Fuel Management	317,887	308,520	626,407
Site Restoration	54,680	69,089	123,769
Total [3]	1,256,169	1,223,951	2,480,120

[1] Includes engineering costs

[2] Includes costs for the dry storage system components, spent fuel loading and transfer, spent fuel pool O&M and EP fees, but excludes program management costs (staffing), security and other related costs

[3] Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Section 1, Page 1 of 14***

1. INTRODUCTION

This report presents estimates of the cost to decommission the Prairie Island Nuclear Generating Plant (Prairie Island) and the operation and eventual decommissioning of the on-site Independent Spent Fuel Storage Installation (ISFSI) for the selected decommissioning scenarios following the scheduled cessation of plant operations. The estimates are designed to provide Xcel Energy with the information to assess its current decommissioning liability, as it relates to Prairie Island.

The analysis relies upon site-specific, technical information from an earlier evaluation prepared in 2014,^[1] updated to reflect current assumptions pertaining to the disposition of the nuclear plant and relevant industry experience in undertaking such projects. The costs are based on several key assumptions in areas of regulation, component characterization, high-level radioactive waste management, low-level radioactive waste disposal, performance uncertainties (contingency) and site restoration requirements.

The analysis is not a detailed engineering evaluation, but an estimate prepared in advance of the detailed engineering required to carry out the decommissioning of the nuclear units. It may also not reflect the actual plan to decommission Prairie Island; the plan may differ from the assumptions made in this analysis based on facts that exist at the time of decommissioning.

The 2014 plant inventory was reviewed for this analysis. It serves as the basis for the decontamination and dismantling requirements, cost, and the decommissioning waste streams. The review confirmed that there were no substantive changes to the configuration of the plant or site facilities that would impact decommissioning over the last three years. Removal of new FLEX facilities was included.

1.1 OBJECTIVES OF STUDY

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

The operating licenses were originally issued for the plant in August 1973 and October 1974 for Units 1 and 2, respectively, and were valid for a period of 40

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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Section 1, Page 2 of 14***

years. In April 2008, Nuclear Management Company (as agent for Xcel Energy), submitted an application for renewed licenses (i.e., 20 year extensions). The application was approved by the NRC in June 2011. Therefore, for the purposes of this study, final shutdown dates (license expiration) for Unit 1 and Unit 2 are August 9, 2033 and October 29, 2034, respectively, assuming a 60-year operating life (the current operating licenses' expiration dates).

1.2 SITE DESCRIPTION

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

The Nuclear Steam Supply System (NSSS) consists of a pressurized water reactor and a two-loop reactor coolant system. The system is comprised of the reactor vessel and two closed reactor coolant loops connected in parallel to the reactor vessel, each containing a reactor coolant pump and a steam generator. An electrically heated pressurizer is connected to one of the loops.

The system is housed within the reactor containment vessel, a free-standing cylindrical steel shell with a hemispherical dome and ellipsoidal bottom designed to withstand the internal pressure accompanying a loss-of-coolant accident. The reactor containment vessel is surrounded by a cylindrical shield building constructed of reinforced concrete, which serves as a radiation shielding for normal operations and for the loss-of-coolant condition.

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

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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 1, Page 3 of 14***

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 the SAFSTOR alternative, the process is restricted in overall duration to 60 years, unless it can be shown that a longer duration is necessary to protect public health and safety. The guidelines for ENTOMB are similar, providing the NRC with both sufficient leverage and flexibility to ensure that these deferred options are only used in situations where it is reasonable and consistent with the definition of decommissioning. At the conclusion of a 50 to 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 re-evaluate the 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. The staff also found that

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 1, Page 4 of 14***

additional rulemaking would be needed before this option could be treated as a generic alternative.

The NRC had considered rulemaking to alter the 60-year time for completing decommissioning and to clarify the use of engineered barriers for reactor entombments.^[5] However, the NRC's staff has recommended that rulemaking be deferred, based upon several factors, e.g., no licensee has committed to pursuing the entombment option, the unresolved issues associated with the disposition of greater-than-Class C material (GTCC), and the NRC's current priorities, at least until after the additional research studies are complete. The Commission concurred with the staff's recommendation. In a draft regulatory basis document published in March 2017 in support of rulemaking that would amend NRC regulations concerning nuclear plant decommissioning, the NRC staff proposes removing any discussion of the ENTOMB option from existing guidance documents since the method is not deemed practically feasible.

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

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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Section 1, Page 5 of 14***

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

1.3.1 High-Level Radioactive Waste Management

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 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.

In 2010, the Obama Administration appointed a Blue Ribbon Commission on America's Nuclear Future (Blue Ribbon Commission) to make recommendations for a new plan for nuclear waste disposal. The Blue Ribbon Commission's charter includes a requirement that it consider "[o]ptions for safe storage of used nuclear fuel while final disposition pathways are selected and deployed."^[9]

On January 26, 2012, the Blue Ribbon Commission issued its "Report to the Secretary of Energy" containing a number of recommendations on

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 1, Page 6 of 14***

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”^[10]
- “[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.”

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

“With the appropriate authorizations from Congress, the Obama Administration planned to implement a program over the next 10 years that would have:

- 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 Obama Administration slashed the budget for completing that work. However, the US Court of Appeals for the District of Columbia Circuit issued a writ of mandamus (in August 2013) ^[12] ordering NRC to comply with federal law and restart its review of DOE’s Yucca Mountain repository license application to the extent of previously appropriated funding for the review. That review is now complete with the publication of the five-

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Section 1, Page 7 of 14***

volume safety evaluation report. A supplement to DOE's environmental impact statement and an adjudicatory hearing on the contentions filed by interested parties must be completed before a licensing decision can be made.

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."^[13]

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 Prairie Island spent fuel is based in general upon:

- 1) Fuel transferred from the pool to the ISFSI within 5 years of shutdown;
- 2) Exchange of Prairie Island and Monticello spent fuel acceptance rights to best manage the overall cost of spent fuel storage for both plants;
- 3) Fuel assemblies currently stored in the ISFSI use TN-40 casks. It's assumed that, starting with final shutdown, and for future recasking, that a NUHOMS system (with a capacity of 37 fuel assemblies, and similar in dimensions to the existing Monticello NUHOMS design) will be used instead of the TN-40 casks. Fuel will be shipped in the existing TN-40s or NUHOMS DSCs (Scenarios 1, 2, 6, and 7); the TN-40s are replaced with NUHOMS in Scenarios 3, 4 and 5. Canisters that are unloaded in the spent fuel transfer operation will be surveyed for neutron activation.
- 4) This estimate does not include any costs for replacing cask head bolts, gaskets, or installation of spacers within the existing TN-40 cask prior to shipment to DOE.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 1, Page 8 of 14***

- 5) As an allowance, some of these canisters and NUHOMS modules from the first off-load operation are assumed to be mildly neutron activated and therefore must be disposed of as radioactive waste.

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).^[14] 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. In the DECON and SAFSTOR scenarios, the assemblies are packaged into dry shielded canisters (DSCs) over the first five years after shutdown for transfer to the ISFSI for interim storage. It is assumed that this period provides the necessary cooling for the final cores to meet the transport and/or storage requirements for decay heat.

An ISFSI, operated under a Part 72 Site Specific License (in accordance with 10 CFR 72^[15]), 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.

DOE has breached its obligations to remove fuel from reactor sites, and has also failed to provide the plant owners with information about how it will ultimately perform. DOE officials have stated that DOE does not have an obligation to accept already-canistered fuel without an amendment to DOE's contracts with plant licensees to remove the fuel (the "Standard Contract"), but DOE has not explained what any such amendment would involve. Consequently, Xcel Energy has no information or expectations on how DOE will remove fuel from the site in the future. In the absence of information about how DOE will perform, and for purposes of this analysis only, it is assumed that DOE will accept already-canistered fuel. If this assumption is incorrect, it is assumed that DOE will have liability for costs incurred to transfer the fuel to DOE-supplied containers.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 1, Page 9 of 14***

Xcel Energy's position is that the DOE has a contractual obligation to accept Prairie Island'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, 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. The cost for the interim storage of spent fuel has been calculated and is separately presented as "Spent Fuel Management" expenditures in this report.

1.3.2 Low-Level Radioactive Waste Disposal

The contaminated and activated material generated in the decontamination and dismantling of a commercial nuclear reactor is classified as low-level (radioactive) waste, although not all of the material is suitable for "shallow-land" disposal. With the passage of the "Low-Level Radioactive Waste Policy Act" in 1980,^[16] and its Amendments of 1985,^[17] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders. It was expected that groups of states would combine together to jointly deal with their radioactive wastes; these organizations are referred to as waste disposal compacts.

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

Disposition of the various waste streams produced by the decommissioning process considered all options and services currently available to Xcel Energy. The majority of the low-level radioactive waste designated for direct disposal (Class A^[18]) can be sent to EnergySolutions' facility in Clive, Utah. Therefore, disposal costs for Class A waste were based upon representative rates. This facility is not licensed to receive the higher activity portion (Classes B and C) of the decommissioning waste stream.

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.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 1, Page 10 of 14***

The dismantling of the components residing closest to the reactor core generates radioactive waste considered unsuitable for shallow-land disposal (i.e., low-level radioactive waste with concentrations of radionuclides that exceed the limits established by the NRC for Class C radioactive waste (GTCC)). The Low-Level Radioactive Waste Policy Amendments Act of 1985 assigned the federal government the responsibility for the disposal of this material. The Act also stated that the beneficiaries of the activities resulting in the generation of such radioactive waste bear all reasonable costs of disposing of such waste. 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 (i.e., in a geologic repository) 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 DOE facility as it is generated (depending upon the timing of the decommissioning and whether the spent fuel has been removed from the site prior to the start of decommissioning).

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

1.3.3 Radiological Criteria for License Termination

In 1997, the NRC published Subpart E, “Radiological Criteria for License Termination,”^[19] amending 10 CFR §20. This subpart provides radiological criteria for releasing a facility for unrestricted use. The regulation states that the site can be released for unrestricted use if radioactivity levels are such that the average member of a critical group would not receive a Total Effective Dose Equivalent (TEDE) in excess of 25 millirem per year, and provided that residual radioactivity has been reduced to levels that are As Low As Reasonably Achievable (ALARA).

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 1, Page 11 of 14***

The decommissioning estimates for Prairie Island assume that the site will be remediated to a residual level consistent with the NRC-prescribed level for radioactive material.

