BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application of	)	
Evergy Metro, Inc. d/b/a Evergy Missouri	)	
Metro for Approval of the Accrual and Funding	)	Case No. EO-2024-_____
of Wolf Creek Generating Station	)	
Decommissioning Costs at Current Levels	)	

APPLICATION OF EVERGY MISSOURI METRO FOR APPROVAL OF THE ACCRUAL AND FUNDING OF WOLF CREEK GENERATING STATION DECOMMISSIONING COSTS AT CURRENT LEVELS AND APPROVAL OF A CHANGE IN INVESTMENT MANAGER

COMES NOW, Evergy Metro, Inc. d/b/a Evergy Missouri Metro ("Evergy Missouri Metro" or the "Company") and, pursuant to 20 CSR 4240-20.070 (4) and (5)(A) , hereby submits its application to the Missouri Public Service Commission ("Commission") for approval of the accrual and funding of Wolf Creek Generating Station ("Wolf Creek") decommissioning costs at current levels and approval of a change in the nuclear decommissioning trust fund investment manager. In support thereof, Evergy Missouri Metro states as follows:

1. Evergy Missouri Metro is a Missouri corporation with its principal office and place of business at 1200 Main Street, Kansas City, Missouri 64105. It is engaged in the generation, transmission, distribution and sale of electricity in western Missouri and eastern Kansas, operating primarily in the Kansas City metropolitan area. Evergy Missouri Metro is an "electrical corporation" and a "public utility" subject to the jurisdiction, supervision, and control of the Commission under Chapters 386 and 393.

2. Evergy Missouri Metro's certificate of good standing was filed in Case No. EN-2020-0063 and is incorporated by reference pursuant to 20 CSR 4240-2.060(1)(G).

3. Evergy Missouri Metro has filed with the Commission certified copies of its Articles of Incorporation and all amendments thereto. These documents are incorporated herein by reference.

4. Communications concerning this submission should be addressed to:

Darrin R. Ives
Vice President, Regulatory Affairs
Evergy, Inc.
1200 Main Street
Kansas City MO 64105
Phone: (816) 556-2522
Fax: (816) 556-2110
Darrin.Ives@evergy.com

Anthony Westenkirchner
Senior Paralegal, Regulatory Affairs
Evergy, Inc.
1200 Main Street
Kansas City, Missouri 64105
Phone: (816) 556-2668
E-mail: anthony.westenkirchner@evergy.com

5. Data requests concerning this Application should be addressed to Regulatory.Affairs@evergy.com.

6. 20 CSR 4240-3.185(3) requires Evergy Missouri Metro to file by September 1, 1990, and every three years thereafter, a cost study detailing Evergy Missouri Metro's latest cost estimate for decommissioning Wolf Creek. The Wolf Creek Generating Station Decommissioning Cost Estimate Update for 2023 ("2023 Study") is filed herewith as **Schedule A**.

7. The Missouri jurisdictional share of the current annual decommissioning trust fund accrual is $1,281,264 and was first authorized by the Commission in Case No. ER-2006-0314. Evergy Missouri Metro has accrued at this rate since January 1, 2007. The Commission order in Case No. EO-2018-0062 approved the continuation of the annual decommissioning

expense accruals and trust fund payment at the current level of $1,281,264. The current level of $1,281,264 was also included in the cost of service in Evergy Missouri Metro's general rate case in Case No. ER-2022-0129.

8. The 2023 Study shows the decommissioning cost estimate to be $1,171,364,000 in 2023 dollars plus the cost to decommission the ISFSI of $11,835,000 in 2023 dollars. 20 CSR 4240-3.185(3) also requires Evergy Missouri Metro to provide funding levels necessary to defray these decommissioning costs. **Schedule B** ("2023 Funding Analysis") along with supporting workpapers is filed herewith. The 2023 Funding Analysis demonstrates that the current annual trust fund contribution of $1,281,264 is sufficient to defray the estimated decommissioning cost within 0.002% of the Missouri jurisdictional share of future estimated total decommissioning costs. The 2023 Funding Analysis is based on the actual nuclear decommissioning trust fund balance as of June 30, 2023, the decommissioning cost estimate from the 2023 Study, a Missouri jurisdictional allocation based on average monthly peak demand. Investment allocations are held constant for four years after 2023 and investment allocations are updated in 2030, 2040, 2055, 2070 and 2079 thereafter[1]. Capital market assumptions dated July 1, 2023 from Evergy Missouri Metro's pension consultants, Willis Towers Watson, are used for the escalation rates. The weighted decommissioning cost escalation of 3.33% is based on a 3.72% wage inflation rate assumption for the labor portion of the decommissioning cost estimate and a 2.83% price inflation rate for the non-labor portion of the decommissioning cost estimate. Evergy Missouri Metro believes that it is reasonable and prudent to continue the annual accruals at the current level of $1,281,264. Evergy Missouri Metro therefore requests that the Commission approve the continuation of the annual accrual at the current level.

[1] As agreed to in the Stipulation and Agreement approved in Case No. EO-2012-0068, initial asset allocations based on the Wolf Creek Nuclear Decommissioning Trust Investment Guidelines authorized in Case No. EO-2009-439.

9. Because Evergy Missouri Metro is not requesting a change in the current level of $1,281,264 already included in Evergy Missouri Metro's retail rates approved in Case No. ER-2022-0129, no new tariff(s) are being filed with this application.

10. Evergy Missouri Metro is also seeking Commission approval for a change in nuclear decommissioning trust ("NDT") investment manager. The Company is planning to change from Columbia Threadneedle as its fixed income portfolio manager and Duff & Phelps as its equity portfolio manager to SEI as an overall Chief Investment Officer for the NDT. The goal is twofold. The primary goal is to maximize the overall expected return of the NDT portfolio while minimizing the risk. This is achieved by optimizing the investment mix and weighting the portfolio in such a way to deliver the best balance of expected returns and risk. This change was contemplated when SEI won an arms-length competitive process in late 2020 and early 2021 to manage a large portion of Evergy's investment assets. As the overall Outsourced Chief Investment Officer ("OCIO"), SEI is also tasked with acting as a fiduciary for the trust which is thinking about optimum portfolio composition, and how that relates to risk and asset balance. SEI won the request for proposal and since that time has been acting as the OCIO for the vast majority of Evergy's Trust Assets. This includes acting as the fiduciary manager of those assets on behalf of Evergy as the trust owner and Bank of New York Mellon as trustee. They are the OCIO for the Master Pension Trust which includes Evergy Kansas Central's Union and Non-Union pensions as well as the Evergy Metro and Missouri West Non-Union Pensions. Additionally, they are the OCIO for the Kansas Central NDT and will add the Evergy Metro NDT. Leveraging that size and scale allowed for the price reduction on the asset management fee while bringing the sophistication of an OCIO that the NDT deserves. A copy of the proposed agreement with SEI is attached as **Schedule C**.

WHEREFORE, Evergy Missouri Metro requests an order from the Commission: (i) finding that the 2023 Study and the 2023 Funding Analysis satisfy the requirements of 20 CSR 4240-3.185(3); (ii) approving the continuation of the annual decommissioning expense accrual and trust fund contribution at the current level of $1,281,264 and (iii) approving SEI as the NDT investment manager.

Respectfully submitted,

/s/ Roger W. Steiner

Roger W. Steiner, MBN 39586
Evergy, Inc.
1200 Main Street
Kansas City, MO 64105
Phone: (816) 556-2791
roger.steiner@energy.com

Counsel for Evergy Missouri Metro

CERTIFICATE OF SERVICE

The undersigned certifies that true and correct copies of the foregoing have been e-mailed or mailed, via first class United States Mail, postage pre-paid, to the service list of record this 1st day of September 2023.

General Counsel's Office
Missouri Public Service Commission
P.O. Box 360
200 Madison Street, Suite 800
Jefferson City, MO 65102
staffcounselservice@psc.mo.gov

Office of the Public Counsel
P.O. Box 2230
200 Madison Street, Suite 650
Jefferson City, MO 65102-2230
opcservice@opc.mo.gov

/s/ Roger W. Steiner
Roger W. Steiner
Counsel for Evergy Missouri Metro

VERIFICATION

STATE OF MISSOURI)
) ss.
COUNTY OF JACKSON)

Geoffrey Ley, being first duly sworn, on his oath and in his capacity as Treasurer for Evergy Missouri Metro, states that he is authorized to execute on behalf of Evergy Missouri Metro this *Application for Approval of the Accrual and Funding of Wolf Creek Generating Station Decommissioning Costs at Current Levels*, and has knowledge of the matters stated in this Application, and that said matters are true and correct to the best of his knowledge, information and belief.

Geoffrey Ley

Subscribed and sworn to before me this 1st day of September 2023.

Notary Pubic

My Commission expires: 4/26/2025

ANTHONY R. WESTENKIRCHNER
NOTARY PUBLIC - NOTARY SEAL
STATE OF MISSOURI
MY COMMISSION EXPIRES APRIL 26, 2025
PLATTE COUNTY
COMMISSION #17279952

DECOMMISSIONING COST ANALYSIS

for the

WOLF CREEK GENERATING STATION

prepared for

Wolf Creek Nuclear Operating Corporation

prepared by

TLG Services, LLC
Bridgewater, Connecticut

August 2023

APPROVALS

Project Manager	Corey J. Munz	8/18/2023 Date
Project Engineer	Christopher R. Koriniskie	8/18/2023 Date
Technical Manager	Adam M. Kaczmarek	8/18/2023 Date

TABLE OF CONTENTS

SECTION **PAGE**

TABLE OF CONTENTS
(continued)

SECTION **PAGE**

TABLES

TABLE OF CONTENTS
(continued)

SECTION **PAGE**

FIGURES

APPENDICES

REVISION LOG

No.	Date	Item Revised	Reason for Revision
0	06-29-2023	-	Original Issue
1	8-18-2023	References, Appendix F, Appendix G	Editorial revision

EXECUTIVE SUMMARY

This report presents estimates of the cost to decommission the Wolf Creek Generating Station (Wolf Creek) for the selected decommissioning alternatives following the scheduled and permanent cessation of plant operations. Wolf Creek is operated by Wolf Creek Nuclear Operating Corporation (WCNOC). Wolf Creek's three owners are Kansas Gas and Electric Company, a wholly owned subsidiary of Westar Energy, Inc., Kansas City Power & Light Company, a wholly owned subsidiary of Great Plains Energy Incorporated, and Kansas Electric Power Cooperative, Inc. The estimates are designed to provide WCNOC and its owners with sufficient information to assess their financial obligations, as they pertain to the eventual decommissioning of the nuclear station.

The analysis relies upon site-specific, technical information from an evaluation prepared in 2020,[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.

As discussed in the 2020 estimate, developments in the area of spent nuclear fuel disposal suggest a possibility that the federal government may not have removed all of Wolf Creek's spent nuclear fuel and high-level radioactive waste (hereafter, simply "spent fuel") from the station by the time the plant is ready for decommissioning. As-such, this estimate will treat the scenario where the spent fuel remains on site for an extended period following decommissioning of the power block, as the base case, as it was in 2020.

For continuity and comparison of the 2020 estimate, the five years wet storage with complete transfer to DOE (the 2020 alternate case) is presented in Appendix F, updated to 2023 dollars. There still is much uncertainty in this area. Because the assumptions used in Appendix F analysis are speculative at this point, the hypothetical cost effects shown here have not been included in the overall updated cost estimate in this report.

While the analysis is not a detailed engineering evaluation, it represents the estimates prepared in advance of the detailed engineering required to carry out the decommissioning of the nuclear plant. It may also not reflect the actual plan to

1 "Decommissioning Cost Analysis for the Wolf Creek Generating Station," Document W11-1781-001, Rev. 0, TLG Services, Inc., August 2020

decommission Wolf Creek; the plan may differ from the assumptions made in this analysis based on facts that exist at the time of decommissioning.

The 2020 plant inventory, the basis for the decontamination and dismantling requirements and cost, and the decommissioning waste streams, was reviewed for this analysis. There were no substantive changes made to the plant inventory that would impact decommissioning.

The costs to decommission Wolf Creek for the scenarios evaluated are tabulated at the end of this section. Costs are reported in 2023 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 and D.

Consistent with the 2020 analysis, the current cost estimates assume that the shutdown of the nuclear plant is a scheduled and pre-planned event (e.g., there is no delay in transitioning the plant and workforce from operations or in obtaining regulatory relief from operating requirements, etc.). The estimates include the continued operation of the fuel building as an interim wet fuel storage facility for approximately four years after operations cease. During this period, it is assumed that the spent fuel residing in the pool will be transferred to the Department of Energy (DOE) or to a newly constructed independent spent fuel storage installation (ISFSI) on the site.

The ISFSI, consisting of transportable storage canisters to house the spent fuel assemblies, and horizontal storage modules, will remain operational until the DOE is able to complete the transfer of the fuel to a federal facility (e.g., a monitored retrievable storage facility).[2] 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. For purposes of this analysis, it is assumed that DOE will accept already-canistered fuel. If this assumption is incorrect, it is assumed the DOE will have liability for costs incurred to transfer the fuel to DOE-supplied containers.

---

2 Projected expenditures for spent fuel management identified in the cost analyses do not consider the outcome of the litigation with the DOE with regard to the delays incurred by the owner in the timely removal of spent fuel from the site.

Alternatives and Regulations

The ultimate objective of the decommissioning process is to reduce the inventory of contaminated and activated material such that the license can be terminated. The Nuclear Regulatory Commission (NRC) provided general decommissioning requirements in a rule adopted on June 27, 1988.[3] In this rule, the NRC set forth technical and financial criteria for decommissioning licensed nuclear 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]
>
> SAFSTOR is defined as "the alternative in which the nuclear facility is placed and maintained in a condition that allows the nuclear facility to be safely stored and subsequently decontaminated (deferred decontamination) to levels that permit release for unrestricted use."[5] Decommissioning is required to be completed within 60 years, although longer periods will be considered when necessary to protect public health and safety.
>
> ENTOMB is defined as "the alternative in which radioactive contaminants are encased in a structurally long-lived material, such as concrete; the entombed structure is appropriately maintained and continued surveillance is carried out until the radioactive material decays to a level permitting unrestricted release of the property."[6] As with the SAFSTOR alternative, decommissioning is currently required to be completed within 60 years, although longer time periods will 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

---

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

4 Ibid. Page FR24022, Column 3

5 Ibid.

6 Ibid. Page FR24023, Column 2

> to re-evaluate this alternative and identify the technical requirements and regulatory actions that would be necessary for entombment to become a viable option. The resulting evaluation provided several recommendations, however, rulemaking has been deferred pending the completion of additional research studies (e.g., on engineered barriers).
>
> 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 proposed 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 process from operations to decommissioning. Regulatory Guide 1.184, issued in July 2000, (as revised 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 issued regulations to improve decommissioning planning and thereby reduce the likelihood that any current operating facility will become a legacy site.[9] The regulations require licensees to report additional details in their decommissioning cost estimate, including a decommissioning estimate for the ISFSI. This estimate is provided in Appendix E.

---

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

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

Decommissioning Scenarios

Two decommissioning scenarios were evaluated for Wolf Creek. The scenarios selected are representative of alternatives available to the owner and are defined as follows:

1. The first scenario assumes that the plant would be promptly decommissioned (DECON alternative) upon the expiration of the current operating license, i.e., in 2045. All remaining spent fuel in the plant's spent fuel storage pool is transferred to the DOE or to the onsite ISFSI within the first four 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. Site structures are then demolished. Spent fuel storage operations continue at the site until the transfer of the fuel from the ISFSI to the DOE is complete, assumed to be in the year 2078.