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).^[20] An additional and separate limit of 4 millirem per year, as defined in 40 CFR §141.66, is applied to drinking water.^[21]

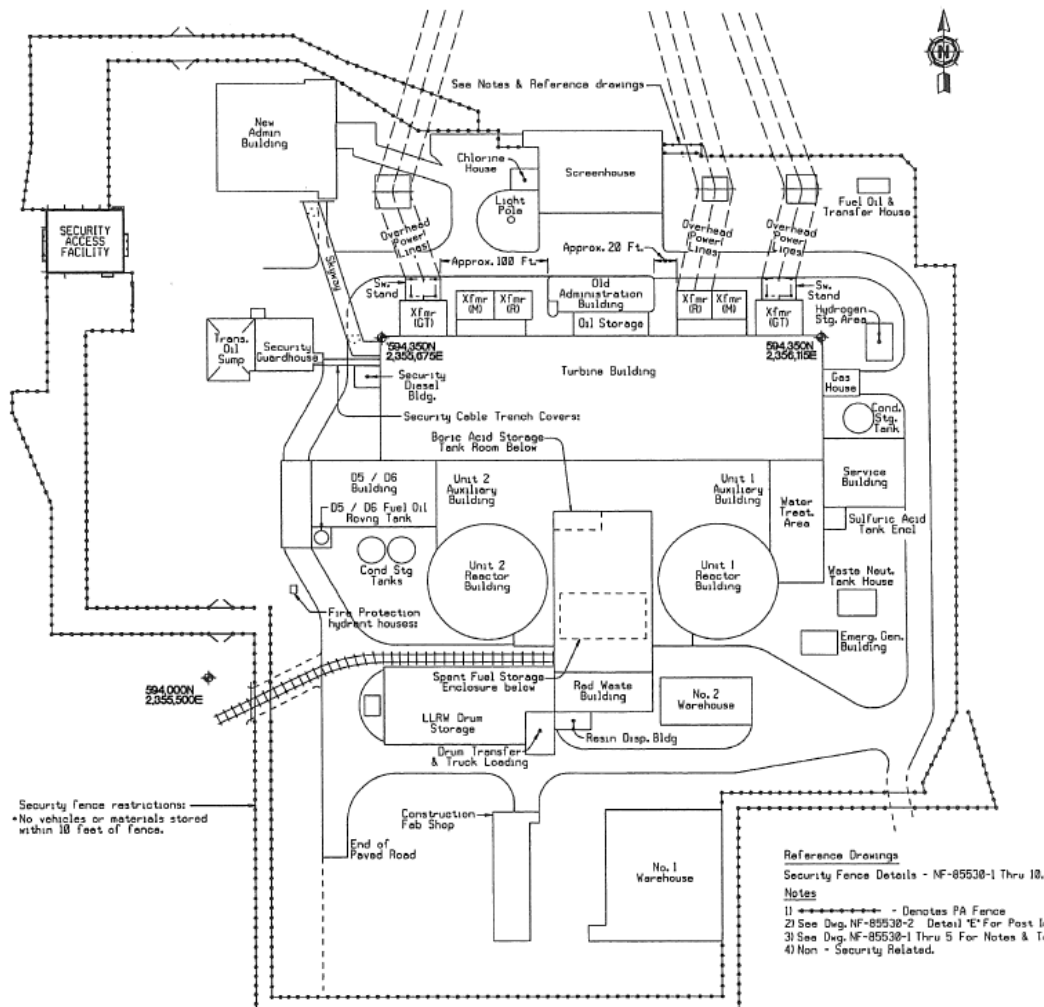
On October 9, 2002, the NRC signed an agreement with the EPA on the radiological decommissioning and decontamination of NRC-licensed sites. The Memorandum of Understanding (MOU)^[22] provides that EPA will defer exercise of authority under CERCLA for the majority of facilities decommissioned under NRC 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.

Prairie Island Nuclear Generating Plant Decommissioning Cost Analysis

Document X01-1725-001, Rev. 0
Section 1, Page 12 of 14

FIGURE 1.1
PRAIRIE ISLAND NUCLEAR GENERATING PLANT
GENERAL PLAN



***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 1, Page 13 of 14***

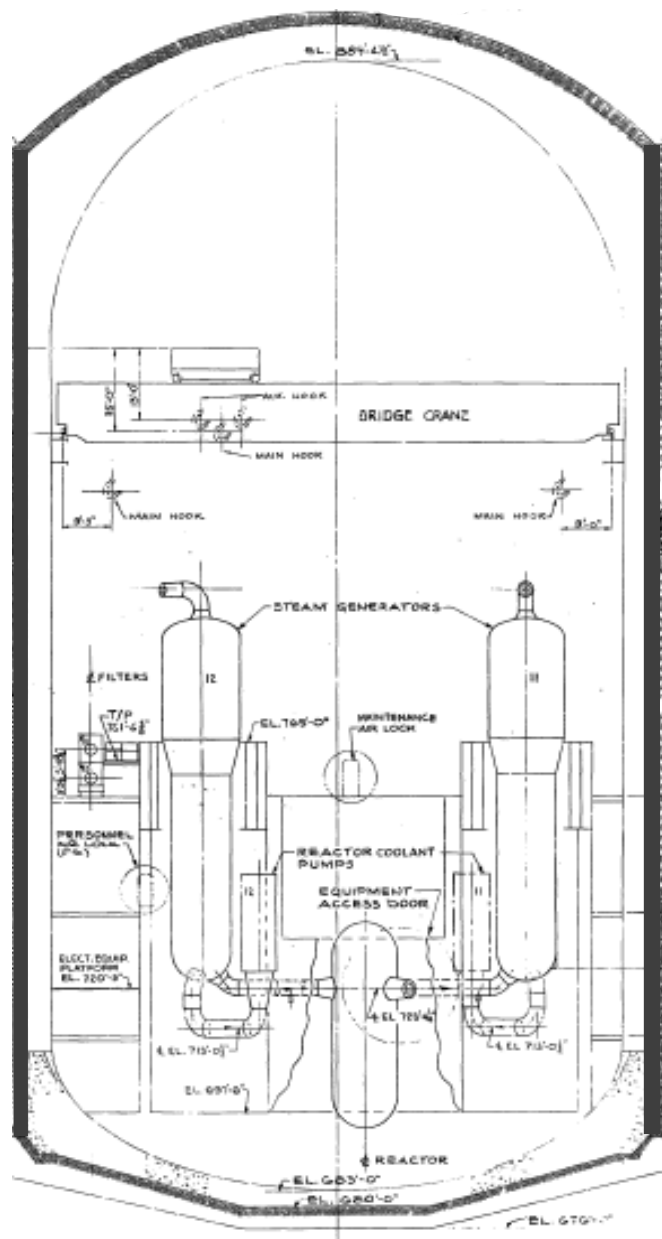
**FIGURE 1.2
PRAIRIE ISLAND NUCLEAR GENERATING PLANT
AERIAL VIEW**



***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 1, Page 14 of 14***

**FIGURE 1.3
PRAIRIE ISLAND NUCLEAR GENERATING PLANT
REACTOR BUILDING SECTION**



***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 2, Page 1 of 14***

2. DECOMMISSIONING ALTERNATIVES

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

The following scenarios were evaluated and are intended to bound the liability associated with the removal of spent fuel from the site. The current operating licenses expire in 2033 and 2034. The scenarios consist of five DECON scenarios, with differing spent fuel management assumptions, but essentially no changes to the decommissioning costs and timing of the power block. There are also two SAFSTOR scenarios (Scenarios 6 and 7) each corresponding to the first two DECON scenario spent fuel management assumptions. The spent fuel in the plant's spent fuel storage pool is transferred to the ISFSI within the first five 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 (2064 in Scenarios 1 & 6, 2077 in Scenarios 2, 5 & 7, 2117 in Scenario 3, and 2217 in Scenario 4).

Scenario	1 st Spent Fuel Canister Replacement	1 st Spent Fuel Assembly Removed from Prairie Island	Last Spent Fuel Assembly Removed from Prairie Island	Scenario Identification
1	n/a	2027	2064	DECON with 32 Year DFS ⁺
2	n/a	2053	2077	DECON with 60 Year DFS
3	2045	2093	2117	DECON with 100 Year DFS
4	2045	2193	2217	DECON with 200 Year DFS
5	2045	2053	2077	DECON with 60 Year DFS and recasking
6	n/a	2027	2064	SAFSTOR with 32 Year DFS
7	n/a	2053	2077	SAFSTOR with 60 Year DFS

⁺ Dry Fuel Storage

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Section 2, Page 2 of 14***

For Scenarios 1 and 6, although they only provide a total fuel storage period of 32 years following plant shutdown, some of the Prairie Island casks have been in storage since 1995. Xcel Energy directed TLG Services to not include the cost of transferring the spent fuel in dry storage to new canisters for those casks that exceed 50 years. The assumption to not transfer spent fuel at 50 years total storage duration for these two scenarios was premised on the likelihood that the life of the canisters could be successfully managed for the additional years.

For Scenarios 2 and 7, although they provide 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.

In Scenarios 3, 4 and 5, the DSCs are assumed to be replaced after fifty years of use. Since the auxiliary building spent fuel storage pool and fuel handling facilities are removed by the year 2040, a dry fuel transfer facility is assumed to be constructed on site to perform the transfers from the old to the new DSCs. For Scenarios 3 and 5, only one such transfer is needed over the time frame assumed (some fuel canisters in Scenario 5 will not require recasking). For Scenario 4, the spent fuel will be transferred three times following initial placement in the ISFSI.

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

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

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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 2, Page 3 of 14***

2.1 DECON

The DECON alternative, as defined by the NRC, is "the alternative in which the equipment, structures, and portions of a facility and site containing radioactive contaminants are removed or decontaminated to a level that permits the property to be released for unrestricted use shortly after cessation of operations." This study does not address the cost to dispose of the spent fuel residing at the site; such costs are funded through a surcharge on electrical generation. However, the study does estimate the costs incurred with the interim on-site storage of the fuel pending shipment by the DOE to an off-site disposal facility. Those costs are separately presented as "Spent Fuel Management" expenditures in this report.

2.1.1 Period 1 - Preparations

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

Engineering and Planning

The PSDAR, required prior to, or within two years of permanent cessation of operations, provides a description of the licensee's planned decommissioning activities, a timetable, a site-specific decommissioning cost estimate, and the associated financial requirements of the intended decommissioning program. Upon receipt of the PSDAR, the NRC will make the document available to the public for comment in a local meeting to be held in the vicinity of the reactor site. Ninety days following submittal and NRC receipt of the PSDAR, the licensee may begin to perform major decommissioning activities under a modified 10 CFR §50.59 procedure, (10 CFR §50.59 establishes the conditions under which licensees may make changes to the facility or procedures and conduct test or experiments, i.e., without prior NRC approval). Major activities are defined as any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment, or results in dismantling components (for shipment)

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Section 2, Page 4 of 14***

containing GTCC, as defined by 10 CFR §61. Major components are further defined as comprising the reactor vessel and internals, large bore reactor coolant system piping, and other large components that are radioactive. The NRC includes the following additional criteria for use of the §50.59 process in decommissioning. The proposed activity must not:

- foreclose release of the site for possible unrestricted use,
- significantly increase decommissioning costs,
- cause any significant environmental impact not previously reviewed, or
- result in there no longer being reasonable assurance that adequate funds will be available for decommissioning

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

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

Site Preparations

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

- Characterization of the site and surrounding environs. This includes radiation surveys of work areas, major components (including the

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Section 2, Page 5 of 14***

reactor vessel and its internals), internal piping, and primary shield cores.