2. In the second scenario, the nuclear plant is placed into safe-storage (SAFSTOR alternative) at the end of its current operating license. All remaining spent fuel in the plant's spent fuel storage pool is transferred to the DOE or to the onsite ISFSI and the plant reconfigured for long-term storage. Spent fuel storage operations continue at the site until the transfer of the fuel from the ISFSI to the DOE is complete, assumed to be in the year 2078. Decommissioning operations commence in 2098, with the decontamination and dismantling of Wolf Creek completed in 2105, sixty years after the cessation of operations. Site structures are then demolished, with site restoration to be complete in 2106.

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.

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

The estimates also reflect 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 Rancho Seco, Trojan, Yankee Rowe, Big Rock Point, Maine Yankee, Humboldt Bay-3, Oyster Creek, Connecticut Yankee, Crystal River, Vermont Yankee, Fort Calhoun, Pilgrim and Indian Point 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 this analysis, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the plant.

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 Management

The contaminated and activated material generated in the decontamination and dismantling of a commercial nuclear reactor is generally 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 Disposal Act" in 1980 and its Amendments of 1985, [12] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders.

---

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

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

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), located in Andrews, Texas. 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 WCNOC. The majority of the low-level radioactive waste designated for controlled disposal (Class A[13]) can be sent to Energy*Solutions*' facility in Clive, Utah. Therefore, disposal costs for Class A waste were based upon WCNOC's "Long Term Waste Disposal Agreement" with Energy*Solutions*. This facility is not licensed to receive the higher activity portion (Classes B and C) of the decommissioning waste stream.

The WCS facility is able to receive the Class B and C waste. As such, for this analysis, Class B and C waste is assumed to be shipped to the WCS facility for disposal. Disposal costs are based upon preliminary and indicative information for the WCS site.

The dismantling of the components residing closest to the reactor core generates radioactive waste that may be considered unsuitable for shallow-land disposal (i.e., low-level radioactive waste with concentrations of radionuclides that exceed the limits established by the NRC for Class C radioactive waste (GTCC)). The Low-Level Radioactive Waste Policy Amendments Act of 1985 assigned the federal government the responsibility for the disposal of this material. The Act also stated that the beneficiaries of the activities resulting in the generation of such radioactive waste bear all reasonable costs of disposing of such waste.

The DOE issued its final Environmental Impact Statement for the disposal of GTCC on January 2016.[14] The study evaluated the potential environmental impacts associated with constructing and operating a new facility or using an existing facility, disposal methods, and locations. DOE is awaiting Congressional action on the report and its recommendations. At this time, the federal government has not identified a specific cost for disposing of GTCC or a schedule for acceptance.

For purposes of this analysis only, 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 canisters compatible with the spent fuel dry storage system and either stored on site or shipped directly to a federal facility as it is generated (depending upon the timing of the

13 Waste is classified in accordance with U.S. Code of Federal Regulations, Title 10, Part 61.55
14 "Final Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste (DOE/EIS-0375)," January 2016

decommissioning and whether the spent fuel has been removed from the site prior to the start of decommissioning).

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

High-Level Radioactive Waste Management

Congress passed the "Nuclear Waste Policy Act"[15] (NWPA) in 1982, assigning the federal government's long-standing responsibility for disposal of the spent nuclear fuel created by the commercial nuclear generating plants to the DOE. The DOE was to begin accepting spent fuel by January 31, 1998; however, to date no progress in the removal of spent fuel from commercial generating sites has been made.

Today, the country is at an impasse on high-level waste disposal, despite DOE's submittal of its License Application for a geologic repository to the NRC in 2008. The Obama administration eliminated the budget for the repository program while promising to "conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle … and make recommendations for a new plan."[16] Towards that goal, 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 included a requirement that it consider "[o]ptions for safe storage of used nuclear fuel while final disposition pathways are selected and deployed."[17]

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:

---

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

16 "Advisory Committee Charter, Blue Ribbon Commission on America's Nuclear Future," Appendix A, January 2012

17 Ibid.

- "[T]he United States [should] establish a program that leads to the timely development of one or more consolidated storage facilities"[18]
- "[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."[19]

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..."[20] This document states:

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

- Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites;
- Advances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities; and
- Makes demonstrable progress on the siting and characterization of repository sites to facilitate the availability of a geologic repository by 2048."[21]

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 significantly reduced 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)[22] ordering NRC to comply with federal law and resume its review of DOE's Yucca Mountain repository license application to the extent allowed by previously

---

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

19 Ibid., p.27

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

21 Ibid., p.2

22 U.S. Court of Appeals for the District Of Columbia Circuit, In Re: Aiken County, et al, Aug. 2013

appropriated funding for the review. That review was completed with the publication of a five-volume safety evaluation report. A supplement to DOE's environmental impact statement and adjudicatory hearing on the contentions filed by interested parties must be completed before a licensing decision can be made. Although the DOE proposed it would start fuel acceptance in 2025, no progress has been made in the repository program since DOE's 2013 strategy was issued except for the completion of the Yucca Mountain safety evaluation report.

Holtec International submitted a license application to the NRC on March 30, 2017 for a consolidated interim spent fuel storage facility in southeast New Mexico called HI-STORE CIS (Consolidated Interim Storage) under the provisions of 10 CFR Part 72. The application is currently under NRC review.

Waste Control Specialists submitted an application to the NRC on April 28, 2016, to construct and operate a Consolidated Interim Storage Facility (CISF) at its West Texas facility. On April 18, 2017, WCS requested that the NRC temporarily suspend all safety and environmental review activities, as well as public participation activities associated with WCS's license application. In March 2018, WCS and Orano USA, announced their intent to form a joint venture to license the facility. The joint venture, named Interim Storage Partners (ISP), requested that the NRC resume its review of the original CISF license application. Subsequently, in September, 2021, NRC issued a license to ISP for its WCS CISF to construct and operate the facility for spent nuclear fuel and GTCC storage. However, the facility is not yet operational.

Completion of the decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. DOE's repository program had originally assumed that spent fuel allocations would be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor.[23] However, the Blue Ribbon Commission, in its final report, noted that: "[A]ccepting spent fuel according to the OFF [Oldest Fuel First] priority ranking instead of giving priority to shutdown reactor sites could greatly reduce the cost savings that could be achieved through consolidated storage if priority could be given to accepting spent fuel from shutdown reactor sites before accepting fuel from still-operating plants. …. The magnitude of the cost savings that could be achieved by giving priority to shutdown sites appears

---

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

to be large enough (i.e., in the billions of dollars) to warrant DOE exercising its right under the Standard Contract to move this fuel first."

WCNOC's current spent fuel management plan for the Wolf Creek spent fuel is based in general upon: a 2031 start date for DOE initiating transfer of commercial spent fuel from the currently operating units to a licensed facility, and expectations for spent fuel receipt by the DOE for the Wolf Creek fuel.

Assuming the DOE starts accepting fuel from the currently operating plants in 2031, and from Wolf Creek in 2038, and a maximum rate of transfer of 3,000 metric tons of uranium (MTU)/year,[25] transfer of spent fuel from the ISFSI is anticipated to continue through the year 2078, if the plant ceases operating in 2045.

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 DOE. [24] Interim storage of the fuel, until the DOE has completed the transfer, will be in the fuel building's storage pool as well as at an on-site ISFSI.

An ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K [25]), supports decommissioning operations. Spent fuel stored in the existing storage pool will be transferred to the DOE first, followed by transfer of the fuel in dry storage canisters at the ISFSI. With the storage pool emptied, the fuel building can be either decontaminated and dismantled or prepared for long-term storage.

WCNOC's position is that the DOE has a contractual obligation to accept the spent 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.

Sensitivity of Spent Fuel Management Assumptions

The estimates described in this analysis were developed with the assumption that the DOE would accept spent fuel from generators in the order in which it was generated or oldest fuel first, and that the ISFSI is used for interim storage, similar to what has occurred at recently decommissioned reactor sites. To support the decommissioning program, the ISFSI would be used for the interim storage of the fuel so that decommissioning could proceed on the power block structures.

---

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

It should also be noted that the additional costs for purchase and operation of the ISFSI, while incurred by the licensee, may also be recoverable as a result of DOE's breech of its contract to take possession of the spent fuel in a timely manner.

If DOE is able to give priority to removing spent fuel from shutdown sites, the spent fuel could be removed from the Wolf Creek site within five and one-half years of the cessation of plant operations (i.e., five and one-half years would provide sufficient cooling time for the spent fuel to meet DOE transportation requirements).

Appendix F evaluates such a scenario (i.e., where spent fuel is accepted from shutdown reactors first). The resulting costs for short-term fuel pool spent fuel management (summarized in Table F) are illustrative only and based upon current regulations and associated constraints that may change as a result of actions taken on the Blue Ribbon Commission's recommendations. However, the analysis described in Appendix F may prove useful as an alternate planning basis should changes occur in the policies involving the national solution for the disposition of spent fuel and high-level waste.

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 is deferred.

Consequently, this study assumes that non-essential site structures addressed by this analysis are removed, once remediation is complete, to a nominal depth of three feet below the local grade level wherever possible. The site is then graded and stabilized.

Summary

The estimates to decommission Wolf Creek assume the removal of all contaminated and activated plant components and structural materials such that the owner may then have unrestricted use of the site with no further requirements for an operating license. Low-level radioactive waste, other than GTCC waste, is sent to a commercial processor for treatment/conditioning or to a controlled disposal facility.

Decommissioning is accomplished within the 60-year period required by current NRC regulations. In the interim, the spent fuel remains in storage at the site until such

time that the transfer to a DOE facility is complete. Once emptied, the storage facility can also be decommissioned.

The decommissioning scenarios are described in Section 2. The assumptions are presented in Section 3, along with schedules of annual expenditures. The major cost contributors are identified in Section 6, with detailed activity costs, waste volumes, and associated work force requirements delineated in Appendices C and D. The major cost components are also identified in the cost summary provided at the end of this section.

The cost elements in the estimates for the DECON and SAFSTOR alternatives are assigned to one of three subcategories: NRC License Termination (radiological remediation), Spent Fuel Management, and Site Restoration. The subcategory "NRC License Termination" is used to accumulate costs that are consistent with "decommissioning" as defined by the NRC in its financial assurance regulations (i.e., 10 CFR §50.75). The cost reported for this subcategory is generally sufficient to terminate the 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 is used to accumulate costs associated with the containerization and transfer of spent fuel from the wet storage pool to the DOE, as well as the eventual 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 removed to a depth of three feet and backfilled to conform to local grade.

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

costs that can be expected to be incurred for the specific subcomponents of the total estimated program cost, if executed as described.

As noted within this document, the estimates were developed and costs are presented in 2023 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.

DECON COST SUMMARY
DECOMMISSIONING COST ELEMENTS
(thousands of 2023 dollars)

Cost Element	Total
Decontamination	21,211
Removal	151,865
Packaging	35,868
Transportation	20,538
Waste Disposal	99,268
Off-site Waste Processing	32,560
Program Management [1]	297,023
Site Security	238,025
Spent Fuel Pool Isolation	16,480
Spent Fuel Management - Direct Costs [2]	124,802
Insurance and Regulatory Fees	35,382
Energy	13,613
Characterization and Licensing Surveys	21,048
Property Taxes	51,584
Miscellaneous Equipment	8,467
Corporate Allocations	3,628
Total [3]	1,171,364

Cost Element	Total
License Termination	736,220
Spent Fuel Management	364,576
Site Restoration	70,567
Total [3]	1,171,364

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

SAFSTOR COST SUMMARY
DECOMMISSIONING COST ELEMENTS
(thousands of 2023 dollars)

Cost Element	Total
Decontamination	18,481
Removal	164,663
Packaging	22,550
Transportation	17,141
Waste Disposal	74,292
Off-site Waste Processing	36,400
Program Management [1]	461,712
Site Security	360,895
Spent Fuel Pool Isolation	16,480
Spent Fuel Management - Direct Costs [2]	115,757
Insurance and Regulatory Fees	63,335
Energy	34,207
Characterization and Licensing Surveys	23,470
Property Taxes	81,735
Miscellaneous Equipment	26,960
Corporate Allocations	6,633
Total [3]	1,524,712

Cost Element	Total
License Termination	1,133,530
Spent Fuel Management	318,571
Site Restoration	72,611
Total [3]	1,524,712

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

1. INTRODUCTION

This report presents estimates of the cost to decommission the Wolf Creek Generating Station (Wolf Creek) for the selected decommissioning scenarios following the scheduled cessation of plant operations. Wolf Creek is operated by Wolf Creek Nuclear Operating Corporation (WCNOC). Wolf Creek's three owners are Kansas Gas and Electric Company, a wholly owned subsidiary of Westar Energy, Inc., Kansas City Power & Light Company, a wholly owned subsidiary of Great Plains Energy Incorporated, and Kansas Electric Power Cooperative, Inc. The estimates are designed to provide the WCNOC and its owners with sufficient information to assess their financial obligations, as they pertain to the eventual decommissioning of the nuclear station.

The analysis relies upon site-specific, technical information from an evaluation prepared in 2020,[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 rather an estimate prepared in advance of the detailed engineering required to carry out the decommissioning of the nuclear plant. It may also not reflect the actual plan to decommission Wolf Creek; the plan may differ from the assumptions made in this analysis based on facts that exist at the time of decommissioning.

The 2020 plant inventory, the basis for the decontamination and dismantling requirements and cost, and the decommissioning waste streams, was reviewed for this analysis. There were no substantive changes made to the plant inventory, that would impact decommissioning.

1.1 OBJECTIVES OF STUDY

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

An operating license was originally issued for Wolf Creek in June of 1985. A license renewal application was filed for the nuclear station in October 2006.

* References provided in Section 7 of the document

The NRC approved the application and a renewed licensed was issued in November 2008. As such, this analysis is based upon a 60-year operating life, with a final shutdown date (license expiration) in March of 2045.

1.2 SITE DESCRIPTION

The Wolf Creek site is located approximately 3.5 miles northeast of the town of Burlington, in Coffey County, Kansas, approximately 75 miles southwest of Kansas City, Kansas. The site is on the east side of a manufactured lake formed by impounding Wolf Creek. The station is a 1,170 MWe (nominal) pressurized water reactor with supporting facilities.

Westinghouse Electric Company designed the Nuclear Steam Supply System (NSSS). The system consists of a pressurized water reactor with four independent primary coolant loops, each of which contains a reactor coolant pump and a steam generator. An electrically heated pressurizer and connecting piping complete the system. The NSSS is rated at a thermal power level of 3,579 MWt (3,565 MWt reactor core plus 14 MWt for reactor coolant pumps), with a corresponding turbine-generator gross output of 1,267 MWe. The system is housed within a containment structure, a pre-stressed, post-tensioned concrete structure with cylindrical wall, a hemispherical dome, and a flat foundation slab. The wall and dome form a pre-stressed post-tensioned system. The inside surface of the structure is covered with a carbon steel liner, providing a leak tight membrane.

A power conversion system converts heat produced in the reactor to electrical energy. This system converts the thermal energy of the steam into mechanical shaft power and then into electrical energy. The turbine-generator is a tandem-compound, six-flow, four element, 1800-rpm unit. The unit consists of one high pressure and three low-pressure turbine elements driving a directly coupled generator. (The four turbine elements were replaced in 2010 with very similar equipment.) The turbine is operated in a closed feedwater cycle that condenses the steam; the feedwater is returned to the steam generators. Heat rejected in the main condensers is removed by the circulating water system.

The circulating water system supplies cooling water to the main condenser, condensing the steam exhausted from the turbine. A large cooling lake provides the heat sink required for removal of waste heat in the power plant thermal cycle.