- An ISFSI has been constructed to support continued plant operation and will need to be expanded following the cessation of operations to offload the spent fuel pool in support of the decommissioning program.
- Isolation of the spent fuel storage pool and fuel handling systems, such that decommissioning operations can commence on the balance of the plant. Decommissioning operations are scheduled around the fuel handling area to optimize the overall project schedule. It is assumed that the fuel pool remains operational for the transfer of fuel for approximately five years following the cessation of operations.
- Specification of transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.
- Development of procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and non-metallic components generated in decommissioning), site security and emergency programs, and industrial safety.
- Perform chemical decontamination of the NSSS to reduce radiation levels in support of removal operations

2.1.2 Period 2 - Decommissioning Operations

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

- Construction of temporary facilities and/or modification of existing facilities to support dismantling activities. This may include a centralized processing area to facilitate equipment removal and component preparations for off-site disposal.
- Reconfiguration and modification of site structures and facilities as needed to support decommissioning operations. This may include the upgrading of roads (on- and off-site) to facilitate hauling and transport. Modifications may be required to the containment

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 2, Page 6 of 14***

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.

- Transfer of the spent fuel from the storage pool to the ISFSI pad for interim storage.
- Design and fabrication of temporary and permanent shielding to support removal and transportation activities, construction of contamination control envelopes, and the procurement of specialty tooling.
- Procurement (lease or purchase) of shipping canisters, cask liners, and industrial packages.
- Decontamination of components and piping systems as required to control (minimize) worker exposure.
- Removal of piping and components no longer essential to support decommissioning operations.
- Removal of control rod drive housings and the head service structure from reactor vessel head. Segment the vessel closure head.
- Removal and segmentation of the upper internals assemblies. Segmentation will maximize the loading of the shielded transport casks, (i.e., by weight and activity). The operations are conducted under water using remotely operated tooling and contamination controls.
- Disassembly and segmentation of the remaining reactor internals, including the core former and lower core support assembly. Some material is expected to exceed Class C disposal requirements. As such, the segments will be packaged in modified spent fuel storage canisters for geologic disposal.
- Segmentation of the reactor vessel. A shielded platform is installed for segmentation as cutting operations are performed in air using remotely operated equipment within a contamination control envelope. The water level is maintained just below the cut to minimize the working area dose rates. Segments are transferred in-air to containers that are stored under water, for example, in an isolated area of the refueling canal.
- Removal of the activated portions of the concrete biological shield and accessible contaminated concrete surfaces. If dictated by the steam generator and pressurizer removal scenarios, those portions of the

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 2, Page 7 of 14***

associated cubicles necessary for access and component extraction are removed.

- Removal of the steam generators and pressurizer for material recovery and controlled disposal. The generators will be moved to an on-site processing center, the steam domes are removed and the internal components segregated for off-site processing. The lower shell and tube bundle will be packaged for direct disposal. These components can serve as their own burial containers provided that all penetrations are properly sealed and the internal contaminants are stabilized. Steel shielding is added, as necessary, to those external areas of the steam generators to meet transportation limits and regulations.
- 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 2064 (Scenario 1).

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

- Removal of remaining plant systems and associated components as they become nonessential to the decommissioning program or worker health and safety (e.g., waste collection and treatment systems, electrical power and ventilation systems).
- Removal of the steel liners from the refueling canal, disposing of the activated and contaminated sections as radioactive waste. Removal of any activated/contaminated concrete.
- Surveys of the decontaminated areas of the containment structure.
- Removal of the contaminated equipment and material from the auxiliary building and any other contaminated facility. Use radiation

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 2, Page 8 of 14***

and contamination control techniques until radiation surveys indicate that the structures can be released for unrestricted access and conventional demolition. This activity may necessitate the dismantling and disposition of most of the systems and components (both clean and contaminated) located within these buildings. This activity will facilitate surface decontamination and subsequent verification surveys required prior to obtaining release for demolition.

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

Incorporated into the LTP is the Final Survey Plan. This plan identifies the radiological surveys to be performed once the decontamination activities are completed and is developed using the guidance provided in the “Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM).”^[23] 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 licenses (that would release the property, exclusive of the ISFSI, for unrestricted use).

The NRC will amend the operating licenses to reduce the licensed area to the ISFSI area 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.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 2, Page 9 of 14***

2.1.3 Period 3 - Site Restoration

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

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

This cost study presumes that non-essential structures and site facilities are dismantled as a continuation of the decommissioning activity. Foundations and exterior walls are completely removed, including foundations and basemats as required by Minnesota regulations.^[24] Site areas affected by the dismantling activities are restored and the plant area graded as required to prevent ponding, establish erosion control by the planting of native vegetation, and inhibit the refloating of subsurface materials.

Non-contaminated concrete rubble produced by demolition activities is processed to remove reinforcing steel and miscellaneous embedments. All non-contaminated materials are trucked to an off-site area for

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 2, Page 10 of 14***

disposal as construction debris. Subgrade voids are backfilled with clean construction fill, suitable under Minnesota regulations.

2.1.4 ISFSI Operations and Decommissioning

The ISFSI will continue to operate under a site-specific license as authorized by 10 CFR Part 72 following the amendment of the operating license to release the adjacent (power block) property. Assuming that Prairie Island spent fuel shipments begin in 2027, the process is not expected to be completed until 2064 (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 3 and 4 address extended delay periods. Scenarios 3, 4 and 5 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 the existing TN-40 casks from Transnuclear, plus the use of a multi-purpose dry shielded storage canister and a horizontal storage module for pad storage for those fuel assemblies packaged after plant shutdown.

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 TN-40s and DSCs containing the spent fuel assemblies have been removed, any required decontamination is performed on the storage overpacks (some minor neutron-induced activation is assumed), and the license for the facility terminated, the concrete overpacks can be dismantled using conventional techniques for the demolition of reinforced concrete. The concrete storage pad is then removed and the area regraded. This topic is discussed in greater detail in section 3.4.1.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 2, Page 11 of 14***

2.2 SAFSTOR

The NRC defines SAFSTOR as "the alternative in which the nuclear facility is placed and maintained in a condition that allows the nuclear facility to be safely stored and subsequently decontaminated (deferred decontamination) to levels that permit release for unrestricted use." The facility is left intact (during the dormancy period), with structures maintained in a sound condition. Systems not required to operate in support of the spent fuel pool or site surveillance and security are drained, de-energized, and secured. Minimal cleaning/removal of loose contamination and/or fixation and sealing of remaining contamination are performed. Access to contaminated areas is secured to provide controlled access for inspection and maintenance.

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

2.2.1 Period 1 - Preparations

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

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

- Isolation of the spent fuel storage services and fuel handling systems located in the auxiliary building so that safe-storage operations may commence on the balance of the plant. This activity may be carried out by plant personnel in accordance with existing operating technical specifications. Activities are scheduled around the fuel handling systems to the greatest extent possible.
- Draining and de-energizing of the non-contaminated systems not required to support continued site operations or maintenance.
- Disposing of contaminated filter elements and resin beds not required for processing wastes from layup activities for future operations.
- Draining of the reactor vessels, with the internals left in place and the vessel heads secured.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 2, Page 12 of 14***

- Draining and de-energizing non-essential, contaminated systems with decontamination as required for future maintenance and inspection.
- Preparing lighting and alarm systems whose continued use is required; de-energizing portions of fire protection, electric power, and HVAC systems whose continued use is not required.
- Cleaning of the loose surface contamination from building access pathways.
- Performing an interim radiation survey of plant, posting warning signs where appropriate.
- Erecting physical barriers and/or securing all access to radioactive or contaminated areas, except as required for inspection and maintenance.
- Installing security and surveillance monitoring equipment and relocating security fence around secured structures, as required.

2.2.2 Period 2 - Dormancy

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

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

Security during the dormancy period is conducted primarily to protect the spent nuclear fuel while it is on site, prevent unauthorized entry,

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 2, Page 13 of 14***

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

During Scenario 6, the transfer of the spent fuel to a DOE facility continues during this period until complete. In Scenario 7, ISFSI operations and fuel transfer to the DOE continue through delayed decommissioning.

The length of the dormancy period is such that decommissioning (license termination) of the station (excluding the ISFSI) is accomplished within 60 years of final shutdown. The Scenario 6 SAFSTOR has the site remain in dormancy following spent fuel removal to the maximum extent possible, such that the licenses are terminated within the required 60-year time period.

It is required that the licensee submit an application to terminate each license, along with a LTP (described in Section 2.1.2), thereby initiating the third phase.

2.2.3 Periods 3 and 4 - Delayed Decommissioning

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

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

ISFSI decommissioning begins immediately upon completion of final shipment of the spent fuel and GTCC canisters.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 2, Page 14 of 14***

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

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

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

2.2.4 Period 5 - Site Restoration

Following completion of decommissioning operations, site-restoration activities can begin. Dismantling, as a continuation of the decommissioning process, is a cost-effective option, as described in Section 2.1.3. The basis for the dismantling cost in this scenario is consistent with that described for DECON, presuming the removal of structures and site facilities to include the existing foundations and basemats, and the limited restoration of the site.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 1 of 72***

3. COST ESTIMATES

The cost estimates prepared for decommissioning Prairie Island consider the unique features of the site, including the NSSS, power generation systems, support services, site buildings, and ancillary facilities. The basis of the estimates, including the sources of information relied upon, the estimating methodology employed, site-specific considerations, and other pertinent assumptions, is described in this section.

3.1 BASIS OF ESTIMATES

The estimates were developed using the site-specific, technical information from the 2014 analysis. The plant inventory, the basis for the decontamination and dismantling requirements and cost, and the decommissioning waste streams, was reviewed for this analysis; no substantive changes were identified over the three-year period to the configuration of the plant or site facilities that would impact decommissioning. The site-specific considerations and assumptions used in the previous evaluation were also revisited; no necessary modifications were identified. Modifications such as new FLEX facilities 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,"^[24] and the DOE "Decommissioning Handbook."^[25] These documents present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal (\$/cubic yard), steel removal (\$/ton), and cutting costs (\$/inch) were developed using local labor rates. The activity-dependent costs were estimated with the item quantities (cubic yards and tons), developed from plant drawings and inventory documents. Removal rates and material costs for the conventional disposition of components and structures relied upon information available in the industry publication, "Building Construction Cost Data," published by RSMeans.^[26]

The unit factor method provides a demonstrable basis for establishing reliable cost estimates. The detail provided in the unit factors, including activity duration, labor costs (by craft), and equipment and consumable costs, ensures

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 2 of 72***

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.

Regulatory Guide 1.184 ^[27] describes the methods and procedures that are acceptable to the NRC staff for implementing the requirements 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 in the regulations. The format and content of the estimates is also consistent with the recommendations of Regulatory Guide 1.202. ^[28]

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

Work Difficulty Factors

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

- | | |
|---------------------------------|------------|
| • Access Factor | 10% to 20% |
| • Respiratory Protection Factor | 10% to 50% |
| • Radiation/ALARA Factor | 10% to 40% |
| • Protective Clothing Factor | 10% to 30% |
| • Work Break Factor | 8.33% |

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

Scheduling Program Durations

The unit factors, adjusted by the WDFs as described above, are applied against the inventory of materials to be removed in the radiologically controlled areas.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 3 of 72***

The resulting man-hours, or crew-hours, are used in the development of the decommissioning program schedule, using resource loading and event sequencing considerations. The scheduling of conventional removal and dismantling activities are based upon productivity information available from the RSMeans "Building Construction Cost Data" publication. Dismantling of the fuel handling 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 or the DOE.

The program schedule is used to determine the period-dependent costs for program management, administration, field engineering, equipment rental, contracted services, etc. The study relies upon regional or site-specific salary and wage rates for the personnel associated with the intended program.

3.3 IMPACT OF DECOMMISSIONING MULTIPLE REACTOR UNITS

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

- The sequence of work generally follows the principal that the work is done at Unit 1 first, followed by similar work at Unit 2. This permits the experience gained at Unit 1 to be applied by the workforce at the second unit. It should be noted however, that the estimates do not consider productivity improvements at the second unit, since there is little documented experience with decommissioning two units simultaneously. The work associated with developing activity specifications and procedures can be considered essentially identical between the two units, therefore the second unit costs are assumed to be a fraction of the first unit (~ 43%).
- Segmenting the reactor vessel and internals will require the use of special equipment. The cost of procuring that equipment is assumed to be shared on an equal basis between the two units. In addition, the decommissioning project will be scheduled such that Unit 2's reactor internals and vessel are segmented immediately after the activities at Unit 1 have been completed.
- Duplication of some program management and support costs, particularly costs associated with the more senior positions, can be avoided with two reactors undergoing decommissioning simultaneously. As a result, the

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 4 of 72***

estimates are based on a “lead” unit that includes these senior positions, and a “second” unit that excludes these positions. The designation as lead is based on the unit undertaking the most complex tasks (for instance vessel segmentation) or performing tasks for the first time.

- The final radiological survey schedule is also affected by a two-unit decommissioning schedule. Trying to complete the final status survey of Unit 1, while Unit 2 still has ongoing radiological remediation work and waste handling in process is considered impractical. As a result, Unit 1 and Unit 2 delay durations awaiting spent fuel pool availability for decommissioning are synchronized, such that the spent fuel pool area decommissioning and subsequent final status survey can be completed for the station. During the spent fuel storage period, program management costs are reduced accordingly.
- The final demolition of buildings at Units 1 and 2 are considered to take place concurrently.
- Unit 1, as the first unit to enter decommissioning, incurs the majority of site characterization costs.
- Shared systems and structures are generally assigned to Unit 2.
- Station costs such as ISFSI operations, emergency response fees, regulatory agency fees, and insurance are generally allocated on an equal basis between the two units.

3.4 FINANCIAL COMPONENTS OF THE COST MODEL

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

3.4.1 Contingency

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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 5 of 72***

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"^[29] as "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this analysis are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, a contingency factor has been applied. In the AIF/NESP-036 study, the types of unforeseeable events that are likely to occur in decommissioning are discussed and guidelines are provided for percentage contingency in each category. It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

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

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

Disposition of the reactor vessel internals involves the underwater cutting of complex components that are highly radioactive. Costs are based upon optimum segmentation, handling, and packaging scenarios. The schedule is primarily dependent upon the turnaround time for the heavily shielded shipping casks, including preparation, loading, and decontamination of the containers for transport. The number of casks

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 6 of 72***

required is a function of the pieces generated in the segmentation activity, a value calculated on optimum performance of the tooling employed in cutting the various subassemblies. The expected optimization, however, may not be achieved, resulting in delays and additional program costs. For this reason, contingency must be included to mitigate the consequences of the expected inefficiencies inherent in this complex activity, along with related concerns associated with the operation of highly specialized tooling, field conditions, and water clarity.

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

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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 7 of 72***

Taxes and Fees	10%
Insurance	10%
Staffing	15%
Spent Fuel Storage (Dry) Systems	15%
Spent Fuel Transfer Costs	15%
Operations and Maintenance Expenses	15%
ISFSI Decommissioning	25%

The contingency values are applied to the appropriate components of the estimates on a line item basis. A composite value is then reported at the end of each detailed estimate (as provided in Appendices C through I). Appendix J, the ISFSI decommissioning calculation, uses a flat 25% contingency added at the end of the calculation.

3.4.2 Financial Risk

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

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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 8 of 72***

- Regulatory changes (e.g., affecting worker health and safety, site release criteria, waste transportation, and disposal).
- Policy decisions altering national commitments (e.g., in the ability to accommodate certain waste forms for disposition) or in the timetable for such, for example, 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.

This cost study does not add any additional costs to the estimate for financial risk, since there is insufficient historical data from which to project future liabilities. Consequently, the areas of uncertainty or risk are revisited periodically and addressed through repeated revisions or updates of the base estimates.

3.5 SITE-SPECIFIC CONSIDERATIONS

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

3.5.1 Spent Fuel Management

The cost to dispose of spent fuel generated from plant operations is not reflected within the estimates to decommission Prairie Island. Ultimate disposition of the spent fuel is within the province of the DOE's Waste Management System, as defined by the Nuclear Waste Policy Act. As such, the disposal cost was financed by a 1 mill/kWhr surcharge paid into the DOE's waste fund during operations. On November 19, 2013, the U.S. Court of Appeals for the D.C. Circuit ordered the Secretary of the Department of Energy to suspend collecting annual fees for nuclear waste disposal from nuclear power plant operators until the DOE has conducted a legally adequate fee assessment.

The NRC does, however, require licensees to 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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Section 3, Page 9 of 72***

Energy. This requirement is prepared for through inclusion of certain high-level waste cost elements within the estimates, as described below.

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

- 1) Fuel transferred from the pool to the ISFSI within 5 years of shutdown;
- 2) Exchange of Prairie Island 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 Transnuclear TN-40 casks, plus NUHOMS DSCs for fuel removed after final plant shutdown (Scenarios 1, 2, 6, and 7); the canisters and NUHOMS are periodically replaced in Scenarios 3, 4 and 5. Spent fuel assemblies from TN-40 casks that are replaced will be put into NUHOMS DSCs. Canisters that are unloaded in the spent fuel transfer operation will be surveyed for neutron activation.
- 4) As an allowance, some of these canisters and NUHOMS modules from the first off-load operation are assumed to be mildly neutron activated and therefore must be disposed of as radioactive waste.

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.

The DOE's repository program assumes that spent fuel will be accepted for disposal from the nation's commercial nuclear plants in the order (the "queue") in which it was removed from service ("oldest fuel first").^[31] Repository operations were based upon annual industry-wide receipt of 400 Metric Tons Heavy Metal (MTHM) in the first year of operation, a total of 3,800 MTHM in years 2 through 4 and 3,000 MTHM for year 5 and beyond.^[32] This logic supports the spent fuel schedules for Scenarios 1 and 6. All other spent fuel scenarios are consistent with those identified by the Minnesota PSC.

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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 10 of 72***

disposition of the ISFSI once the transfer of the TN-40s and 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). The existing TN-40 casks will remain in the ISFSI until either shipment to the DOE, or until recasked.

Canister Loading and Transfer

The estimates include an average cost of \$1,000,000 for the labor to load/transport the spent fuel from the pool to the ISFSI pad. For estimating purposes an allowance of \$332,800 is used for the cost to transfer each fuel canister from the ISFSI pad to the DOE transport vehicle.

Operations and Maintenance

An annual cost (excluding labor) of approximately \$803,000 and \$103,000 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 five years the assemblies are packaged into DSCs for transfer to the ISFSI for transfer to the DOE. It is assumed that the five years provides the necessary cooling period for the final cores 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, 2, 6, and 7 do not assume any replacement of the spent fuel storage DSCs (recasking).

Three of the cost estimates, Scenarios 3, 4 and 5, include costs to recask the spent fuel, based upon an assumption that the DSC has a limited lifetime of approximately 50 years.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 11 of 72***

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 Prairie Island.

Scenario 5, which is 60 years (nominally) in length, considers a single repackaging effort for each DSC in the ISFSI. Not all fuel will be recasked.

Since the auxiliary building, spent fuel storage pool, and fuel handling facilities are removed by the year 2040, 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, 4 and 5 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, 4 and 5.

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 for the plan. 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.

The NUHOMS multi-purpose dry shielded storage canister with a horizontal, reinforced concrete storage module is used as a basis for the ISFSI decommissioning cost analyses. The modules are assumed to have some level of neutron-induced activation, as a result of the long-term storage of the fuel, i.e., to levels exceeding free-release limits. As an allowance, 8 modules are assumed to require remediation, equivalent to the number of modules required to accommodate the final core offloads at Prairie Island (121 assemblies per unit). The cost of the disposition of this material, as well as the demolition of the ISFSI facility, is included in the estimates.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 12 of 72***

The existing ISFSI pad, supporting the TN-40 casks, is not expected to be contaminated and will be demolished accordingly after a confirmation survey.

In accordance with the specific requirements of 10 CFR §72.30 for the ISFSI work scope, 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 J. It contains four different scenarios reflecting the different number of casks present at the end of the ISFSI operations. The demolition of the ISFSI for all seven scenarios is reflected within the estimates.

GTCC

The dismantling of the reactor internals is expected to generate radioactive waste considered unsuitable for shallow land disposal (i.e., low-level radioactive waste with concentrations of radionuclides that exceed the limits established by the NRC for Class C radioactive waste (GTCC)). Although the material is not classified as high-level waste, federal regulations under the LLRW Policy Amendments Act specifies the GTCC LLRW 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. ^[32]

The number of DSCs required and the packaged volume for GTCC was based upon experience at Maine Yankee (e.g., the constraints on loading as identified in the canister's certificate of compliance), but adjusted for the increased spent fuel capacity of the 32 assembly DSCs.

It is assumed that the DOE would not accept this waste prior to completing the transfer of spent fuel. Therefore, until such time the DOE is ready to accept GTCC waste, it is reasonable to assume that this material would remain in storage at Prairie Island (for the DECON alternatives). In the SAFSTOR alternatives, the GTCC material is shipped directly to a DOE facility as it is generated. GTCC costs have

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 13 of 72***

been segregated and included within the "License Termination" expenditures.

3.5.2 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 refueling canal, where a turntable and remote cutter are installed. The vessels are segmented in place, using a mast-mounted cutter supported off the lower head and directed from a shielded work platform installed overhead in the reactor cavity. Transportation cask specifications and transportation regulations dictate the segmentation and packaging methodology. The control elements are disposed of along with the spent fuel; there is no additional cost provided for their disposal.

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.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Section 3, Page 14 of 72***

It is not known whether this option will be available when Prairie Island 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.

3.5.3 Primary System Components

The reactor coolant system components are assumed to be decontaminated using chemical agents prior to the start of cutting operations. This type of decontamination can be expected to have a significant ALARA impact in the DECON scenario, since in this scenario the removal work is done within the first few years of shutdown. A decontamination factor (average reduction) of 10 is assumed for the process. Disposal of the decontamination solution effluent is included within the estimate as a "process liquid waste" charge. The SAFSTOR scenarios do not include any decontamination of the reactor system; radioactive decay from the delay period in the dormancy results in similar results.