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 all alternatives, 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. At the conclusion of a 60-year dormancy period (or longer 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 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 subsequently 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 decommissioning regulations were adopted in 1988, it was assumed that the majority of licensees would decommission at the end of the facility's operating licensed life. Since that time, several licensees permanently and prematurely ceased operations. Exemptions from certain operating requirements were required once the reactor was defueled to facilitate the decommissioning. Each case was handled individually, without clearly defined generic requirements. The NRC amended the decommissioning regulations in 1996 to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process. The amendments allow for greater public participation and better define the transition process from operations to decommissioning.

Under the revised regulations, licensees will submit written certification to the NRC within 30 days after the decision to cease operations. Certification will also be required once the fuel is permanently removed from the reactor vessel. Submittal of these notices, along with related changes to Technical Specifications, entitle the licensee to a fee reduction and eliminate the obligation to follow certain requirements needed only during operation of the reactor. Prior to or within 2 years following permanent cessation of operations, the licensee is required to submit a Post-Shutdown Decommissioning Activities Report (PSDAR) to the NRC, and a copy to the affected State(s) (10 CFR 50.82(a)(4)(i)). The PSDAR describes the planned decommissioning activities, the associated sequence and schedule, and an estimate of expected costs. Prior to completing decommissioning, the licensee is required to submit an application to the NRC to terminate the license, which includes a license termination plan (LTP).

In 2011, the NRC issued regulations to improve decommissioning planning and thereby reduce the likelihood that any current operating facility will become a legacy site.[7] The regulations require licensees to report additional details in their decommissioning cost estimate including a decommissioning estimate for the ISFSI. This estimate is provided in Appendix E.

1.3.1 High-Level Radioactive Waste Management

Congress passed the "Nuclear Waste Policy Act" (NWPA) in 1982,[8] assigning the federal government's long-standing responsibility for disposal of the spent nuclear fuel created by the commercial nuclear generating plants to the DOE. It was to begin accepting spent fuel by January 31, 1998; however, to date no progress in the removal of spent fuel from commercial generating sites has been made.

Today, the country is at an impasse on high-level waste disposal, despite DOE's submittal of its License Application for a geologic repository to the NRC in 2008. The Obama administration eliminated the budget for the repository program while promising to "conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle … and make recommendations for a new plan." Towards this goal, the 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 included a requirement that it consider "[o]ptions for safe storage of used nuclear fuel while final disposition pathways are selected and deployed."[9]

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

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

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

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

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

The NRC's review of DOE's license application to construct a geologic repository at Yucca Mountain was suspended in 2011, when the Obama administration significantly reduced 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 resume its review of DOE's Yucca Mountain repository license application to the extent allowed by previously appropriated funding for the review. That review was completed with the publication of a five-volume safety evaluation report. A supplement to DOE's environmental impact statement and adjudicatory hearing on the contentions filed by interested parties must be completed before a licensing decision can be made. Although the DOE proposed it would start fuel acceptance in 2025, no progress has been made in the repository program since DOE's 2013 strategy was issued except for the completion of the Yucca Mountain safety evaluation report.

Holtec International submitted a license application to the NRC on March 30, 2017 for a consolidated interim spent fuel storage facility in southeast New Mexico called HI-STORE CISF (Consolidated Interim Storage Facility) under the provisions of 10 CFR Part 72. In May 2023, the NRC

issued a license to Holtec to construct and operate a facility to receive, possess, store, and transfer spent nuclear fuel at the HI–STORE CISF.

Waste Control Specialists submitted an application to the NRC on April 28, 2016, to construct and operate a Consolidated Interim Storage Facility (CISF) at its West Texas facility. On April 18, 2017, WCS requested that the NRC temporarily suspend all safety and environmental review activities, as well as public participation activities associated with WCS's license application. In March 2018, WCS and Orano USA, announced their intent to form a joint venture to license the facility. The joint venture, named Interim Storage Partners (ISP), requested that the NRC resume its review of the original CISF license application. Subsequently, in September, 2021, NRC issued a license to ISP for its WCS CISF to construct and operate the facility for spent nuclear fuel and GTCC storage. However, the facility is not yet operational.

Completion of the decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. DOE's repository program had originally assumed that spent fuel allocations would be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor.[13] However, the Blue Ribbon Commission, in its final report, noted that: "[A]ccepting spent fuel according to the OFF [Oldest Fuel First] priority ranking instead of giving priority to shutdown reactor sites could greatly reduce the cost savings that could be achieved through consolidated storage if priority could be given to accepting spent fuel from shutdown reactor sites before accepting fuel from still-operating plants. …. The magnitude of the cost savings that could be achieved by giving priority to shutdown sites appears to be large enough (i.e., in the billions of dollars) to warrant DOE exercising its right under the Standard Contract to move this fuel first."

WCNOC's current spent fuel management plan for the Wolf Creek spent fuel is based in general upon: 1) a 2031 start date for DOE initiating transfer of commercial spent fuel to a federal facility, and 2) a 2038 start date for the transfer of spent fuel from the Wolf Creek site based on an oldest fuel first priority, and the DOE achieving an annual rate of transfer (3,000 metric tons of uranium per year) as reflected in DOE's latest Acceptance Priority Ranking and Annual Capacity Report.[14] Transfer of spent fuel from the ISFSI is anticipated to continue through the year 2078, with plant operations ceasing in 2045.

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 DOE.[15] Interim storage of the fuel, until the DOE has completed the transfer, will be in the fuel building storage pool as well as at an on-site ISFSI.

The ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[16]), supports decommissioning operations. Spent fuel stored in the existing storage pool will be transferred to the DOE first, followed by transfer of the fuel in dry storage canisters at the ISFSI. With the storage pool emptied, the fuel building can be either decontaminated and dismantled or prepared for long-term storage.

WCNOC's position is that the DOE has a contractual obligation to accept the spent 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.

1.3.2 Low-Level Radioactive Waste Management

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,[17] and its Amendments of 1985,[18] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders.

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, located in Andrews, Texas, is also able to accept limited volumes of non-Compact waste.

Disposition of the various waste streams produced by the decommissioning process considered all options and services currently available to WCNOC. The majority of the low-level radioactive waste designated for controlled disposal (Class A[19]) can be sent to Energy*Solutions*' facility in Clive, Utah. Therefore, disposal costs for Class A waste were based upon WCNOC's "Long Term Waste Disposal Agreement" with Energy*Solutions*. This facility is not licensed to receive

the higher activity portion (Classes B and C) of the decommissioning waste stream.

The WCS facility is able to receive the Class B and C waste. As such, for this analysis, Class B and C waste is assumed to be shipped to the WCS facility for disposal. Disposal costs are based upon preliminary and indicative information for the WCS site.

The dismantling of the components residing closest to the reactor core generates radioactive waste that may be considered unsuitable for shallow-land disposal (i.e., low-level radioactive waste with concentrations of radionuclides that exceed the limits established by the NRC for Class C radioactive waste (GTCC)). The Low-Level Radioactive Waste Policy Amendments Act of 1985 assigned the federal government the responsibility for the disposal of this material. The Act also stated that the beneficiaries of the activities resulting in the generation of such radioactive waste bear all reasonable costs of disposing of such waste.

The DOE issued its final Environmental Impact Statement for the disposal of GTCC on January 2016.[20] The study evaluated the potential environmental impacts associated with constructing and operating a new facility or using an existing facility, disposal methods, and locations. DOE is awaiting Congressional action on the report and its recommendations. At this time, the federal government has not identified a specific cost for disposing of GTCC or a schedule for acceptance.

For purposes of this analysis only, 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 canisters compatible with the spent fuel dry storage system and either stored on site or shipped directly to a federal facility as it is generated (depending upon the timing of the decommissioning and whether the spent fuel has been removed from the site prior to the start of decommissioning).

A significant portion of the waste material generated during decommissioning may only be potentially contaminated by radioactive materials. This waste can be analyzed on site or shipped off site to licensed facilities for further analysis, for processing and/or for conditioning/recovery. Reduction in the volume of low-level radioactive waste requiring disposal in a licensed low-level radioactive waste disposal facility can be accomplished through a variety of methods, including analyses and surveys or decontamination to eliminate the portion of waste

that does not require disposal as radioactive waste, compaction, incineration or metal melt. The estimates 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,"[21] amending 10 CFR Part 20. This subpart provides radiological criteria for releasing a facility for unrestricted use. The regulation states that the site can be released for unrestricted use if radioactivity levels are such that the average member of a critical group would not receive a Total Effective Dose Equivalent (TEDE) in excess of 25 millirem per year, and provided that residual radioactivity has been reduced to levels that are As Low As Reasonably Achievable (ALARA). The decommissioning estimates assume that the Wolf Creek site will be remediated to a residual level consistent with the NRC-prescribed level.

It should be noted that the NRC and the Environmental Protection Agency (EPA) differ on the amount of residual radioactivity considered acceptable in site remediation. The EPA has two limits that apply to radioactive materials. An EPA limit of 15 millirem per year is derived from criteria established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund).[22] An additional and separate limit of 4 millirem per year, as defined in 40 CFR §141.16, is applied to drinking water.[23]

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)[24] provides that EPA will defer exercise of authority under CERCLA for the majority of facilities decommissioned under NRC authority. The MOU also includes provisions for NRC and EPA consultation for certain sites when, at the time of license termination, (1) groundwater contamination exceeds EPA-permitted levels; (2) NRC contemplates restricted release of the site; and/or (3) residual radioactive soil concentrations exceed levels defined in the MOU.

The MOU does not impose any new requirements on NRC licensees and should reduce the involvement of the EPA with NRC licensees who are decommissioning. Most sites are expected to meet the NRC criteria for unrestricted use, and the NRC believes that only a few sites will have groundwater or soil contamination in excess of the levels specified in the MOU that trigger consultation with the EPA. However, if there are other

hazardous materials on the site, the EPA may be involved in the cleanup. As such, the possibility of dual regulation remains for certain licensees. The present study does not include any costs for this occurrence.

2. DECOMMISSIONING ALTERNATIVES

Detailed cost estimates were developed to decommission Wolf Creek based upon the NRC-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.

Two decommissioning scenarios were evaluated for Wolf Creek. The scenarios selected are representative of alternatives available to the owner and are defined as follows:

1. The first scenario assumes that the plant would be promptly decommissioned (DECON alternative) upon the expiration of the current operating license, i.e., in 2045. All remaining spent fuel in the plant's spent fuel storage pool is transferred to the DOE or to the onsite ISFSI within the first four 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. Site structures are then demolished. Spent fuel storage operations continue at the site until the transfer of the fuel from the ISFSI to the DOE is complete, assumed to be in the year 2078.

2. In the second scenario, the nuclear plant is placed into safe-storage (SAFSTOR alternative) at the end of its current operating license (2045). All remaining spent fuel in the plant's spent fuel storage pool is transferred to the DOE or to the onsite ISFSI and the plant reconfigured for long-term storage. Spent fuel storage operations continue at the site until the transfer of the fuel from the ISFSI to the DOE is complete, assumed to be in the year 2078. Decommissioning operations commence in 2098, with the decontamination and dismantling of Wolf Creek completed in 2105, sixty years after the cessation of operations. Site structures are then demolished, with site restoration to be complete in 2106.

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 facility de-activation and closure. During the first phase, notification is to be provided to the NRC

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

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

2.1 DECON

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

2.1.1 Period 1 - Preparations

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

<u>Engineering and Planning</u>

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, and the associated financial requirements of the intended decommissioning program. Upon receipt of the PSDAR, the NRC will make the document available to the public for comment in a local hearing to be held in the vicinity of the reactor site. Ninety days following submittal and NRC receipt of the PSDAR, the licensee may begin to perform major decommissioning activities under a

modified 10 CFR §50.59 procedure, i.e., without specific NRC approval. Major activities are defined as any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment, or results in dismantling components (for shipment) containing GTCC, as defined by 10 CFR §61. Major components are further defined as comprising the reactor vessel and internals, large bore reactor coolant system piping, and other large components that are radioactive. The NRC includes the following additional criteria for use of the §50.59 process in decommissioning. The proposed activity must not:

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

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

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

Site Preparations

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

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

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

- Isolation of the spent fuel storage pool and reactor systems, such that decommissioning operations can commence on the balance of the plant. Decommissioning operations are scheduled around the reactor areas to optimize the overall project schedule. The fuel is transferred to the DOE as allocations permit. Consequently, it is assumed that the fuel pool remains operational for approximately four years following the cessation operations.
- Specification of transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.
- Development of procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and non-metallic components generated in decommissioning), site security and emergency programs, and industrial safety.

2.1.2 Period 2 - Decommissioning Operations

This period includes the physical decommissioning activities associated with the removal and disposal of contaminated and activated components and structures, including the successful release of the site from the 10 CFR §50 operating license, 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. For example, this will 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 will include the upgrading of roads (on- and off-site) to facilitate hauling and transport. Modifications will be required to the containment structure to facilitate access of large/heavy equipment. Modifications will also be required to the refueling area of the reactor building to support the segmentation of the reactor vessel internals and component extraction.
- Procurement and installation of all required Dry Shielded Canisters (DSCs) and horizontal storage modules (HSMs) in the ISFSI for the storage of Wolf Creek spent fuel that-cannot be transferred directly to the DOE.

- Transfer of the spent fuel from the spent fuel pool to the DOE and/or ISFSI. The spent fuel pool at Wolf Creek is kept open for approximately four years after the cessation of plant operations. In the prompt decommissioning scenario, once the majority of the decontamination and dismantling activities have been completed (over the first five years), the site organization is configured and streamlined to support the remaining spent fuel transfer activities. With the pool emptied, management resources are remobilized to support the final site survey (exclusive of the ISFSI) and building demolition.
- 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 for the disposition of low-level radioactive waste.
- Decontamination of components and piping systems as required to control (minimize) worker exposure.
- Removal of piping and components no longer essential to support decommissioning operations.
- Removal of control rod drive housings and the head service structure from reactor vessel head. Segmentation of the vessel closure head.
- Removal and segmentation of the upper internals assemblies. Segmentation will maximize the loading of the shielded transport casks, i.e., by weight and activity. The operations are conducted under water using remotely operated tooling and contamination controls.
- Disassembly and segmentation of the remaining reactor internals, including the core shroud and lower core support assembly. Some material is expected to exceed Class C disposal requirements. As such, the segments packaged in modified fuel storage canisters for geologic disposal.
- Segmentation of the reactor vessel. A shielded platform is installed for segmentation as cutting operations are performed in-air using remotely operated equipment within a contamination control envelope. The water level is maintained just below the cut to minimize the working area dose rates. Segments are transferred in-air to containers that are stored under water, for example, in an isolated area of the refueling canal.
- Removal of the activated portions of the concrete biological shield and accessible contaminated concrete surfaces. If dictated by the steam

generator and pressurizer removal scenarios, those portions of the associated 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 removed and the internal components segregated for recycling. 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, e.g., with grout. Steel shielding will be added, as necessary, to those external areas of the package to meet transportation limits and regulations. The pressurizer is disposed of intact.

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 hearing. LTP approval will be subject to any conditions and limitations as deemed appropriate by the Commission. The licensee may then commence with the final remediation of site facilities and services, including:

- Removal of remaining plant systems and associated components as they become nonessential to the decommissioning program or worker health and safety (e.g., waste collection and treatment systems, electrical power and ventilation systems).
- Removal of the steel liners from 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 and fuel buildings and any other contaminated facility. Radiation and contamination controls will be utilized until residual levels indicate that the structures and equipment can be released for unrestricted access and conventional demolition. This activity may necessitate the dismantling and disposition of most of the systems and

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

- 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)."[25] This document incorporates the statistical approaches to survey design and data interpretation used by the EPA. It also identifies commercially available instrumentation and procedures for conducting radiological surveys. Use of this guidance ensures that the surveys are conducted in a manner that provides a high degree of confidence that applicable NRC criteria are satisfied. Once the survey is complete, the results are provided to the NRC in a format that can be verified. The NRC then reviews and evaluates the information, performs an independent confirmation of radiological site conditions, and makes a determination on the requested change to the operating license (that would release the property, exclusive of the ISFSI, for unrestricted use).