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

A trolley crane is set up for the removal of the generators. It can also be used to move portions of the steam generator cubicle walls and floor slabs from the reactor building to a location where they can be decontaminated and transported to the material handling area. Interferences within the work area, such as grating, piping, and other components are removed to create sufficient lay-down space for processing these large components.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 15 of 72***

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

The generators are disassembled on-site with the outer shell and lightly contaminated subassemblies designated for off-site recycling. The more highly contaminated tube sheet and tube bundle are packaged for direct disposal.

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

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

3.5.4 Main Turbine and Condenser

The main turbine and condenser are assumed to have only minor levels of contamination. As such, the components are dismantled using conventional maintenance procedures. The turbine rotors and shafts 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, or controlled disposal. Components will be packaged and readied for transport in accordance with the intended disposition.

3.5.5 Transportation Methods

Contaminated piping, components, and structural material other than the highly activated reactor vessels and internal components will qualify as LSA-I, II or III or Surface Contaminated Object, SCO-I or II, as

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Section 3, Page 16 of 72***

described in Title 49.^[34] 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 10 CFR Part 71, as Type B. It is conceivable that the reactor, due to its limited specific activity, could qualify as LSA II or III. However, the high radiation levels on the outer surface would require that additional shielding be incorporated within the packaging so as to attenuate the dose to levels acceptable for transport.

Any fuel cladding failure that occurred during the lifetime of the plant is assumed to have released fission products at sufficiently low levels that the buildup of quantities of long-lived isotopes (e.g., ¹³⁷Cs, ⁹⁰Sr, 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 radioactive material requiring controlled disposal are based upon the mileage to the EnergySolutions facility in Clive, Utah. Transportation costs for the higher activity Class B and C radioactive material are based upon the mileage to the WCS facility in Andrews County, Texas. The transportation cost for the GTCC material is assumed to be contained within the disposal cost. Transportation costs for off-site waste processing are based upon the mileage to Oak Ridge, Tennessee. Truck transport costs were estimated using published tariffs from Tri-State Motor Transit.^[35]

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 17 of 72***

3.5.6 Low-Level Radioactive Waste Disposal

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

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 through J, and summarized in Section 5. 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 and weight, with surcharges added for the special handling requirements and the radiological characteristics of the payload. Packaging efficiencies are lower for the highly activated materials (greater than Type A quantity waste), where high concentrations of gamma-emitting radionuclides limit the capacity of the shipping canisters.

The cost to dispose of the lowest level and majority of the material generated from the decontamination and dismantling activities is based upon representative costs for disposal at EnergySolutions facility in Clive, Utah. Disposal costs for the higher activity waste (Class B and C) were based upon preliminary and indicative information from WCS for the Andrews County facility

Material exceeding Class C limits (limited to material closest to the reactor core and comprising less than 1% of the total waste volume) is generally not suitable for shallow-land disposal. This material is

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 18 of 72***

packaged in the same multipurpose canisters used for spent fuel storage/transport, for eventual transfer to the DOE for disposal.

3.5.7 Site Conditions Following Decommissioning

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

Asphalt surfaces in the immediate vicinity of site buildings are broken up and the material disposed of as construction debris. The site access road will remain.

Only existing site structures are considered in the dismantling cost. All subgrade structures are removed. 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.

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

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.

3.6 ASSUMPTIONS

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

3.6.1 Estimating Basis

The study follows the principles of ALARA through the use of work duration adjustment factors. These factors address the impact of

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 19 of 72***

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

3.6.2 Labor Costs

For purposes of this analysis, it is assumed that Xcel Energy will hire a Decommissioning Operations Contractor (DOC) to manage the decommissioning. Xcel Energy will provide site security, radiological health and safety, quality assurance and overall site administration during the decommissioning and demolition phases. Contract personnel will provide engineering services (e.g., for preparing the activity specifications, work procedures, neutron activation, and structural analyses) under the direction of Xcel Energy.

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 nuclear 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.

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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 20 of 72***

Representative profiles of the staffing level for decommissioning, including contractors and craft, is provided in Figures 3.1 and 3.2 for the DECON (Scenario 2) and SAFSTOR (Scenario 7) estimates. Utility staffing levels will gradually decrease after completing the removal of physical systems. 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 levels increase again during the site restoration period due to the work associated with structures demolition. During SAFSTOR dormancy, following transfer of the spent fuel to the ISFSI, staffing levels for the power block are reduced to a minimum, then rise as the delayed dismantling operations begin.

Security, while reduced from operating levels, is maintained throughout the decommissioning for access control, material control, and to safeguard the spent fuel (in accordance with the requirements of 10 CFR Part 37, Part 72, and Part 73). Once the fuel has been transferred to the DOE, the security organization will be reduced to Part 37 requirements for Scenario 6.

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

The curie contents of the vessels and internals at final shutdown are derived from those listed in NUREG/CR-3474.^[35] Actual estimates are derived from the curie/gram values contained therein and adjusted for the different mass of the Prairie Island components, projected operating life, and different periods of decay. Additional short-lived isotopes were derived from NUREG/CR-0130^[36] and NUREG/CR-0672,^[37] and benchmarked to the long-lived values from NUREG/CR-3474.

It is anticipated that there will be control element assemblies (CEAs) in the spent fuel pool at the cessation of operations, including those CEAs from the final core. This analysis assumes that the CEAs can be

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 21 of 72***

disposed of along with the spent fuel at no additional cost (in accordance with Appendix E of the Standard Contract ^[38])

Neutron activation of the reactor building structure is confined to the reactor biological shield.

3.6.4 General

Transition Activities

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

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

Scrap and Salvage

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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Section 3, Page 22 of 72***

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

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

The concrete debris resulting from building demolition activities is crushed on site to reduce the size of the debris. The resulting crushed concrete is disposed offsite as construction debris. 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.

Asbestos

At the time of Prairie Island’s construction, asbestos was still being used for system component and piping insulation, and as fireproofing material for structures. No inventory of asbestos at Prairie Island was available, so TLG developed an estimated quantity. The allowance for the remediation of this asbestos is captured in the detailed cost analyses (Appendices C through I).

Energy

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

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 23 of 72***

Emergency Planning

FEMA and state fees associated with emergency planning are assumed to continue for approximately 18 months following the cessation of operations. At this time, the FEMA fees are discontinued. The timing is based upon the anticipated condition of the spent fuel (i.e., the hottest spent fuel assemblies are assumed to be cool enough that no substantial Zircaloy oxidation and off-site event would occur with the loss of spent fuel pool water). State and local fees are continued until all spent fuel is transferred out of the spent fuel pool.

Insurance

Costs for continuing coverage (nuclear liability and property insurance) following cessation of plant operations and during decommissioning are included and based upon current operating premiums. Reductions in premiums throughout the decommissioning process are based upon guidance provided by Xcel Energy. 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."^[39] 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 \$3,936 per person per year of the Xcel Energy staff is included throughout the estimate. A fixed annual overhead charge is also included, starting at \$1.5 million per reactor at the time of unit shut down and decreasing to approximately \$467 thousand per reactor.

Taxes

Property taxes are included for all decommissioning periods. Xcel Energy provided a schedule of decreasing tax payments against the

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 24 of 72***

current tax assessment. These payments are maintained for the balance of the decommissioning program.

NRC Fees

These estimates include charges from the NRC to support the Prairie Island decommissioning program. Charges are included for the yearly license held by Xcel Energy for the Part 50 licenses, 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 \$194 thousand per year. Once the reactors have been decommissioned, the site Part 50 license continues at the same fee until final removal of the spent fuel. The hourly rate for NRC review is \$267.00. 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 16,800 hours from Unit 1 shutdown until termination of the ISFSI license

Disposal of Processed Water

This estimate assumes that processed water which meets state and federal release limits can be disposed of without additional cost.

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.

Prairie Island Indian Community Payments

This estimate includes a \$2.5 million annual payment to the Prairie Island Indian Community while spent fuel is still on the Prairie Island site.

Minnesota state regulations regarding concrete

This estimate complies with the Minnesota state regulations regarding the removal of all subterranean concrete during demolition, plus the survey and confirmation of the suitability of the clean fill used for backfill of the subgrade structures following concrete removal.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 25 of 72***

3.7 COST ESTIMATE SUMMARY

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

Schedules of expenditures are provided in Tables 3.1 through 3.14. The tables delineate the cost contributors by year of expenditures as well as cost contributor (e.g., labor, materials, and waste disposal).

Additional tables in Appendices C through I provide detailed costs elements. The cost elements are also assigned to one of three subcategories: “License Termination,” “Spent Fuel Management,” and “Site Restoration.” The subcategory “License Termination” is used to accumulate costs that are consistent with “decommissioning” as defined by the NRC in its financial assurance regulations (i.e., 10 CFR §50.75). In situations where the long-term management of spent fuel is not an issue, the cost reported for this subcategory is generally sufficient to terminate each unit’s 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 from the pool to the DOE or to the ISFSI for interim storage, and the transfer of the multipurpose canisters from the ISFSI to the DOE. Costs are also included for the operations of the pool and management of the ISFSI until such time that the transfer of all fuel from this facility to an off-site location (e.g., interim storage facility) 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 completely removed, including foundations and basemats and backfilled to conform to local grade.

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 (for the DECON alternative). While designated for disposal at a federal facility along with the spent fuel, GTCC waste is still classified as low-level radioactive waste and, as such, included as a “License Termination” expense.

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis******Document X01-1725-001, Rev. 0
Section 3, Page 26 of 72***

Decommissioning costs are reported in 2017 dollars. Costs are not inflated, escalated, or discounted over the period of expenditure (or projected lifetime of the plant).