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

2.1.3 Period 3 - Site Restoration

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

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

It is not currently anticipated that these structures would be repaired and preserved after the radiological contamination is removed. The cost to dismantle site structures, once remediation is complete, with a work force already mobilized on site is more efficient than if the process is deferred.

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

Non-contaminated concrete rubble produced by demolition activities is processed to remove reinforcing steel and miscellaneous embedments. The processed material is then used on site to backfill foundation voids. Excess non-contaminated materials are trucked to an off-site area for disposal as construction debris.

2.1.4 ISFSI Operations and Decommissioning

Transfer of spent fuel to a DOE repository or interim facility is assumed to be exclusively from the ISFSI once the fuel pool has been emptied and the fuel building released for decommissioning. The ISFSI will continue to operate, for example, under a general license (10 CFR Part 50), following the amendment of the operating license to release the adjacent (power block) property.

Assuming the DOE starts accepting fuel from Wolf Creek in 2038, transfer of spent fuel from the ISFSI is anticipated to be completed by the year 2078.

At the conclusion of the spent fuel transfer process, the ISFSI will be decommissioned. The Commission will terminate the Part 50 license 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.

The design of the ISFSI is based upon a transportable storage canister to house the spent fuel assemblies, and a horizontal storage module for pad storage. It is assumed that once the canisters containing the spent fuel assemblies have been removed, any required decontamination is performed on the storage modules (some minor neutron activation is assumed), and the license for the facility terminated, the modules can be dismantled using conventional techniques for the demolition of reinforced concrete. The concrete storage pad is then removed and the area regraded.

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 that are not required to support the spent fuel pool or site surveillance and security are drained, de-energized, and secured (the spent fuel pool will be operational for four years after shutdown). Minimal cleaning/removal of loose contamination and/or fixation and sealing of remaining contamination are performed. Access to contaminated areas is secured to provide controlled access for inspection and maintenance.

The engineering and planning requirements are similar to those for the DECON alternative, although a shorter time period is expected for these activities due to the more limited work scope. Site preparations are also similar to those for the DECON alternative. However, with the exception of the required radiation surveys and site characterizations, the mobilization and preparation of site facilities is less extensive.

2.2.1 Period 1 - Preparations

Preparations for long-term storage include the planning for permanent defueling of the reactor, 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 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.
- Transferring the spent fuel from the storage pool to the DOE or to the ISFSI, following the required cooling period in the spent fuel pool.
- Draining and de-energizing of the non-contaminated systems not required to support continued site operations or maintenance.
- Disposing of contaminated filter elements and resin beds not required for processing wastes from layup activities for future operations.
- Draining of the reactor vessel, with the internals left in place and the vessel head secured.
- Draining and de-energizing non-essential, contaminated systems including 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.

Consistent with the DECON scenario, the spent fuel storage pool is emptied within approximately four years from the cessation of operations. The pool is drained and decontaminated and prepared for long-term storage. The transfer of the spent fuel from the ISFSI to a DOE facility begins in 2050 and continues throughout the dormancy period until completed in 2078. Once emptied, the ISFSI is placed in storage and decommissioned along with the power block structures in Period 4.

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

Security during the dormancy period is conducted primarily to prevent unauthorized entry and to protect the public from the consequences of its own actions. The security fence, sensors, alarms, and other surveillance equipment are maintained throughout the dormancy period. Fire and radiation alarms are also monitored and maintained.

After a period of storage (such that license termination is accomplished within 60 years of final shutdown), it is required that the licensee submit an application to terminate the 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 and the assembly of activity specifications and detailed work 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 this deferred scenario is the absence, in the latter, of any constraint on the dismantling process due to the operation of the spent fuel pool in the DECON option.

Radioactive decay over the length of the dormancy period will 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 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. However, due to the lower activity levels, a greater percentage of the waste volume can be designated for off-site processing and recovery.

The delay in decommissioning also yields lower working area radiation levels. As such, the estimate for this delayed scenario incorporates 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 vessel will still exhibit sufficiently high radiation dose rates to require remote sectioning under water due to the presence of long-lived radionuclides such as ^{94}Nb, ^{59}Ni, and ^{63}Ni. Therefore, the dismantling procedures described for the DECON alternative would still be employed during this scenario. Portions of the biological shield will still be radioactive due to the presence of activated trace elements with long half-lives (^{152}Eu and ^{154}Eu). Decontamination will require controlled removal and disposal. It is assumed that radioactive corrosion products on inner surfaces of piping and components will not have decayed to levels that will

permit unrestricted use or allow conventional removal. These systems and components will be surveyed as they are removed and disposed of in accordance with the existing radioactive release criteria.

2.2.4 Period 5 - Site Restoration

Following completion of decommissioning operations, site-restoration activities 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 is consistent with that described for DECON, presuming the removal of structures and site facilities to a nominal depth of three feet below grade and the limited restoration of the site.

3. COST ESTIMATES

The cost estimates prepared for decommissioning Wolf Creek consider the unique features of the site, including the nuclear steam supply system, electric power generating systems, structures, and supporting 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 current estimates were developed using the site-specific, technical information from a previous analysis performed in 2020. This information was reviewed and updated for the current analysis. The site-specific considerations and assumptions used in the previous evaluation were also revisited. Modifications were incorporated where new information was available or experience from ongoing decommissioning programs provided viable alternatives or improved processes.

3.2 METHODOLOGY

The methodology used to develop the estimates follows the basic approach originally presented in the AIF/NESP-036 study report, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates,"[26] and the DOE "Decommissioning Handbook."[27] These documents present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal ($/cubic yard), steel removal ($/ton), and cutting costs ($/inch) are developed using local labor rates. The activity-dependent costs are estimated with the item quantities (cubic yards and tons), developed from plant drawings and inventory documents. Removal rates and material costs for the conventional disposition of components and structures rely upon information available in the industry publication, "Building Construction Cost Data," published by RSMeans. [28]

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

Regulatory Guide 1.184[29] Revision 1, issued in October 2013, 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,[30] issued February 2005.

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 Rancho Seco, Trojan, Yankee Rowe, Big Rock Point, Maine Yankee, Humboldt Bay-3, Oyster Creek, Connecticut Yankee, Crystal River, Vermont Yankee, Fort Calhoun, Pilgrim and Indian Point nuclear units have provided additional insight into the process, the regulatory aspects, and the technical challenges of decommissioning commercial nuclear units.

Work Difficulty Factors

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

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

- Access Factor 10% to 20%
- Respiratory Protection Factor 10% to 50%
- Radiation/ALARA Factor 10% to 37%
- Protective Clothing Factor 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 radiological controlled areas. The resulting labor-hours, or crew-hours, are used in the development of the decommissioning program schedule, using resource loading and event sequencing considerations. The scheduling of conventional removal and dismantling activities is based upon productivity information available from the "Building Construction Cost Data" publication. In the DECON alternative, dismantling of the fuel building 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 DOE and/or ISFSI.

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

3.3 FINANCIAL COMPONENTS OF THE COST MODEL

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

3.3.1 Contingency

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

The activity- and period-dependent costs are combined to develop the total decommissioning cost. A contingency is then applied on a line-item basis, using one or more of the contingency types listed in the AIF/NESP-036 study. "Contingencies" are defined in the American Association of Cost Engineers "Project and Cost Engineers' Handbook"[31] as "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this analysis are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, contingency is included. In the AIF/NESP-036 study, the types of unforeseeable events that are likely to occur in decommissioning are discussed and guidelines are provided for a contingency percentage in each category. It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the plant.

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%

- Low-Level Radioactive Waste Processing 15%
- Reactor Segmentation 75%
- NSSS Component Removal 25%
- Reactor Waste Packaging 25%
- Reactor Waste Transport 25%

- Reactor Vessel Component Disposal 50%
- GTCC Disposal 15%

• Staffing	15%
• Spent Fuel Management	15%
• Non-Radioactive Component Removal	15%
• Heavy Equipment and Tooling	15%
• Supplies	25%
• Engineering	15%
• Energy	15%
• Insurance and Fees	10%
• Characterization and Termination Surveys	30%
• Operations and Maintenance Expense	15%
• Construction	15%
• Property Taxes	10%
• 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, D and F). A contingency of 25% is applied to the subtotal of the ISFSI decommissioning costs in Appendix E.

3.3.2 Financial Risk

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

- Transition activities and costs: ancillary expenses associated with eliminating 50% to 80% of the site labor force shortly after the cessation of plant operations, added cost for worker separation packages throughout the decommissioning program, national or company-mandated retraining, and retention incentives for key personnel.

- Delays in approval of the decommissioning plan due to intervention, public participation in local community meetings, legal challenges, and national and local hearings.
- Changes in the project work scope from the baseline estimate, involving the discovery of unexpected levels of contaminants, contamination in places not previously expected, contaminated soil previously undiscovered (either radioactive or hazardous material contamination), variations in plant inventory or configuration not indicated by the as-built drawings.
- Regulatory changes, for example, affecting worker health and safety, site release criteria, waste transportation, and disposal.
- Policy decisions altering national commitments (e.g., in the ability to accommodate certain waste forms for disposition, or in the timetable for such, or the start and rate of acceptance of spent fuel by the DOE.
- Pricing changes for basic inputs such as labor, energy, materials, and waste 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.

3.4 SITE-SPECIFIC CONSIDERATIONS

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

3.4.1 Spent Fuel Management

The cost to dispose the spent fuel generated from plant operations is not reflected within the estimates to decommission Wolf Creek. 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, until recently, the disposal cost was being financed by a 1 mill/kWhr surcharge on nuclear generated energy delivered to customers, the fee being paid into the DOE's waste fund during operations. The D.C. Circuit

ruling on November 19, 2013, ordered the DOE to submit a proposal to Congress to suspend the Nuclear Waste Fund fee "until such time as either the Secretary chooses to comply with the Act as it is currently written, or until Congress enacts an alternative waste management plan." The fee was reduced to 0.0 mill/kWh as of May 16, 2014. The fee is expected to be reinstated in the future.

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

Completion of the decommissioning process is highly dependent upon the DOE's ability to remove spent fuel from the site. For planning purposes only, this estimate assumes that the currently shutdown sites will receive priority. WCNOC's current spent fuel management plan for the Wolf Creek spent fuel is based in general upon: 1) a 2031 start date for DOE initiating transfer of commercial spent fuel from the currently operating units to a licensed facility, and 2) expectations for spent fuel receipt by the DOE for the Wolf Creek fuel.

Assuming the DOE starts accepting fuel from the currently operating plants in 2031, and from Wolf Creek in 2038, and a maximum rate of transfer of 3,000 metric tons of uranium (MTU)/year,[32] transfer of spent fuel from the ISFSI is anticipated to continue through the year 2078, if the plant ceases operating in 2045.

ISFSI

The new ISFSI is designed to accommodate all fuel assemblies expected to be discharged by the Wolf Creek reactor. For purposes of this analysis only, the ISFSI would be sized to accommodate 2,439 Wolf Creek assemblies.

The ISFSI will be expected to operate throughout decommissioning, and beyond the conclusion of the remediation phase in the DECON decommissioning scenario, until such time that the transfer of spent fuel to the DOE can be completed. The scenario is similar for the SAFSTOR alternative; however, based upon the expected completion date for fuel transfer, the ISFSI will be emptied prior to the commencement of decommissioning operations.

Operation and maintenance costs for the spent fuel pool and the ISFSI are included within the estimates and address the cost for staffing the facility, as well as other costs (e.g., security, insurance, and licensing fees). The estimates also include the costs to transfer the transportable storage canisters to the DOE. Costs are also provided for the final disposition of the facilities once the transfer is complete.

Storage Canister Design

A horizontal dry storage system is used as a cost basis. The system consists of a transportable storage canister with a horizontal concrete storage module. A dry-storage canister capacity of 37 pressurized water reactor assemblies was assumed.

Canister Loading and Transfer

For fuel transferred directly from the pool to the DOE, the DOE was assumed to provide Transport, Aging and Disposal (TAD) canisters with a 21 assembly capacity for pressurized water reactor fuel. The TADs are assumed to be provided at no additional cost to the owner.

The estimates include the cost for the materials and labor to load, seal and transfer each spent fuel canister from the pool into either a DOE transport cask for off-site shipment or an on-site transporter for relocation to the ISFSI.

Operations and Maintenance

The estimates also include the cost of operating and maintaining the spent fuel pool and the ISFSI, respectively. Pool operations are expected to continue for approximately four years after the cessation of operations. ISFSI operating costs are based upon the previously stated assumptions on fuel transfer expectations.

ISFSI Decommissioning

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

The Wolf Creek ISFSI storage modules are assumed to have some level of neutron-induced activation as a result of the long-term storage of the Wolf Creek fuel, i.e., to levels exceeding free-release limits. As an allowance for module remediation, six horizontal modules are assumed to have some level of neutron-induced activation (i.e., to levels exceeding free-release limits), equivalent to the number of modules required to accommodate the final core off load. The ISFSI pad is not expected to be contaminated and will be demolished accordingly, after a confirmation survey.

The cost estimate for decommissioning the ISFSI reflects: 1) the cost of an independent contractor performing the decommissioning activities; 2) an adequate contingency factor; and 3) the cost of meeting the criteria for unrestricted use. The cost summary for decommissioning the ISFSI is presented in Appendix E.

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)). The Low-Level Radioactive Waste Policy Amendments Act of 1985 assigned the federal government the responsibility for the disposal of this material. The Act also stated that the beneficiaries of the activities resulting in the generation of such radioactive waste bear all reasonable costs of disposing of such waste. Although the DOE is responsible for disposing of GTCC waste, any costs for that service have not been determined. For purposes of this estimate, the GTCC is packaged in canisters compatible with the spent fuel dry storage system and disposed of at a cost equivalent to that envisioned for the spent fuel.

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 the Wolf Creek site (for the DECON alternative). In the SAFSTOR scenario, the GTCC material is shipped directly to a DOE facility as it is generated since the fuel has been removed from the site prior to the start of delayed dismantling.

3.4.2 Reactor Vessel and Internal Components

The reactor pressure vessel and internal components are segmented for disposal in shielded, reusable transportation casks. Segmentation is

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

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

- the reactor package could be secured to the transport vehicle for the entire journey, i.e., the package was not lifted during transport,
- there were no man-made or natural terrain features between the plant site and the disposal location that could produce a large drop, and
- transport speeds were very low, limited by the overland transport vehicle and the river barge.

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

It is not known whether this option will be available when the Wolf Creek plant ceases operation. Future viability of this option will depend upon the ultimate location of the disposal site, as well as the disposal site licensee's ability to accept highly radioactive packages and effectively isolate them from the environment. Consequently, the study assumes that the reactor vessel will require segmentation, as a bounding condition.

3.4.3 Primary System Components

In the DECON scenario, the reactor coolant system components are assumed to be decontaminated using chemical agents prior to the start of dismantling operations. This type of decontamination can be expected to have a significant ALARA impact, 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. In the SAFSTOR scenario, radionuclide decay is expected to provide the same benefit and, therefore, a chemical decontamination is not included.

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

A trolley crane 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 laydown space for processing these large components.