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 27 of 72***

TABLE 3.1
SCENARIO 1: DECON WITH 32 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2033	22,324	776	692	25	9,206	33,023
2034	63,582	8,741	2,434	4,050	18,997	97,804
2035	66,069	37,773	1,850	20,920	22,520	149,133
2036	57,951	22,861	1,465	22,493	20,601	125,370
2037	38,254	6,920	984	15,000	15,667	76,825
2038	10,524	808	348	38	10,999	22,718
2039	35,902	65,387	409	817	10,713	113,229
2040	32,068	4,105	560	2,732	7,666	47,132
2041	19,800	6,499	235	16	4,502	31,053
2042	14,925	8,952	174	0	4,223	28,275
2043	8,672	4,303	82	0	3,719	16,776
2044	3,150	287	0	0	3,279	6,716
2045	3,142	287	0	0	3,270	6,699
2046	3,046	0	0	0	3,270	6,316
2047	3,046	0	0	0	3,270	6,316
2048	3,055	0	0	0	3,279	6,333
2049	3,046	0	0	0	3,270	6,316
2050	3,142	287	0	0	3,270	6,699
2051	3,142	287	0	0	3,270	6,699
2052	3,150	287	0	0	3,279	6,716
2053	3,142	287	0	0	3,270	6,699
2054	3,142	287	0	0	3,270	6,699
2055	3,142	287	0	0	3,270	6,699
2056	3,150	287	0	0	3,279	6,716
2057	3,142	287	0	0	3,270	6,699
2058	3,142	287	0	0	3,270	6,699
2059	3,142	287	0	0	3,270	6,699
2060	3,150	287	0	0	3,279	6,716
2061	3,142	287	0	0	3,270	6,699
2062	3,142	287	0	0	3,270	6,699

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 28 of 72***

TABLE 3.1 (continued)
SCENARIO 1: DECON WITH 32 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2063	3,142	287	0	0	3,270	6,699
2064	3,147	1,940	0	0	13,259	18,345
2065	796	381	15	2,697	1,418	5,306
Total	436,517	174,040	9,248	68,788	208,927	897,520

Note: Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 29 of 72***

TABLE 3.2
SCENARIO 1: DECON WITH 32 YEAR DFS, UNIT 2
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2034	7,760	336	305	10	5,078	13,490
2035	47,103	6,322	2,047	1,819	27,237	84,528
2036	67,705	41,230	2,261	23,855	20,777	155,828
2037	71,040	25,567	1,413	27,883	17,376	143,278
2038	43,920	7,411	847	13,940	13,784	79,901
2039	40,527	65,576	409	930	11,387	118,830
2040	37,549	4,783	560	3,109	7,440	53,440
2041	23,571	10,022	235	16	4,588	38,433
2042	16,800	14,214	174	0	4,470	35,659
2043	9,556	6,782	82	0	3,836	20,256
2044	3,150	287	0	0	3,279	6,716
2045	3,142	287	0	0	3,270	6,699
2046	3,046	0	0	0	3,270	6,316
2047	3,046	0	0	0	3,270	6,316
2048	3,055	0	0	0	3,279	6,333
2049	3,046	0	0	0	3,270	6,316
2050	3,142	287	0	0	3,270	6,699
2051	3,142	287	0	0	3,270	6,699
2052	3,150	287	0	0	3,279	6,716
2053	3,142	287	0	0	3,270	6,699
2054	3,142	287	0	0	3,270	6,699
2055	3,142	287	0	0	3,270	6,699
2056	3,150	287	0	0	3,279	6,716
2057	3,142	287	0	0	3,270	6,699
2058	3,142	287	0	0	3,270	6,699
2059	3,142	287	0	0	3,270	6,699
2060	3,150	287	0	0	3,279	6,716
2061	3,142	287	0	0	3,270	6,699
2062	3,142	287	0	0	3,270	6,699
2063	3,142	287	0	0	3,270	6,699

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 30 of 72***

TABLE 3.2 (continued)
SCENARIO 1: DECON WITH 32 YEAR DFS, UNIT 2
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2064	3,147	1,940	0	0	13,259	18,345
2065	796	381	15	2,697	1,418	5,306
Total	431,975	189,158	8,349	74,258	196,087	899,828

Note: Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 31 of 72***

TABLE 3.3
SCENARIO 2: DECON WITH 60 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2033	22,324	776	692	25	9,486	33,303
2034	63,582	8,741	2,434	4,050	19,423	98,230
2035	65,877	37,199	1,850	20,920	22,520	148,367
2036	57,759	22,286	1,465	22,493	20,601	124,604
2037	38,111	6,490	984	15,000	15,667	76,251
2038	13,208	8,859	348	38	10,999	33,453
2039	36,036	65,782	409	820	10,715	113,763
2040	31,920	3,668	559	2,729	7,660	46,535
2041	19,571	5,945	235	16	4,500	30,267
2042	14,782	8,522	174	0	4,223	27,701
2043	8,544	3,992	82	0	3,669	16,287
2044	3,055	0	0	0	3,189	6,244
2045	3,046	0	0	0	3,180	6,227
2046	3,046	0	0	0	3,180	6,227
2047	3,046	0	0	0	3,180	6,227
2048	3,055	0	0	0	3,189	6,244
2049	3,046	0	0	0	3,180	6,227
2050	3,046	0	0	0	3,180	6,227
2051	3,046	0	0	0	3,180	6,227
2052	3,055	0	0	0	3,189	6,244
2053	3,142	287	0	0	3,180	6,609
2054	3,238	574	0	0	3,180	6,992
2055	3,238	574	0	0	3,180	6,992
2056	3,294	718	0	0	3,189	7,201
2057	3,190	431	0	0	3,180	6,801
2058	3,334	861	0	0	3,180	7,375
2059	3,190	431	0	0	3,180	6,801
2060	3,150	287	0	0	3,189	6,627
2061	3,238	574	0	0	3,180	6,992
2062	3,238	574	0	0	3,180	6,992

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 32 of 72***

TABLE 3.3 (continued)
SCENARIO 2: DECON WITH 60 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2063	3,190	431	0	0	3,180	6,801
2064	3,246	574	0	0	3,189	7,009
2065	3,238	574	0	0	3,180	6,992
2066	3,190	431	0	0	3,180	6,801
2067	3,238	574	0	0	3,180	6,992
2068	3,246	574	0	0	3,189	7,009
2069	3,190	431	0	0	3,180	6,801
2070	3,238	574	0	0	3,180	6,992
2071	3,238	574	0	0	3,180	6,992
2072	3,246	574	0	0	3,189	7,009
2073	3,238	574	0	0	3,180	6,992
2074	3,238	574	0	0	3,180	6,992
2075	3,570	1,570	0	0	3,180	8,320
2076	3,246	574	0	0	3,189	7,009
2077	3,238	2,238	0	0	13,165	18,641
2078	833	455	15	2,697	1,453	5,453
Total	481,032	188,867	9,246	68,788	249,109	997,041

Note: Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 33 of 72***

TABLE 3.4
SCENARIO 2: DECON WITH 60 YEAR DFS, UNIT 2
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2034	7,760	336	305	10	5,078	13,490
2035	46,911	5,748	2,047	1,819	27,237	83,763
2036	67,514	40,656	2,261	23,855	20,777	155,063
2037	70,896	25,136	1,413	27,883	17,376	142,704
2038	46,604	15,462	847	13,940	13,784	90,636
2039	40,664	65,972	409	933	11,388	119,366
2040	37,417	4,345	559	3,106	7,433	52,861
2041	23,328	9,482	235	16	4,587	37,648
2042	16,657	13,784	174	0	4,471	35,086
2043	9,423	6,458	82	0	3,785	19,747
2044	3,055	0	0	0	3,189	6,244
2045	3,046	0	0	0	3,180	6,227
2046	3,046	0	0	0	3,180	6,227
2047	3,046	0	0	0	3,180	6,227
2048	3,055	0	0	0	3,189	6,244
2049	3,046	0	0	0	3,180	6,227
2050	3,046	0	0	0	3,180	6,227
2051	3,046	0	0	0	3,180	6,227
2052	3,055	0	0	0	3,189	6,244
2053	3,142	287	0	0	3,180	6,609
2054	3,238	574	0	0	3,180	6,992
2055	3,238	574	0	0	3,180	6,992
2056	3,294	718	0	0	3,189	7,201
2057	3,190	431	0	0	3,180	6,801
2058	3,334	861	0	0	3,180	7,375
2059	3,190	431	0	0	3,180	6,801
2060	3,150	287	0	0	3,189	6,627
2061	3,238	574	0	0	3,180	6,992
2062	3,238	574	0	0	3,180	6,992
2063	3,190	431	0	0	3,180	6,801

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 34 of 72***

TABLE 3.4 (continued)
SCENARIO 2: DECON WITH 60 YEAR DFS, UNIT 2
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2064	3,246	574	0	0	3,189	7,009
2065	3,238	574	0	0	3,180	6,992
2066	3,190	431	0	0	3,180	6,801
2067	3,238	574	0	0	3,180	6,992
2068	3,246	574	0	0	3,189	7,009
2069	3,190	431	0	0	3,180	6,801
2070	3,238	574	0	0	3,180	6,992
2071	3,238	574	0	0	3,180	6,992
2072	3,246	574	0	0	3,189	7,009
2073	3,238	574	0	0	3,180	6,992
2074	3,238	574	0	0	3,180	6,992
2075	3,570	1,570	0	0	3,180	8,320
2076	3,246	574	0	0	3,189	7,009
2077	3,238	2,238	0	0	13,164	18,640
2078	833	455	15	2,697	1,453	5,453
Total	476,490	203,985	8,347	74,258	235,562	998,643

Note: Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 35 of 72***

TABLE 3.5
SCENARIO 3: DECON WITH 100 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2033	22,324	776	692	25	9,206	33,023
2034	63,582	8,741	2,434	4,050	18,997	97,804
2035	65,877	37,199	1,850	20,920	22,520	148,367
2036	57,759	22,286	1,465	22,493	20,601	124,604
2037	39,808	11,582	984	15,000	15,667	83,040
2038	13,208	8,859	348	38	10,999	33,453
2039	35,713	64,815	409	820	10,715	112,472
2040	31,920	3,668	559	2,729	7,660	46,535
2041	19,625	5,945	235	16	4,500	30,321
2042	14,864	8,522	174	0	4,223	27,782
2043	8,912	3,992	82	0	3,646	16,633
2044	3,676	0	0	0	3,147	6,823
2045	5,973	6,921	0	0	3,138	16,032
2046	5,204	4,614	0	0	3,138	12,956
2047	5,204	4,614	0	0	3,138	12,956
2048	3,676	0	0	0	3,147	6,823
2049	5,204	4,614	0	0	3,138	12,956
2050	5,973	6,921	0	0	3,138	16,032
2051	5,779	6,339	0	0	3,138	15,256
2052	5,983	6,921	0	0	3,147	16,051
2053	3,666	0	0	0	3,138	6,805
2054	3,666	0	0	0	3,138	6,805
2055	5,973	6,921	0	0	3,138	16,032
2056	5,214	4,614	0	0	3,147	12,975
2057	5,204	4,614	0	0	3,138	12,956
2058	3,666	0	0	0	3,138	6,805
2059	5,010	4,032	0	0	3,138	12,180
2060	5,214	4,614	0	0	3,147	12,975
2061	5,204	4,614	0	0	3,138	12,956
2062	3,666	0	0	0	3,138	6,805

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 36 of 72***

TABLE 3.5 (continued)
SCENARIO 3: DECON WITH 100 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2063	8,280	13,841	0	0	3,138	25,259
2064	6,558	8,646	0	0	3,147	18,351
2065	5,204	4,614	0	0	3,138	12,956
2066	3,666	0	0	0	3,138	6,805
2067	3,666	0	0	0	3,138	6,805
2068	6,752	9,227	0	0	3,147	19,126
2069	5,973	6,921	0	0	3,138	16,032
2070	3,666	0	0	0	3,138	6,805
2071	3,666	0	0	0	3,138	6,805
2072	7,327	10,952	0	0	3,147	21,426
2073	3,666	0	0	0	3,138	6,805
2074	3,666	0	0	0	3,138	6,805
2075	7,843	12,530	0	0	3,138	23,511
2076	3,676	0	0	0	3,147	6,823
2077	3,666	0	0	0	3,138	6,805
2078	7,511	11,534	0	0	3,138	22,184
2079	3,666	0	0	0	3,138	6,805
2080	3,676	0	0	0	3,147	6,823
2081	3,666	0	0	0	3,138	6,805
2082	7,123	10,371	0	0	3,138	20,632
2083	3,666	0	0	0	3,138	6,805
2084	3,676	0	0	0	3,147	6,823
2085	3,666	0	0	0	3,138	6,805
2086	3,666	0	0	0	3,138	6,805
2087	3,666	0	0	0	3,138	6,805
2088	3,676	0	0	0	3,147	6,823
2089	26,816	69,448	0	1,934	3,138	101,337
2090	3,666	0	0	0	3,138	6,805
2091	3,666	0	0	0	3,138	6,805
2092	3,676	0	0	0	3,147	6,823

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 37 of 72***

TABLE 3.5 (continued)
SCENARIO 3: DECON WITH 100 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2093	3,050	287	0	0	2,934	6,271
2094	3,146	574	0	0	2,934	6,653
2095	5,453	7,495	0	0	2,934	15,881
2096	4,740	5,331	0	0	2,942	13,013
2097	4,636	5,044	0	0	2,934	12,614
2098	3,241	861	0	0	2,934	7,036
2099	3,098	431	0	0	2,934	6,462
2100	5,357	7,208	0	0	2,934	15,498
2101	5,453	7,495	0	0	2,934	15,881
2102	5,453	7,495	0	0	2,934	15,881
2103	3,098	431	0	0	2,934	6,462
2104	3,154	574	0	0	2,942	6,670
2105	5,453	7,495	0	0	2,934	15,881
2106	4,636	5,044	0	0	2,934	12,614
2107	4,684	5,188	0	0	2,934	12,805
2108	3,154	574	0	0	2,942	6,670
2109	4,636	5,044	0	0	2,934	12,614
2110	4,677	5,166	0	0	2,934	12,776
2111	4,669	5,145	0	0	2,934	12,748
2112	3,140	531	0	0	2,942	6,612
2113	7,745	14,372	0	0	2,934	25,051
2114	6,207	9,759	0	0	2,934	18,899
2115	5,001	6,140	0	0	2,934	14,075
2116	3,140	2,195	0	0	12,934	18,268
2117	3,128	520	0	0	2,934	6,582
2118	1,058	725	15	0	1,545	3,343
Total	740,717	515,942	9,246	68,025	367,538	1,701,468

Note: Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 38 of 72***

TABLE 3.6
SCENARIO 3: DECON WITH 100 YEAR DFS, UNIT 2
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2034	7,760	336	305	10	5,078	13,490
2035	46,911	5,748	2,047	1,819	27,237	83,763
2036	67,514	40,656	2,261	23,855	20,777	155,063
2037	72,593	30,228	1,413	27,883	17,376	149,494
2038	46,604	15,462	847	13,940	13,784	90,636
2039	40,341	65,004	409	933	11,388	118,076
2040	37,417	4,345	559	3,106	7,433	52,861
2041	23,381	9,482	235	16	4,587	37,701
2042	16,739	13,784	174	0	4,471	35,167
2043	9,791	6,458	82	0	3,763	20,092
2044	3,676	0	0	0	3,147	6,823
2045	5,973	6,921	0	0	3,138	16,032
2046	5,204	4,614	0	0	3,138	12,956
2047	5,204	4,614	0	0	3,138	12,956
2048	3,676	0	0	0	3,147	6,823
2049	5,204	4,614	0	0	3,138	12,956
2050	5,973	6,921	0	0	3,138	16,032
2051	5,779	6,339	0	0	3,138	15,256
2052	5,983	6,921	0	0	3,147	16,051
2053	3,666	0	0	0	3,138	6,805
2054	3,666	0	0	0	3,138	6,805
2055	5,973	6,921	0	0	3,138	16,032
2056	5,214	4,614	0	0	3,147	12,975
2057	5,204	4,614	0	0	3,138	12,956
2058	3,666	0	0	0	3,138	6,805
2059	5,010	4,032	0	0	3,138	12,180
2060	5,214	4,614	0	0	3,147	12,975
2061	5,204	4,614	0	0	3,138	12,956
2062	3,666	0	0	0	3,138	6,805
2063	8,280	13,841	0	0	3,138	25,259

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 39 of 72***

TABLE 3.6 (continued)
SCENARIO 3: DECON WITH 100 YEAR DFS, UNIT 2
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2064	6,558	8,646	0	0	3,147	18,351
2065	5,204	4,614	0	0	3,138	12,956
2066	3,666	0	0	0	3,138	6,805
2067	3,666	0	0	0	3,138	6,805
2068	6,752	9,227	0	0	3,147	19,126
2069	5,973	6,921	0	0	3,138	16,032
2070	3,666	0	0	0	3,138	6,805
2071	3,666	0	0	0	3,138	6,805
2072	7,327	10,952	0	0	3,147	21,426
2073	3,666	0	0	0	3,138	6,805
2074	3,666	0	0	0	3,138	6,805
2075	7,843	12,530	0	0	3,138	23,511
2076	3,676	0	0	0	3,147	6,823
2077	3,666	0	0	0	3,138	6,805
2078	7,511	11,534	0	0	3,138	22,184
2079	3,666	0	0	0	3,138	6,805
2080	3,676	0	0	0	3,147	6,823
2081	3,666	0	0	0	3,138	6,805
2082	7,123	10,371	0	0	3,138	20,632
2083	3,666	0	0	0	3,138	6,805
2084	3,676	0	0	0	3,147	6,823
2085	3,666	0	0	0	3,138	6,805
2086	3,666	0	0	0	3,138	6,805
2087	3,666	0	0	0	3,138	6,805
2088	3,676	0	0	0	3,147	6,823
2089	26,816	69,448	0	0	3,138	99,403
2090	3,666	0	0	1,934	3,138	8,739
2091	3,666	0	0	0	3,138	6,805
2092	3,676	0	0	0	3,147	6,823
2093	3,050	287	0	0	2,934	6,271

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 40 of 72***

TABLE 3.6 (continued)
SCENARIO 3: DECON WITH 100 YEAR DFS, UNIT 2
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2094	3,146	574	0	0	2,934	6,653
2095	5,453	7,495	0	0	2,934	15,881
2096	4,740	5,331	0	0	2,942	13,013
2097	4,636	5,044	0	0	2,934	12,614
2098	3,241	861	0	0	2,934	7,036
2099	3,098	431	0	0	2,934	6,462
2100	5,357	7,208	0	0	2,934	15,498
2101	5,453	7,495	0	0	2,934	15,881
2102	5,453	7,495	0	0	2,934	15,881
2103	3,098	431	0	0	2,934	6,462
2104	3,154	574	0	0	2,942	6,670
2105	5,453	7,495	0	0	2,934	15,881
2106	4,636	5,044	0	0	2,934	12,614
2107	4,684	5,188	0	0	2,934	12,805
2108	3,154	574	0	0	2,942	6,670
2109	4,636	5,044	0	0	2,934	12,614
2110	4,677	5,166	0	0	2,934	12,776
2111	4,669	5,145	0	0	2,934	12,748
2112	3,140	531	0	0	2,942	6,612
2113	7,745	14,372	0	0	2,934	25,051
2114	6,207	9,759	0	0	2,934	18,899
2115	5,001	6,140	0	0	2,934	14,075
2116	3,140	2,195	0	0	12,934	18,268
2117	3,128	520	0	0	2,934	6,582
2118	1,058	725	15	0	1,545	3,343
Total	736,175	531,061	8,347	73,496	354,698	1,703,777

Note: Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 41 of 72***

**TABLE 3.7
SCENARIO 4: DECON WITH 200 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)**

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2033	22,324	776	692	25	9,206	33,023
2034	63,582	8,741	2,434	4,050	18,997	97,804
2035	65,877	37,199	1,850	20,920	22,520	148,367
2036	57,759	22,286	1,465	22,493	20,601	124,604
2037	39,808	11,582	984	15,000	15,667	83,040
2038	13,208	8,859	348	38	10,999	33,453
2039	35,713	64,815	409	820	10,715	112,472
2040	31,920	3,668	559	2,729	7,660	46,535
2041	19,625	5,945	235	16	4,500	30,321
2042	14,864	8,522	174	0	4,223	27,782
2043	8,912	3,992	82	0	3,608	16,594
2044	3,676	0	0	0	3,075	6,751
2045	5,973	6,921	0	0	3,066	15,960
2046	5,204	4,614	0	0	3,066	12,884
2047	5,204	4,614	0	0	3,066	12,884
2048	3,676	0	0	0	3,075	6,751
2049	5,204	4,614	0	0	3,066	12,884
2050	5,973	6,921	0	0	3,066	15,960
2051	5,779	6,339	0	0	3,066	15,184
2052	5,983	6,921	0	0	3,075	15,979
2053	3,666	0	0	0	3,066	6,733
2054	3,666	0	0	0	3,066	6,733
2055	5,973	6,921	0	0	3,066	15,960
2056	5,214	4,614	0	0	3,075	12,903
2057	5,204	4,614	0	0	3,066	12,884
2058	3,666	0	0	0	3,066	6,733
2059	5,010	4,032	0	0	3,066	12,109
2060	5,214	4,614	0	0	3,075	12,903
2061	5,204	4,614	0	0	3,066	12,884
2062	3,666	0	0	0	3,066	6,733

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 42 of 72***

TABLE 3.7 (continued)
SCENARIO 4: DECON WITH 200 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2063	8,280	13,841	0	0	3,066	25,188
2064	6,558	8,646	0	0	3,075	18,279
2065	5,204	4,614	0	0	3,066	12,884
2066	3,666	0	0	0	3,066	6,733
2067	3,666	0	0	0	3,066	6,733
2068	6,752	9,227	0	0	3,075	19,054
2069	5,973	6,921	0	0	3,066	15,960
2070	3,666	0	0	0	3,066	6,733
2071	3,666	0	0	0	3,066	6,733
2072	7,327	10,952	0	0	3,075	21,354
2073	3,666	0	0	0	3,066	6,733
2074	3,666	0	0	0	3,066	6,733
2075	7,843	12,530	0	0	3,066	23,439
2076	3,676	0	0	0	3,075	6,751
2077	3,666	0	0	0	3,066	6,733
2078	7,511	11,534	0	0	3,066	22,112
2079	3,666	0	0	0	3,066	6,733
2080	3,676	0	0	0	3,075	6,751
2081	3,666	0	0	0	3,066	6,733
2082	7,123	10,371	0	0	3,066	20,560
2083	3,666	0	0	0	3,066	6,733
2084	3,676	0	0	0	3,075	6,751
2085	3,666	0	0	0	3,066	6,733
2086	3,666	0	0	0	3,066	6,733
2087	3,666	0	0	0	3,066	6,733
2088	3,676	0	0	0	3,075	6,751
2089	26,770	69,311	0	1,934	3,214	101,230
2090	3,666	0	0	0	3,066	6,733
2091	3,666	0	0	0	3,066	6,733
2092	3,676	0	0	0	3,075	6,751