The generators are rigged for removal, disconnected from the surrounding piping and supports, and maneuvered into the open area where they are lowered onto a dolly. 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 processing and storage area.

The generators are disassembled on-site with the steam dome and lightly contaminated subassemblies designated for off-site recycling. The more highly contaminated tube sheet and tube bundle are packaged for direct disposal. The interior volume is filled with low-density cellular concrete for stabilization of the internal contamination.

Disposal costs are based upon the displaced volume and weight of the units. Each component is then loaded onto a rail car for transport to the disposal facility.

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

3.4.4 Main Turbine and Condenser

The main turbine is dismantled using conventional maintenance procedures. The turbine rotors and shafts are removed to a laydown area. The lower turbine casings are removed from their anchors by controlled demolition. The main condensers are also disassembled and moved to a laydown area. Material is then prepared for transportation to an off-site recycling facility where it is surveyed and designated for either decontamination or volume reduction, conventional disposal, or controlled disposal. Components are packaged and readied for transport in accordance with the intended disposition.

3.4.5 Transportation Methods

Contaminated piping, components, and structural material other than the highly activated reactor vessel and internal components will qualify as LSA-I, II or III or Surface Contaminated Object, SCO-I or II, as described in Title 49.[33] The contaminated material will be packaged in Industrial Packages (IP-1, IP-2, or IP-3, as defined in subpart 10 CFR §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, in Type B containers. It is conceivable that the reactor, due to its limited specific activity, could qualify as LSA II or III. However, the high radiation levels on the outer surface would require that additional shielding be incorporated within the packaging to attenuate the dose to levels acceptable for transport.

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

Transport of the highly activated metal, produced in the segmentation of the reactor vessel and internal components, will be by shielded truck cask.

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

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

Truck transport costs were developed from published tariffs from Tri-State Motor Transit.[34] based upon the mileage to the Energy*Solutions* facility in Clive, Utah and the Waste Control Specialist facility in Andrews County, Texas. Transportation costs for off-site waste processing are based upon the mileage to Oak Ridge, Tennessee. The disposal cost for the GTCC material is assumed to be inclusive of the transportation cost.

3.4.6 Low-Level Radioactive Waste Disposal

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

The mass of radioactive waste generated during the various decommissioning activities at the site is shown on a line-item basis in the detailed Appendices C, D, E, and F, and summarized in 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, as well as the special handling requirements of the payload. Packaging efficiencies are lower for the highly activated materials (greater than Type A quantity waste), where high concentrations of gamma-emitting radionuclides limit the capacity of the shipping canisters.

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

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 packaged in the same multi-purpose canisters used for spent fuel storage/transport.

3.4.7 Site Conditions Following Decommissioning

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

The major structures that may require decontamination or radiological remediation are the reactor, auxiliary, communication corridor, radwaste, and fuel buildings.

The estimates presented herein include the dismantling of the major structures to a nominal depth of three feet below grade, backfilling and the collapsing of below grade voids, and general terra-forming such that the site upon which the power block and supplemental structures are located is transformed into a "grassy plain."

Concrete rubble generated from demolition activities is processed and made available as clean fill for the power block foundations; excess rubble is removed from the site and disposed of as construction debris. Soil is brought in to cap the power block excavations and to permit seeding for erosion control.

A significant amount of the below grade piping is located around the perimeter of the power block. The estimate includes a cost to excavate this area to an average depth of six feet so as to expose the piping, duct bank, conduit, and any near-surface grounding grid. The overburden is surveyed and stockpiled on site for future use in backfilling the below grade voids.

The existing electrical switchyard and access roads will remain in support of the electrical transmission and distribution system. Other structures that will remain are the main dam, cooling lake, makeup water discharge structure (west side of lake), makeup water screen house (located below the John Redmond Dam) and associated underground piping, the Eisenhower Learning Center, and a railroad spur running about 11.5 miles from the plant southeast to near Aliceville, Kansas, where it connects to a Union Pacific Railroad line.

The estimates do not assume the remediation of any significant volume of contaminated soil. Costs are included, however, for the remediation of the firing range, i.e., removal of soil containing lead residue. This assumption may be affected by continued plant operations and/or future regulatory actions, such as the development of site-specific release criteria.

3.5 ASSUMPTIONS

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

3.5.1 Estimating Basis

Decommissioning costs are reported in the year of projected expenditure; however, the values are provided in 2023 dollars. Costs are not inflated, escalated, or discounted over the periods of performance.

The estimates rely upon the physical plant inventory that was the basis for the 2020 analysis (updated to reflect any material changes to the plant over the past three years).

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

3.5.2 Labor Costs

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

Personnel costs are based upon average salary information provided by WCNOC. Overhead costs are included for site and corporate support, reduced commensurate with the staffing of the project.

The craft labor required to decontaminate and dismantle the nuclear plant is acquired through standard site contracting practices. The current cost of labor at the site is used as an estimating basis.

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).

Security levels are assumed to be maintained at “operating levels” for approximately 18 months after operations ceases. Additional reductions in force size are assumed when the spent fuel pool is empty and with the completion of the decommissioning and site restoration activities.

A profile of the staffing levels for decommissioning, including contractors and craft, is provided in Figures 3.1 and 3.2 for the DECON and SAFSTOR scenarios, respectively. 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 license termination survey period. However, craft levels increase again during the site restoration period due to the work associated with structures demolition.

3.5.3 Design Conditions

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

The curie contents of the vessel 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 Wolf Creek 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.

Neutron activation of the containment building structure is assumed to be confined to the biological shield.

3.5.4 General

Transition Activities

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

- Drain and collect fuel oils, lubricating oils, and transformer oils for recycle and/or sale.
- Drain and collect acids, caustics, and other chemical stores for recycle and/or sale.

- Process operating waste inventories (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. WCNOC 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 value that an owner may realize based upon those efforts.

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

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

Energy

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

Insurance

Costs for continuing coverage (nuclear liability and property insurance) following cessation of plant operations and during decommissioning are included and based upon current operating premiums. Reductions in premiums, throughout the decommissioning process, are based upon the guidance provided in SECY-00-0145, "Integrated Rulemaking Plan for Nuclear Power Plant Decommissioning."[38] The NRC's financial protection requirements are based on various reactor (and spent fuel) configurations.

Emergency Planning

FEMA emergency planning fees are included for approximately 18 months after the cessation of plant operations. At that time, the 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 continue until all fuel has been removed from the site (approximately thirty-three years following the cessation of operations).

Severance Program

No severance program is included for the personnel in the decommissioning organization.

Taxes

Property tax payments are included for the land and those facilities that will continue to be used to support the decommissioning project. When the facilities are no longer needed, the taxes are reduced accordingly.

Site Modifications

The perimeter fence and in-plant security barriers will be moved, as appropriate, to conform to the Site Security Plan in force during the various stages of the project.

3.6 COST ESTIMATE SUMMARY

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

The tables in Appendices C and D provide additional detail. The cost elements in these tables are 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). The cost reported for this subcategory is generally sufficient to terminate the plant's operating license, recognizing that there may be some additional cost impact from spent fuel management. These costs are identified in Tables 3.1a and 3.2a.

The "Spent Fuel Management" subcategory contains costs associated with the containerization and transfer of spent fuel from the wet storage pool to the DOE, as well as the eventual 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. These costs are identified in Tables 3.1b and 3.2b.

"Site Restoration" is used to capture costs associated with the dismantling and demolition of buildings and facilities demonstrated to be free from contamination. This includes structures never exposed to radioactive materials, as well as those facilities that have been decontaminated to appropriate levels. Structures are removed to a depth of three feet and backfilled to conform to local grade. These costs are identified in Tables 3.1c and 3.2c.

It should be noted that the costs assigned to these subcategories are allocations. Delegation of cost elements is for the purposes of comparison (e.g., with NRC financial guidelines) or to permit specific financial treatment (e.g., Asset Retirement Obligation determinations). In reality, there can be considerable interaction between the activities in the three subcategories. For example, an

owner may decide to remove non-contaminated structures early in the project to improve access to highly contaminated facilities or plant components. In these instances, the non-contaminated removal costs could be reassigned from Site Restoration to an NRC License Termination support activity. However, in general, the allocations represent a reasonable accounting of those costs that can be expected to be incurred for the specific subcomponents of the total estimated program cost, if executed as described.

As discussed in Section 3.4.1, 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.

Decommissioning costs are reported in 2023 dollars. Costs are not inflated, escalated, or discounted over the period of expenditure (or projected lifetime of the plant). The schedules are based upon the detailed activity costs reported in Appendices C and D, along with the timelines presented in Section 4.

TABLE 3.1
DECON ALTERNATIVE
TOTAL ANNUAL EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	63,175	2,157	2,303	35	11,093	78,764
2046	88,822	26,148	4,211	17,166	30,963	167,311
2047	90,651	43,354	2,698	42,788	16,303	195,794
2048	100,325	60,914	2,340	36,003	14,972	214,554
2049	61,420	11,445	1,246	14,090	8,589	96,789
2050	40,995	7,249	465	22	4,625	53,356
2051	28,912	14,416	284	0	5,113	48,724
2052	9,450	2,368	36	0	3,523	15,377
2053	6,548	401	0	0	3,283	10,232
2054	6,548	401	0	0	3,283	10,232
2055	6,614	602	0	0	3,283	10,499
2056	6,565	401	0	0	3,292	10,258
2057	6,548	401	0	0	3,283	10,232
2058	6,614	602	0	0	3,283	10,499
2059	6,548	401	0	0	3,283	10,232
2060	6,565	401	0	0	3,292	10,258
2061	6,614	602	0	0	3,283	10,499
2062	6,548	401	0	0	3,283	10,232
2063	6,548	401	0	0	3,283	10,232
2064	6,632	602	0	0	3,292	10,526
2065	6,548	401	0	0	3,283	10,232
2066	6,548	401	0	0	3,283	10,232
2067	6,614	602	0	0	3,283	10,499
2068	6,565	401	0	0	3,292	10,258
2069	6,614	602	0	0	3,283	10,499
2070	6,548	401	0	0	3,283	10,232
2071	6,548	401	0	0	3,283	10,232
2072	6,632	602	0	0	3,292	10,526
2073	6,548	401	0	0	3,283	10,232
2074	6,548	401	0	0	3,283	10,232

TABLE 3.1 (continued)
DECON ALTERNATIVE
TOTAL ANNUAL EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2075	6,614	602	0	0	3,283	10,499
2076	6,565	401	0	0	3,292	10,258
2077	6,548	401	0	0	3,283	10,232
2078	6,481	1,654	0	0	19,882	28,016
2079	1,764	1,315	30	5,120	6,360	14,590
Total	656,322	182,650	13,613	115,225	203,554	1,171,363

TABLE 3.1a
DECON ALTERNATIVE
LICENSE TERMINATION EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	62,624	2,157	2,303	35	8,761	75,881
2046	85,703	24,088	4,211	17,166	28,299	159,468
2047	85,558	41,172	2,698	42,788	14,104	186,320
2048	85,751	26,276	2,340	36,003	12,768	163,137
2049	55,641	11,006	1,246	14,090	7,311	89,294
2050	26,418	1,779	363	22	2,355	30,936
2051	158	0	0	0	711	868
2052	20	0	0	0	90	109
2053-77	0	0	0	0	0	0
2078	246	1,453	0	0	16,674	18,373
2079	926	300	20	5,120	5,467	11,834
Total	403,044	108,231	13,181	115,225	96,539	736,220

TABLE 3.1b
DECON ALTERNATIVE
SPENT FUEL MANAGEMENT EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	0	0	0	0	2,332	2,332
2046	668	2,005	0	0	2,664	5,338
2047	668	2,005	0	0	2,199	4,873
2048	11,501	34,504	0	0	2,205	48,211
2049	5,343	418	0	0	1,277	7,039
2050	6,548	401	103	0	1,636	8,687
2051	6,550	401	284	0	2,648	9,883
2052	6,632	602	36	0	3,212	10,482
2053	6,548	401	0	0	3,283	10,232
2054	6,548	401	0	0	3,283	10,232
2055	6,614	602	0	0	3,283	10,499
2056	6,565	401	0	0	3,292	10,258
2057	6,548	401	0	0	3,283	10,232
2058	6,614	602	0	0	3,283	10,499
2059	6,548	401	0	0	3,283	10,232
2060	6,565	401	0	0	3,292	10,258
2061	6,614	602	0	0	3,283	10,499
2062	6,548	401	0	0	3,283	10,232
2063	6,548	401	0	0	3,283	10,232
2064	6,632	602	0	0	3,292	10,526
2065	6,548	401	0	0	3,283	10,232
2066	6,548	401	0	0	3,283	10,232
2067	6,614	602	0	0	3,283	10,499
2068	6,565	401	0	0	3,292	10,258
2069	6,614	602	0	0	3,283	10,499
2070	6,548	401	0	0	3,283	10,232
2071	6,548	401	0	0	3,283	10,232
2072	6,632	602	0	0	3,292	10,526
2073	6,548	401	0	0	3,283	10,232
2074	6,548	401	0	0	3,283	10,232

TABLE 3.1b (continued)
DECON ALTERNATIVE
SPENT FUEL MANAGEMENT EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2075	6,614	602	0	0	3,283	10,499
2076	6,565	401	0	0	3,292	10,258
2077	6,548	401	0	0	3,283	10,232
2078	6,235	201	0	0	3,208	9,643
2079	0	0	0	0	0	0
Total	208,473	52,168	422	0	103,512	364,576

TABLE 3.1c
DECON ALTERNATIVE
SITE RESTORATION EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	551	0	0	0	0	551
2046	2,450	55	0	0	0	2,505
2047	4,424	177	0	0	0	4,601
2048	3,073	134	0	0	0	3,206
2049	436	21	0	0	0	457
2050	8,030	5,068	0	0	634	13,733
2051	22,204	14,015	0	0	1,754	37,973
2052	2,798	1,766	0	0	221	4,786
2053-78	0	0	0	0	0	0
2079	838	1,015	9	0	893	2,756
Total	44,805	22,250	9	0	3,503	70,567

TABLE 3.2
SAFSTOR ALTERNATIVE
TOTAL ANNUAL EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	52,611	1,598	2,303	35	10,869	67,416
2046	55,949	9,836	2,130	1,436	28,431	97,782
2047	26,666	2,681	568	17	8,095	38,026
2048	37,570	35,182	570	17	8,117	81,455
2049	13,053	906	338	10	4,182	18,488
2050	9,997	845	284	8	3,270	14,404
2051	9,997	845	284	8	3,270	14,404
2052	10,091	1,047	285	8	3,279	14,710
2053	9,997	845	284	8	3,270	14,404
2054	9,997	845	284	8	3,270	14,404
2055	10,064	1,045	284	8	3,270	14,672
2056	10,024	846	285	8	3,279	14,442
2057	9,997	845	284	8	3,270	14,404
2058	10,064	1,045	284	8	3,270	14,672
2059	9,997	845	284	8	3,270	14,404
2060	10,024	846	285	8	3,279	14,442
2061	10,064	1,045	284	8	3,270	14,672
2062	9,997	845	284	8	3,270	14,404
2063	9,997	845	284	8	3,270	14,404
2064	10,091	1,047	285	8	3,279	14,710
2065	9,997	845	284	8	3,270	14,404
2066	9,997	845	284	8	3,270	14,404
2067	10,064	1,045	284	8	3,270	14,672
2068	10,024	846	285	8	3,279	14,442
2069	10,064	1,045	284	8	3,270	14,672
2070	9,997	845	284	8	3,270	14,404
2071	9,997	845	284	8	3,270	14,404
2072	10,091	1,047	285	8	3,279	14,710
2073	9,997	845	284	8	3,270	14,404
2074	9,997	845	284	8	3,270	14,404

TABLE 3.2 (continued)
SAFSTOR ALTERNATIVE
TOTAL ANNUAL EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2075	10,064	1,045	284	8	3,270	14,672
2076	10,024	846	285	8	3,279	14,442
2077	9,997	845	284	8	3,270	14,404
2078	9,930	644	284	8	3,270	14,137
2079	4,374	431	284	7	1,900	6,996
2080	4,386	432	285	7	1,905	7,015
2081	4,374	431	284	7	1,900	6,996
2082	4,374	431	284	7	1,900	6,996
2083	4,374	431	284	7	1,900	6,996
2084	4,386	432	285	7	1,905	7,015
2085	4,374	431	284	7	1,900	6,996
2086	4,374	431	284	7	1,900	6,996
2087	4,374	431	284	7	1,900	6,996
2088	4,386	432	285	7	1,905	7,015
2089	4,374	431	284	7	1,900	6,996
2090	4,374	431	284	7	1,900	6,996
2091	4,374	431	284	7	1,900	6,996
2092	4,386	432	285	7	1,905	7,015
2093	4,374	431	284	7	1,900	6,996
2094	4,374	431	284	7	1,900	6,996
2095	4,374	431	284	7	1,900	6,996
2096	4,386	432	285	7	1,905	7,015
2097	4,374	431	284	7	1,900	6,996
2098	8,359	816	508	16	1,958	11,657
2099	50,313	5,091	2,840	99	2,581	60,923
2100	62,997	27,807	2,756	25,512	14,985	134,058
2101	64,985	33,040	2,545	35,150	19,260	154,981
2102	55,779	9,505	2,130	12,996	7,657	88,066
2103	55,779	9,505	2,130	12,996	7,657	88,066
2104	44,587	5,588	1,220	5,431	4,398	61,225

TABLE 3.2 (continued)
SAFSTOR ALTERNATIVE
TOTAL ANNUAL EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2105	25,477	12,444	338	6	3,178	41,443
2106	15,513	9,946	192	0	2,326	27,977
Total	943,433	198,251	34,207	94,089	254,731	1,524,712

TABLE 3.2a
SAFSTOR ALTERNATIVE
LICENSE TERMINATION EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	52,611	1,598	2,303	35	8,537	65,084
2046	53,277	7,830	2,130	1,436	25,767	90,441
2047	19,581	676	568	17	5,896	26,737
2048	19,635	677	570	17	5,912	26,810
2049	6,496	488	338	10	2,905	10,236
2050	3,446	444	284	8	2,208	6,389
2051	3,446	444	284	8	2,208	6,389
2052	3,455	445	285	8	2,214	6,407
2053	3,446	444	284	8	2,208	6,389
2054	3,446	444	284	8	2,208	6,389
2055	3,446	444	284	8	2,208	6,389
2056	3,455	445	285	8	2,214	6,407
2057	3,446	444	284	8	2,208	6,389
2058	3,446	444	284	8	2,208	6,389
2059	3,446	444	284	8	2,208	6,389
2060	3,455	445	285	8	2,214	6,407
2061	3,446	444	284	8	2,208	6,389
2062	3,446	444	284	8	2,208	6,389
2063	3,446	444	284	8	2,208	6,389
2064	3,455	445	285	8	2,214	6,407
2065	3,446	444	284	8	2,208	6,389
2066	3,446	444	284	8	2,208	6,389
2067	3,446	444	284	8	2,208	6,389
2068	3,455	445	285	8	2,214	6,407
2069	3,446	444	284	8	2,208	6,389
2070	3,446	444	284	8	2,208	6,389
2071	3,446	444	284	8	2,208	6,389
2072	3,455	445	285	8	2,214	6,407
2073	3,446	444	284	8	2,208	6,389
2074	3,446	444	284	8	2,208	6,389

TABLE 3.2a (continued)
SAFSTOR ALTERNATIVE
LICENSE TERMINATION EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2075	3,446	444	284	8	2,208	6,389
2076	3,455	445	285	8	2,214	6,407
2077	3,446	444	284	8	2,208	6,389
2078	3,446	444	284	8	2,208	6,389
2079	4,374	431	284	7	1,900	6,996
2080	4,386	432	285	7	1,905	7,015
2081	4,374	431	284	7	1,900	6,996
2082	4,374	431	284	7	1,900	6,996
2083	4,374	431	284	7	1,900	6,996
2084	4,386	432	285	7	1,905	7,015
2085	4,374	431	284	7	1,900	6,996
2086	4,374	431	284	7	1,900	6,996
2087	4,374	431	284	7	1,900	6,996
2088	4,386	432	285	7	1,905	7,015
2089	4,374	431	284	7	1,900	6,996
2090	4,374	431	284	7	1,900	6,996
2091	4,374	431	284	7	1,900	6,996
2092	4,386	432	285	7	1,905	7,015
2093	4,374	431	284	7	1,900	6,996
2094	4,374	431	284	7	1,900	6,996
2095	4,374	431	284	7	1,900	6,996
2096	4,386	432	285	7	1,905	7,015
2097	4,374	431	284	7	1,900	6,996
2098	8,296	816	508	16	1,958	11,594
2099	49,494	5,091	2,840	99	2,581	60,104
2100	60,328	27,725	2,756	25,512	14,985	131,306
2101	62,125	32,919	2,545	35,150	19,260	152,000
2102	53,891	9,436	2,130	12,996	7,657	86,109
2103	53,891	9,436	2,130	12,996	7,657	86,109
2104	43,801	5,559	1,220	5,431	4,398	60,410

TABLE 3.2a (continued)
SAFSTOR ALTERNATIVE
LICENSE TERMINATION EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2105	7,015	526	107	6	390	8,044
2106	107	0	0	0	0	107
Total	673,700	123,848	33,785	94,089	208,108	1,133,530

TABLE 3.2b
SAFSTOR ALTERNATIVE
SPENT FUEL MANAGEMENT EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	0	0	0	0	2,332	2,332
2046	2,672	2,005	0	0	2,664	7,342
2047	7,084	2,005	0	0	2,199	11,289
2048	17,935	34,504	0	0	2,205	54,644
2049	6,557	418	0	0	1,277	8,252
2050	6,551	401	0	0	1,062	8,015
2051	6,551	401	0	0	1,062	8,015
2052	6,636	602	0	0	1,065	8,303
2053	6,551	401	0	0	1,062	8,015
2054	6,551	401	0	0	1,062	8,015
2055	6,618	602	0	0	1,062	8,282
2056	6,569	401	0	0	1,065	8,035
2057	6,551	401	0	0	1,062	8,015
2058	6,618	602	0	0	1,062	8,282
2059	6,551	401	0	0	1,062	8,015
2060	6,569	401	0	0	1,065	8,035
2061	6,618	602	0	0	1,062	8,282
2062	6,551	401	0	0	1,062	8,015
2063	6,551	401	0	0	1,062	8,015
2064	6,636	602	0	0	1,065	8,303
2065	6,551	401	0	0	1,062	8,015
2066	6,551	401	0	0	1,062	8,015
2067	6,618	602	0	0	1,062	8,282
2068	6,569	401	0	0	1,065	8,035
2069	6,618	602	0	0	1,062	8,282
2070	6,551	401	0	0	1,062	8,015
2071	6,551	401	0	0	1,062	8,015
2072	6,636	602	0	0	1,065	8,303
2073	6,551	401	0	0	1,062	8,015
2074	6,551	401	0	0	1,062	8,015

TABLE 3.2b (continued)
SAFSTOR ALTERNATIVE
SPENT FUEL MANAGEMENT EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2075	6,618	602	0	0	1,062	8,282
2076	6,569	401	0	0	1,065	8,035
2077	6,551	401	0	0	1,062	8,015
2078	6,484	201	0	0	1,062	7,747
2079-2106	0	0	0	0	0	0
Total	224,894	52,168	0	0	41,509	318,571

TABLE 3.2c
SAFSTOR ALTERNATIVE
SITE RESTORATION EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045-97	0	0	0	0	0	0
2098	63	0	0	0	0	63
2099	819	0	0	0	0	819
2100	2,669	82	0	0	0	2,752
2101	2,859	121	0	0	0	2,980
2102	1,888	69	0	0	0	1,957
2103	1,888	69	0	0	0	1,957
2104	786	29	0	0	0	815
2105	18,462	11,919	230	0	2,788	33,399
2106	15,406	9,946	192	0	2,326	27,870
Total	44,839	22,235	422	0	5,114	72,611

FIGURE 3.1
DECOMMISSIONING PERSONNEL LEVELS
DECON

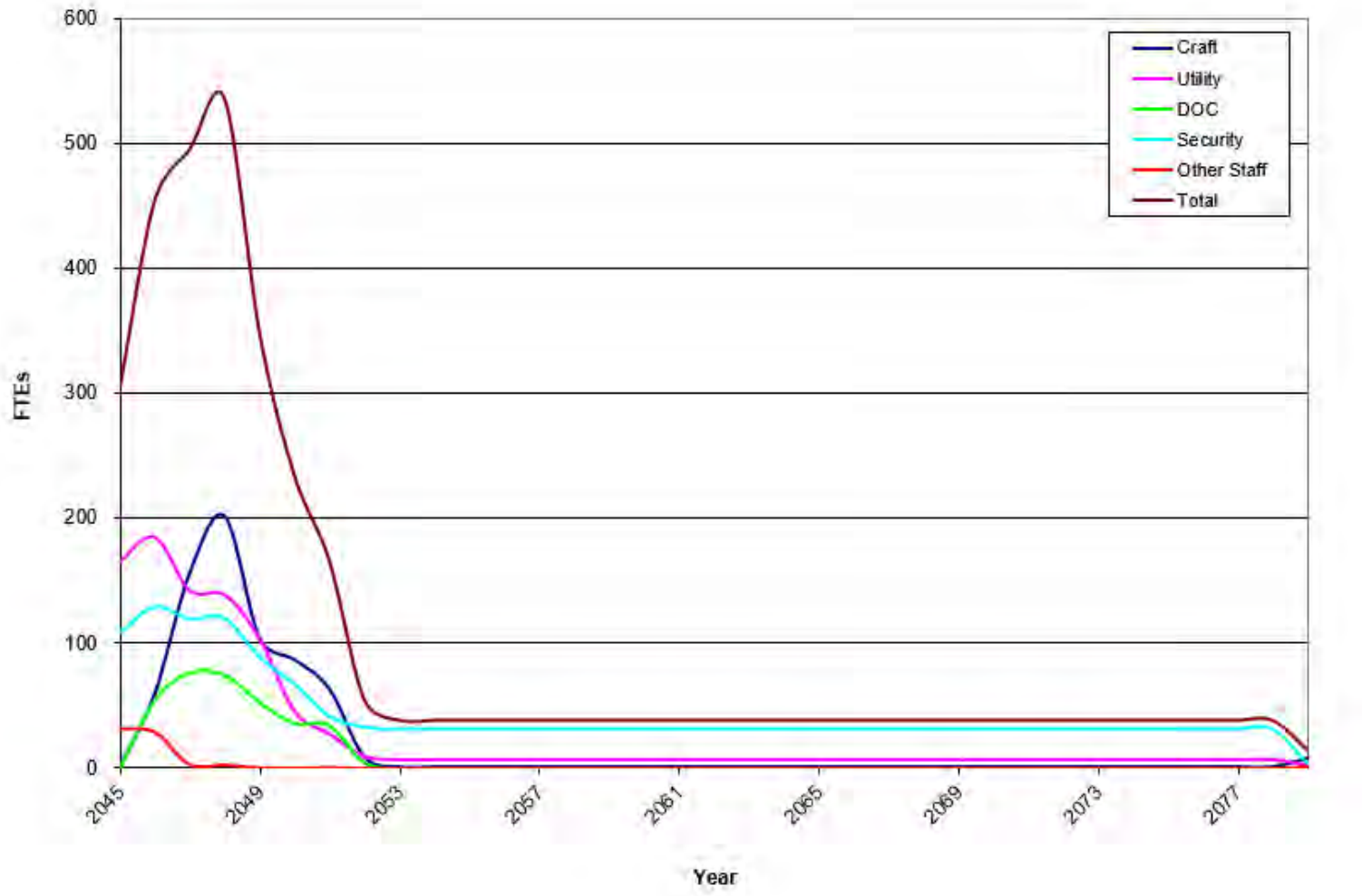
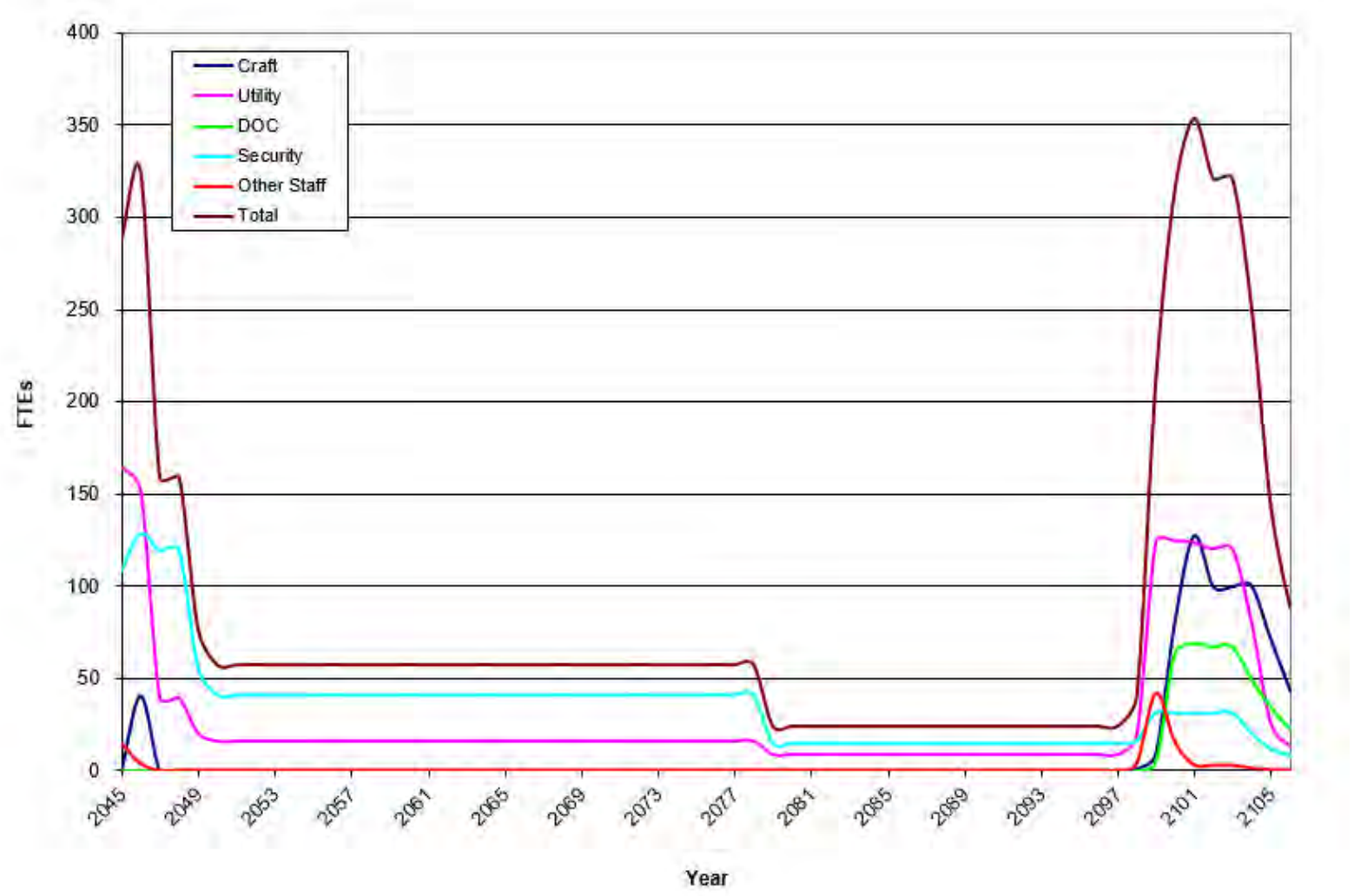


FIGURE 3.2
DECOMMISSIONING PERSONNEL LEVELS
SAFSTOR



4. SCHEDULE ESTIMATE

The schedules for the decommissioning scenarios considered in this analysis follow the sequences 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 described in Section 3.4.1.