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 43 of 72***

TABLE 3.7 (continued)
SCENARIO 4: DECON WITH 200 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2093	3,666	0	0	0	3,066	6,733
2094	3,666	0	0	0	3,066	6,733
2095	5,973	6,921	0	0	3,066	15,960
2096	5,214	4,614	0	0	3,075	12,903
2097	5,204	4,614	0	0	3,066	12,884
2098	3,666	0	0	0	3,066	6,733
2099	3,666	0	0	0	3,066	6,733
2100	5,973	6,921	0	0	3,066	15,960
2101	5,973	6,921	0	0	3,066	15,960
2102	5,973	6,921	0	0	3,066	15,960
2103	3,666	0	0	0	3,066	6,733
2104	3,676	0	0	0	3,075	6,751
2105	5,973	6,921	0	0	3,066	15,960
2106	5,204	4,614	0	0	3,066	12,884
2107	5,204	4,614	0	0	3,066	12,884
2108	3,676	0	0	0	3,075	6,751
2109	5,204	4,614	0	0	3,066	12,884
2110	5,204	4,614	0	0	3,066	12,884
2111	5,204	4,614	0	0	3,066	12,884
2112	3,676	0	0	0	3,075	6,751
2113	8,280	13,841	0	0	3,066	25,188
2114	6,742	9,227	0	0	3,066	19,036
2115	5,536	5,609	0	0	3,066	14,212
2116	3,676	0	0	0	3,075	6,751
2117	3,666	0	0	0	3,066	6,733
2118	6,742	9,227	0	0	3,066	19,036
2119	5,973	6,921	0	0	3,066	15,960
2120	3,676	0	0	0	3,075	6,751
2121	3,666	0	0	0	3,066	6,733
2122	7,511	11,534	0	0	3,066	22,112

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 44 of 72***

TABLE 3.7 (continued)
SCENARIO 4: DECON WITH 200 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2123	3,666	0	0	0	3,066	6,733
2124	3,676	0	0	0	3,075	6,751
2125	7,511	11,534	0	0	3,066	22,112
2126	3,666	0	0	0	3,066	6,733
2127	3,666	0	0	0	3,066	6,733
2128	7,521	11,534	0	0	3,075	22,130
2129	3,666	0	0	0	3,066	6,733
2130	3,666	0	0	0	3,066	6,733
2131	3,666	0	0	0	3,066	6,733
2132	7,521	11,534	0	0	3,075	22,130
2133	3,666	0	0	0	3,066	6,733
2134	3,666	0	0	0	3,066	6,733
2135	3,666	0	0	0	3,066	6,733
2136	3,676	0	0	0	3,075	6,751
2137	3,666	0	0	0	3,066	6,733
2138	3,666	0	0	0	3,066	6,733
2139	26,781	69,344	0	0	3,066	99,191
2140	3,676	0	0	0	3,075	6,751
2141	3,666	0	0	0	3,066	6,733
2142	3,666	0	0	0	3,066	6,733
2143	3,666	0	0	0	3,066	6,733
2144	3,676	0	0	0	3,075	6,751
2145	5,973	6,921	0	0	3,066	15,960
2146	5,204	4,614	0	0	3,066	12,884
2147	5,204	4,614	0	0	3,066	12,884
2148	3,676	0	0	0	3,075	6,751
2149	3,666	0	0	0	3,066	6,733
2150	5,973	6,921	0	0	3,066	15,960
2151	5,973	6,921	0	0	3,066	15,960
2152	5,983	6,921	0	0	3,075	15,979

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 45 of 72***

TABLE 3.7 (continued)
SCENARIO 4: DECON WITH 200 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2153	3,666	0	0	0	3,066	6,733
2154	3,666	0	0	0	3,066	6,733
2155	6,305	7,916	0	0	3,066	17,287
2156	5,214	4,614	0	0	3,075	12,903
2157	5,204	4,614	0	0	3,066	12,884
2158	3,666	0	0	0	3,066	6,733
2159	5,204	4,614	0	0	3,066	12,884
2160	5,214	4,614	0	0	3,075	12,903
2161	5,204	4,614	0	0	3,066	12,884
2162	3,666	0	0	0	3,066	6,733
2163	8,280	13,841	0	0	3,066	25,188
2164	6,752	9,227	0	0	3,075	19,054
2165	5,204	4,614	0	0	3,066	12,884
2166	3,666	0	0	0	3,066	6,733
2167	3,666	0	0	0	3,066	6,733
2168	6,752	9,227	0	0	3,075	19,054
2169	5,973	6,921	0	0	3,066	15,960
2170	3,666	0	0	0	3,066	6,733
2171	3,666	0	0	0	3,066	6,733
2172	7,521	11,534	0	0	3,075	22,130
2173	3,666	0	0	0	3,066	6,733
2174	3,666	0	0	0	3,066	6,733
2175	7,511	11,534	0	0	3,066	22,112
2176	3,676	0	0	0	3,075	6,751
2177	3,666	0	0	0	3,066	6,733
2178	7,511	11,534	0	0	3,066	22,112
2179	3,666	0	0	0	3,066	6,733
2180	3,676	0	0	0	3,075	6,751
2181	3,666	0	0	0	3,066	6,733
2182	7,511	11,534	0	0	3,066	22,112

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 46 of 72***

TABLE 3.7 (continued)
SCENARIO 4: DECON WITH 200 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2183	3,666	0	0	0	3,066	6,733
2184	3,676	0	0	0	3,075	6,751
2185	3,666	0	0	0	3,066	6,733
2186	3,666	0	0	0	3,066	6,733
2187	3,666	0	0	0	3,066	6,733
2188	3,676	0	0	0	3,075	6,751
2189	26,781	69,344	0	0	3,066	99,191
2190	3,666	0	0	0	3,066	6,733
2191	3,666	0	0	0	3,066	6,733
2192	3,676	0	0	0	3,075	6,751
2193	3,050	287	0	0	2,934	6,271
2194	3,146	574	0	0	2,934	6,653
2195	5,784	8,490	0	0	2,934	17,208
2196	4,740	5,331	0	0	2,942	13,013
2197	4,636	5,044	0	0	2,934	12,614
2198	3,241	861	0	0	2,934	7,036
2199	3,098	431	0	0	2,934	6,462
2200	5,357	7,208	0	0	2,934	15,498
2201	5,453	7,495	0	0	2,934	15,881
2202	5,453	7,495	0	0	2,934	15,881
2203	3,098	431	0	0	2,934	6,462
2204	3,154	574	0	0	2,942	6,670
2205	5,453	7,495	0	0	2,934	15,881
2206	4,636	5,044	0	0	2,934	12,614
2207	4,684	5,188	0	0	2,934	12,805
2208	3,154	574	0	0	2,942	6,670
2209	4,636	5,044	0	0	2,934	12,614
2210	4,677	5,166	0	0	2,934	12,776
2211	4,669	5,145	0	0	2,934	12,748
2212	3,140	531	0	0	2,942	6,612

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 47 of 72***

TABLE 3.7 (continued)
SCENARIO 4: DECON WITH 200 YEAR DFS, UNIT 1
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2213	7,745	14,372	0	0	2,934	25,051
2214	6,207	9,759	0	0	2,934	18,899
2215	4,669	5,145	0	0	2,934	12,748
2216	3,140	2,195	0	0	12,934	18,268
2217	3,146	574	0	0	2,934	6,653
2218	1,058	724	15	0	1,545	3,342
Total	1,259,023	970,270	9,246	68,025	670,974	2,977,538

Note: Columns may not add due to rounding

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 48 of 72***

**TABLE 3.8
SCENARIO 4: DECON WITH 200 YEAR DFS, UNIT 2
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)**

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2034	7,760	336	305	10	5,078	13,490
2035	46,911	5,748	2,047	1,819	27,237	83,763
2036	67,514	40,656	2,261	23,855	20,777	155,063
2037	72,593	30,228	1,413	27,883	17,376	149,494
2038	46,604	15,462	847	13,940	13,784	90,636
2039	40,341	65,004	409	933	11,388	118,076
2040	37,417	4,345	559	3,106	7,433	52,861
2041	23,381	9,482	235	16	4,587	37,701
2042	16,739	13,784	174	0	4,471	35,167
2043	9,791	6,458	82	0	3,725	20,055
2044	3,676	0	0	0	3,076	6,752
2045	5,973	6,921	0	0	3,067	15,961
2046	5,204	4,614	0	0	3,067	12,885
2047	5,204	4,614	0	0	3,067	12,885
2048	3,676	0	0	0	3,076	6,752
2049	5,204	4,614	0	0	3,067	12,885
2050	5,973	6,921	0	0	3,067	15,961
2051	5,779	6,339	0	0	3,067	15,185
2052	5,983	6,921	0	0	3,076	15,980
2053	3,666	0	0	0	3,067	6,734
2054	3,666	0	0	0	3,067	6,734
2055	5,973	6,921	0	0	3,067	15,961
2056	5,214	4,614	0	0	3,076	12,904
2057	5,204	4,614	0	0	3,067	12,885
2058	3,666	0	0	0	3,067	6,734
2059	5,010	4,032	0	0	3,067	12,110
2060	5,214	4,614	0	0	3,076	12,904
2061	5,204	4,614	0	0	3,067	12,885
2062	3,666	0	0	0	3,067	6,734
2063	8,280	13,841	0	0	3,067	25,189

***Prairie Island Nuclear Generating Plant
Decommissioning Cost Analysis***

***Document X01-1725-001, Rev. 0
Section 3, Page 49 of 72***

TABLE 3.8 (continued)
SCENARIO 4: DECON WITH 200 YEAR DFS, UNIT 2
TOTAL ANNUAL EXPENDITURES
(thousands, 2017 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2064	6,558	8,646	0	0	3,076	18,280
2065	5,204	4,614	0	0	3,067	12,885
2066	3,666	0	0	0	3,067	6,734
2067	3,666	0	0	0	3,067	6,734
2068	6,752	9,227	0	0	3,076	19,055
2069	5,973	6,921	0	0	3,067	15,961
2070	3,666	0	0	0	3,067	6,734
2071	3,666	0	0	0	3,067	6,734
2072	7,327	10,952	0	0	3,076	21,355
2073	3,666	0	0	0	3,067	6,734
2074	3,666	0	0	0	3,067	6,734
2075	7,843	12,530	0	0	3,067	23,440
2076	3,676	0	0	0	3,076	6,752
2077	3,666	0	0	0	3,067	6,734
2078	7,511	11,534	0	0	3,067	22,113
2079	3,666	0	0	0	3,067	6,734
2080	3,676	0	0	0	3,076	6,752
2081	3,666	0	0	0	3,067	6,734
2082	7,123	10,371	0	0	3,067	20,561
2083	3,666	0	0	0	3,067	6,734
2084	3,676	0	0	0	3,076	6,752
2085	3,666	0	0	0	3,067	6,734
2086	3,666	0	0	0	3,067	6,734
2087	3,666	0	0	0	3,067	6,734
2088	3,676	0	0	0	3,076	6,752
2089	26,770	69,311	0	1,934	3,067	101,083
2090	3,666	0	0	0	3,067	6,734
2091	3,666	0	0	0	3,067	6,734
2092	3,676	0	0	0	3,076	6,752
2093	3,666	0	0	0	3,067	6,734