A schedule or sequence of activities for the DECON alternative is presented in Figure 4.1. The scheduling sequence is based on the fuel being removed from the spent fuel pool within approximately four years. 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. [39]

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 person-hour estimates from the cost table, adjusted by stretching certain activities over their slack range and shifting the start and end dates of others. The following assumptions were made in the development of the decommissioning schedule:

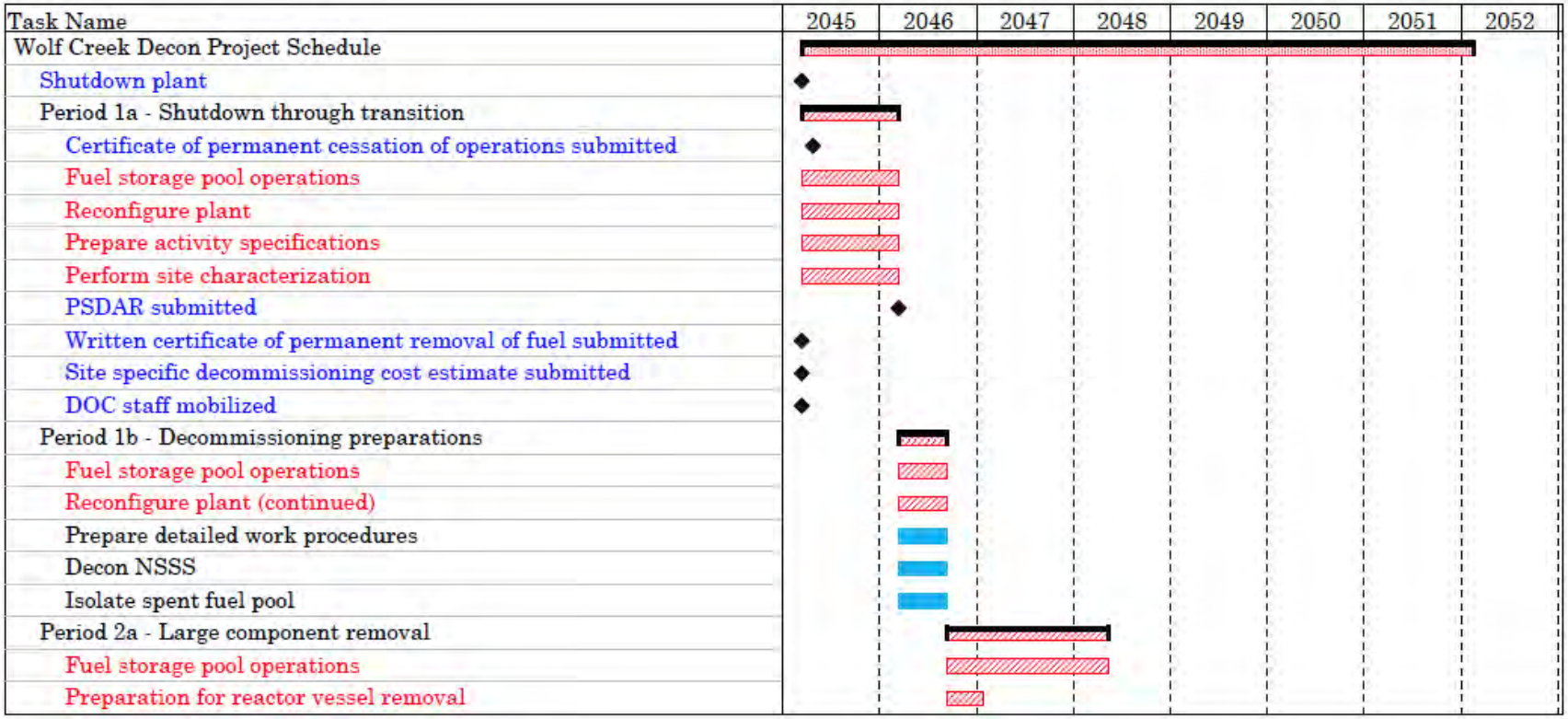
- The fuel building is isolated until such time that all spent fuel has been discharged from the spent fuel pool to the DOE and/or ISFSI. Decontamination and dismantling of the storage pool is initiated once the transfer of spent fuel is complete (DECON option).
- All work (except vessel and internals removal) is performed during an 8-hour workday, 5 days per week, with no overtime.
- Reactor and internals removal activities are performed by using separate crews for different activities working on different shifts, with a corresponding backshift charge for the second shift.
- Multiple crews work parallel activities to the maximum extent possible, consistent with optimum efficiency, adequate access for cutting, removal and laydown space, and with the stringent safety measures necessary during demolition of heavy components and structures.
- For plant systems removal, the systems with the longest removal durations in areas on the critical path are considered to determine the duration of the activity.

4.2 PROJECT SCHEDULE

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

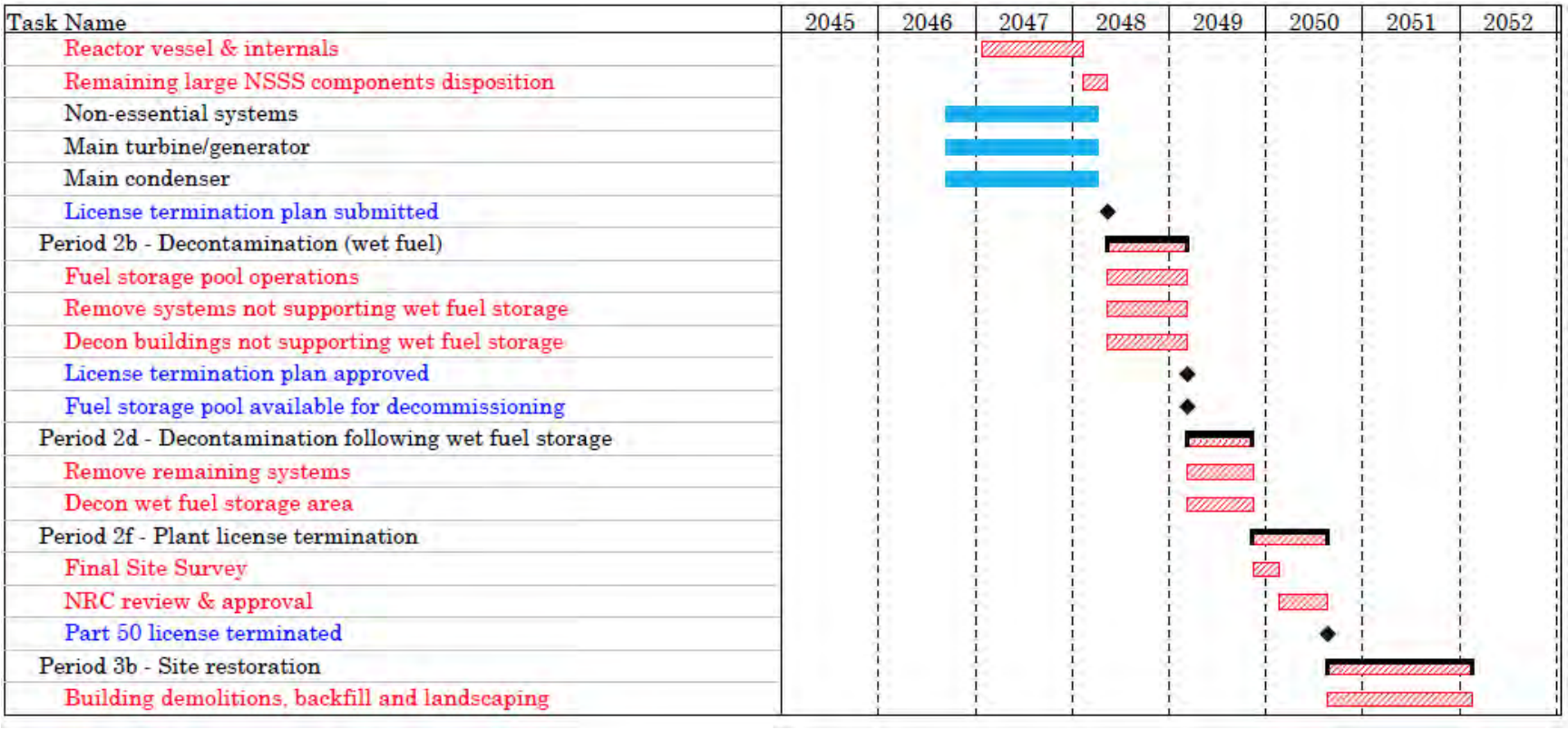
Project timelines are provided in Figures 4.2 and 4.3, with milestone dates based on the 2045 shutdown date. The fuel pool is emptied approximately four years after shutdown, while ISFSI operations continue until the DOE can complete the transfer of assemblies. Deferred decommissioning in the SAFSTOR scenario is assumed to commence so that the operating license is terminated within a 60-year period from the cessation of plant operations.

FIGURE 4.1
ACTIVITY SCHEDULE



1. Red text and/or shaded scheduling bars indicate critical path activities
2. Shaded scheduling bars associated with major decommissioning periods, e.g., Period 1a, indicate overall duration of that period
3. Blue text and/or diamond symbols indicate major milestones

FIGURE 4.1
ACTIVITY SCHEDULE
(continued)



1. Red text and/or shaded scheduling bars indicate critical path activities
2. Shaded scheduling bars associated with major decommissioning periods, e.g., Period 1a, indicate overall duration of that period
3. Blue text and/or diamond symbols indicate major milestones

FIGURE 4.2
DECOMMISSIONING TIMELINE
DECON
(not to scale)

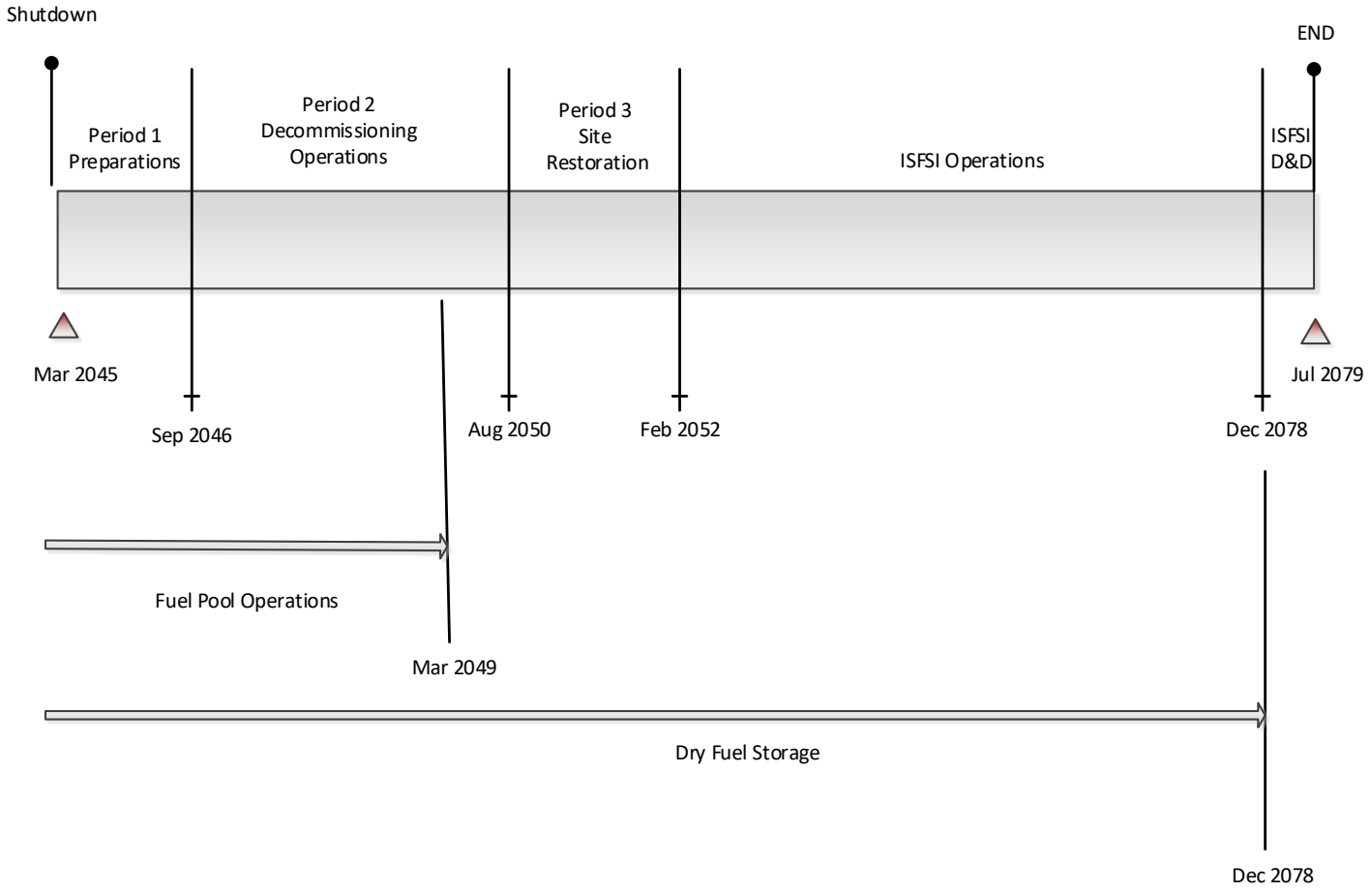
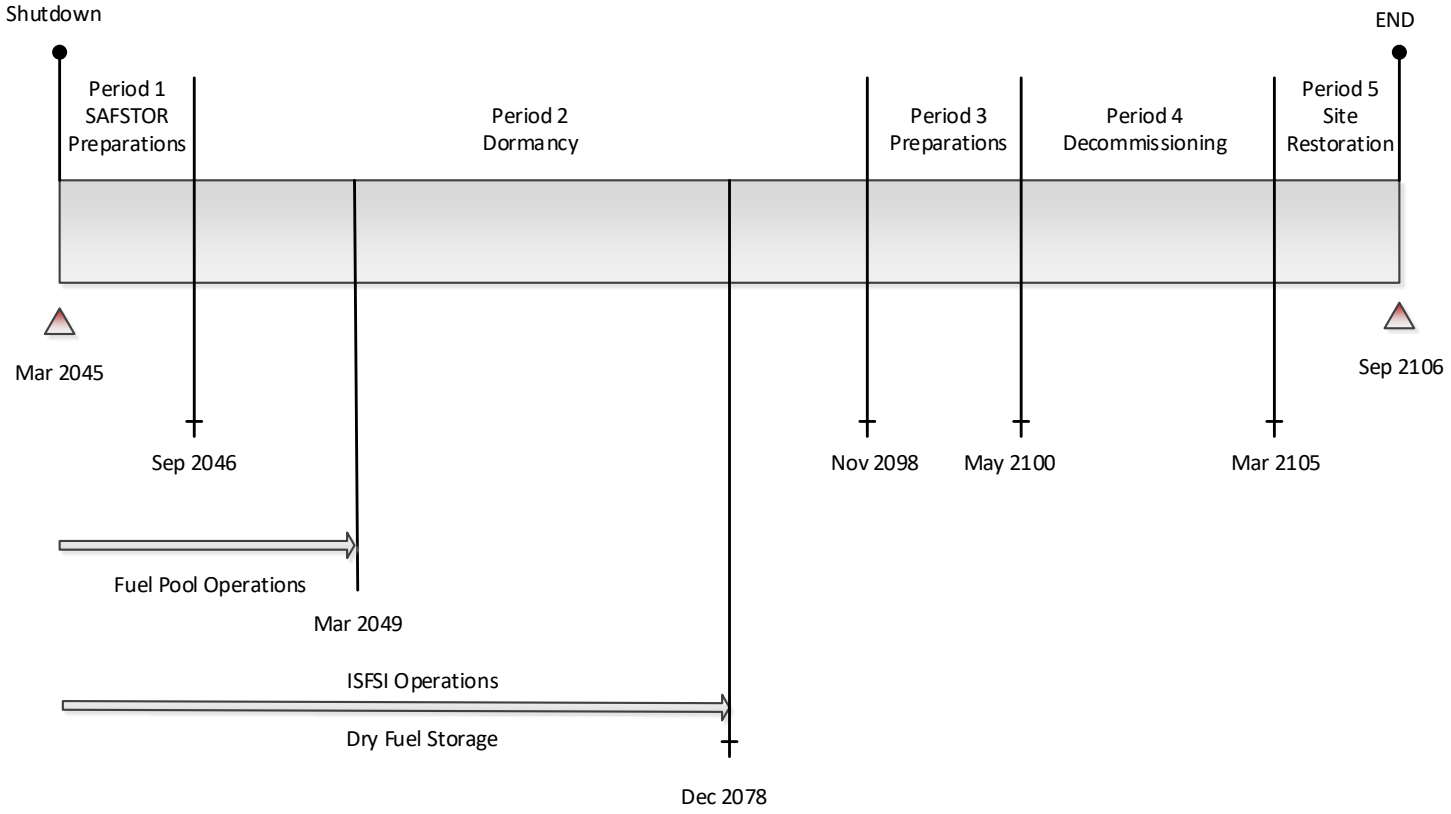


FIGURE 4.3
DECOMMISSIONING TIMELINE
SAFSTOR



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,[40] 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 are shown on a line-item basis in Appendices C and D and summarized in Tables 5.1 and 5.2. 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 casks.

No process system containing/handling radioactive substances at shutdown is presumed to meet material release criteria by decay alone (i.e., systems radioactive at shutdown will still be radioactive over the time period during which the decommissioning is accomplished, due to the presence of long-lived radionuclides). While the dose rates decrease with time, radionuclides such as ^{137}Cs will still control the disposition requirements.

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

Disposal costs for Class A waste were based upon information provided by Wolf Creek. Separate rates were used for containerized waste and large components, including the steam generators and reactor coolant pump motors. Demolition debris including miscellaneous steel, scaffolding, and concrete was disposed of at a bulk rate. The decommissioning waste stream also included resins and dry active waste.

Since Energy*Solutions* is not currently able to receive the more highly radioactive components generated in the decontamination and dismantling of the reactor, disposal costs for the Class B and C material were based upon preliminary and indicative rates for WCS's Andrews County disposal facility.

A small quantity of material generated during the 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 five 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 and 5.2 represent the packaged weight and volume of the spent fuel storage canisters.

FIGURE 5.1
RADIOACTIVE WASTE DISPOSITION

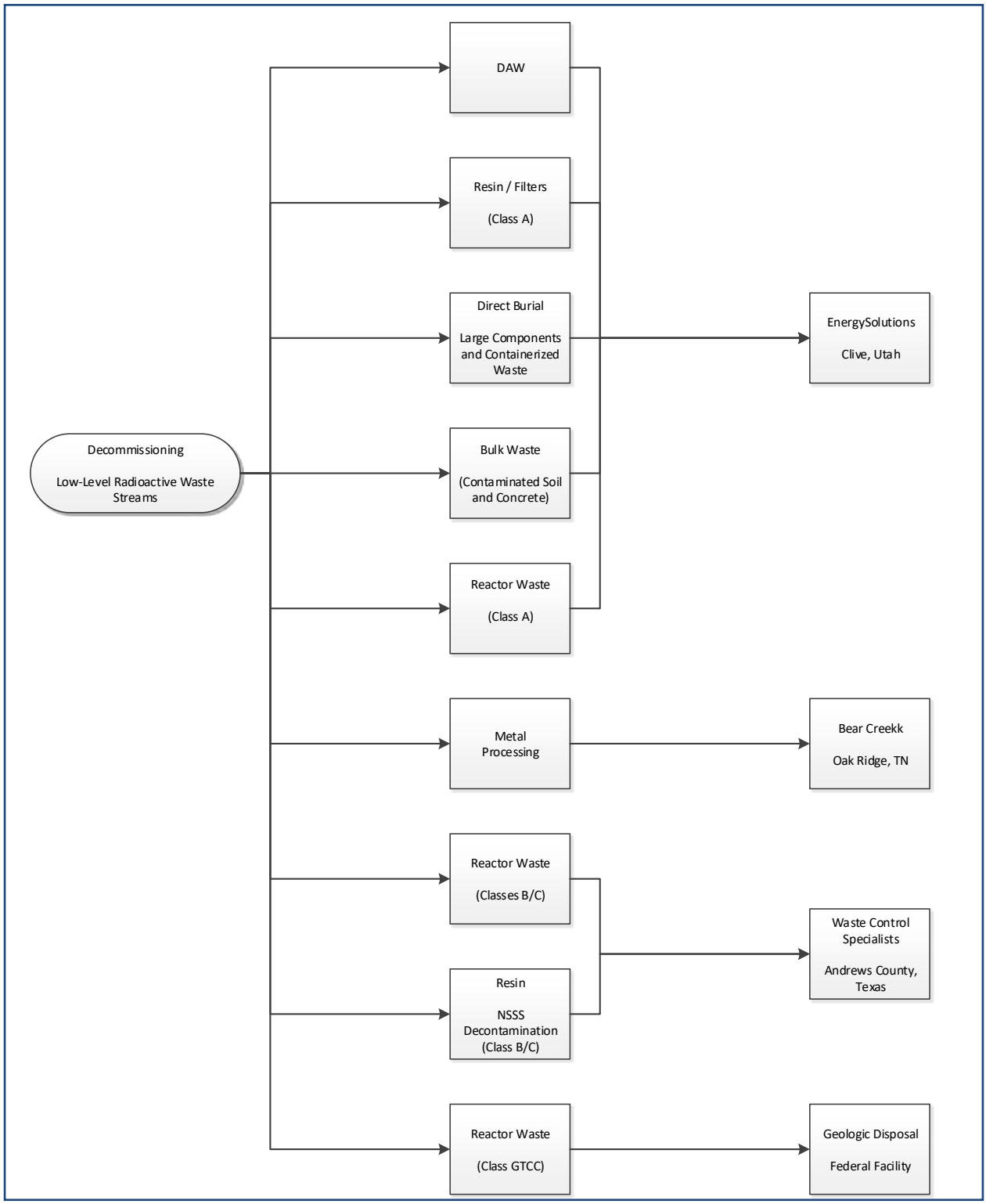


FIGURE 5.2
DECOMMISSIONING WASTE DESTINATIONS
RADIOLOGICAL

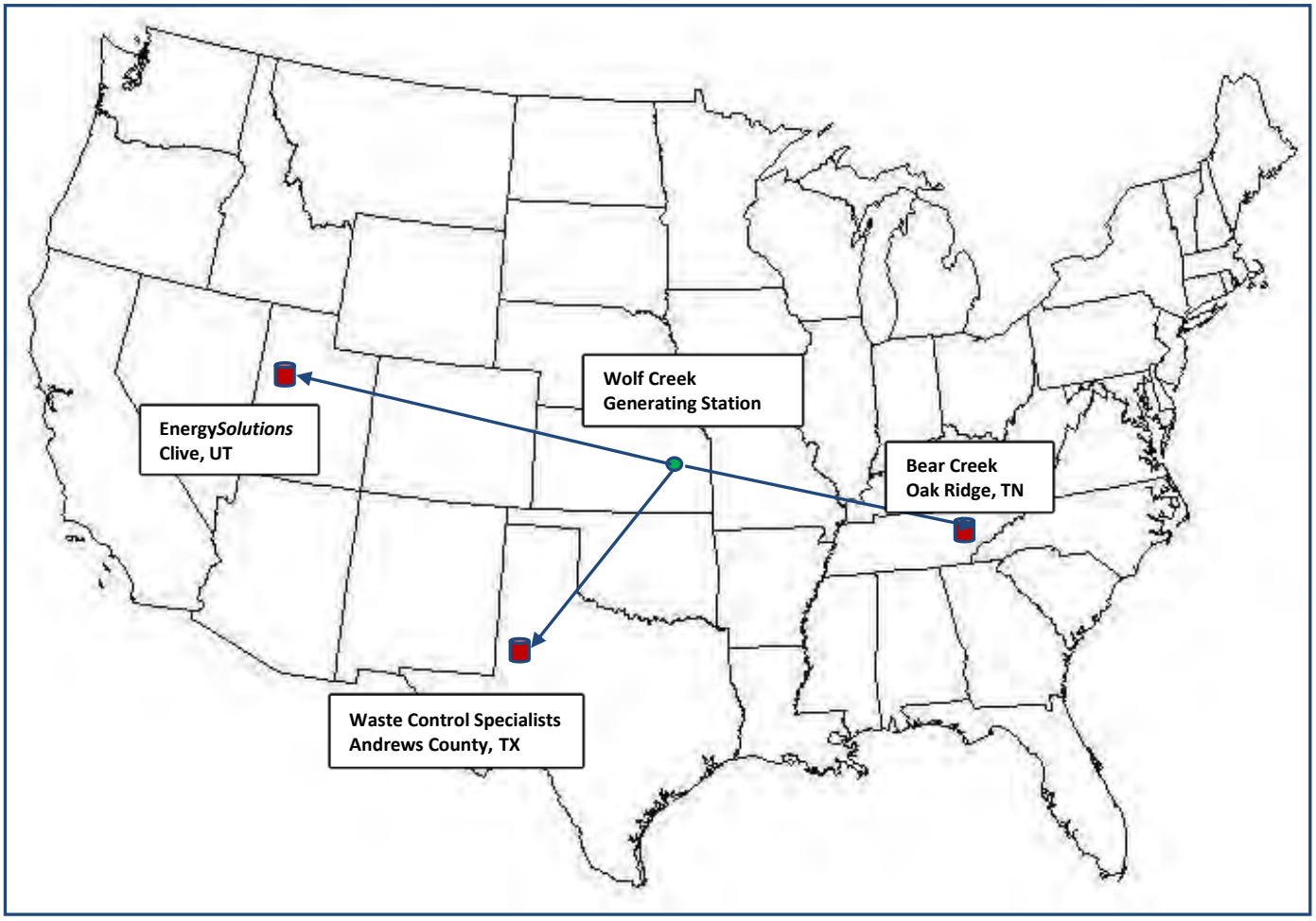


TABLE 5.1
DECON ALTERNATIVE
DECOMMISSIONING WASTE SUMMARY

Waste	Cost Basis	Class [1]	Waste Volume (cubic feet)	Mass (pounds)
Low-Level Radioactive Waste (near-surface disposal)	Energy*Solutions*	A	177,453	12,964,540
	WCS	B	1,750	191,469
	WCS	C	393	47,411
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	2,217	433,180
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	264,361	9,982,628
Totals [2]			446,173	23,619,229

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

[2] Columns may not add due to rounding.

TABLE 5.2
SAFSTOR ALTERNATIVE
DECOMMISSIONING WASTE SUMMARY

Waste	Cost Basis	Class [1]	Waste Volume (cubic feet)	Mass (pounds)
Low-Level Radioactive Waste (near-surface disposal)	Energy*Solutions*	A	143,761	10,493,454
	WCS	B	501	50,254
	WCS	C	406	46,747
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	2,217	433,180
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	292,159	11,146,110
Totals [2]			439,044	22,169,746

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

[2] Columns may not add due to rounding.

6. RESULTS

The analysis to estimate the costs to decommission Wolf Creek relied upon the site-specific, technical information developed for a previous analysis prepared in 2020. While not an engineering study, the estimates provide the owner with sufficient information to assess their financial obligations, as they pertain to the eventual decommissioning of the nuclear station.

The estimates described in this report are based on numerous fundamental assumptions, including regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. The decommissioning scenarios assume continued operation of the plant's spent fuel pool for a minimum of approximately four years following the cessation of operations for continued cooling of the assemblies.

The cost projected to promptly decommission (DECON) Wolf Creek is estimated to be $1,171 million. The majority of this cost (approximately 62.9%) is associated with the physical decontamination and dismantling of the nuclear plant so that the operating license can be terminated. Another 31.1% is associated with the management, interim storage, and eventual transfer of the spent fuel. The remaining 6.0% is for the demolition of the designated structures and limited restoration of the site.

The cost projected for deferred decommissioning (SAFSTOR) is estimated to be $1,525 million. The majority of this cost (approximately 74.3%) is associated with placing the plant in storage, ongoing caretaking of the plant during dormancy, and the eventual physical decontamination and dismantling of the nuclear plant so that the operating license can be terminated. Another 20.9% is associated with the management, interim storage, and eventual transfer of the spent fuel. The remaining 4.8% is for the demolition of the designated structures and limited restoration of the site.

The primary cost contributors, identified in Tables 6.1 and 6.2, are either labor-related or associated with the management and disposition of the radioactive waste. Program management and security are the largest single contributors 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 WCNOC will oversee the decommissioning program, using a DOC to manage the decommissioning labor force and the associated subcontractors. The size and composition of the management organization varies with the decommissioning phase and associated site activities. However, once the operating license is terminated, the staff is substantially reduced for the conventional demolition and restoration of the site, and the long-term care of the spent fuel (for the DECON alternative).

As described in this report, the spent fuel pool will remain operational for a minimum of four years following the cessation of operations. Over this period, the spent fuel will be packaged into transportable canisters for loading into a DOE-provided transport cask, or will be transferred to dry fuel storage canisters and placed on the onsite ISFSI.

The cost for waste disposal includes only those costs associated with the controlled disposition of the low-level radioactive waste generated from decontamination and dismantling activities, including plant equipment and components, structural material, filters, resins and dry-active waste. As described in Section 5, disposition of the low-level radioactive material requiring controlled disposal is at the Energy*Solutions*' and WCS facilities. 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 union wages. Non-radiological demolition is a natural extension of the decommissioning process. The methods employed in decontamination and dismantling are generally destructive and indiscriminate in inflicting collateral damage. With a work force mobilized to support decommissioning operations, non-radiological demolition can be an integrated activity and a logical expansion of the work being performed in the process of terminating the operating license. Prompt demolition reduces future liabilities and can be more cost effective than deferral, due to the deterioration of the facilities (and therefore the working conditions) with time.

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

Decontamination is used to reduce the plant's radiation fields and minimize worker exposure. Slightly contaminated material or material located within a contaminated area is sent to an off-site processing center, i.e., this analysis does not assume that

contaminated plant components and equipment can be decontaminated for uncontrolled release in-situ. Centralized processing centers have proven to be a more economical means of handling the large volumes of material produced in the dismantling of a nuclear station.

License termination survey costs are associated with the labor intensive and complex activity of verifying that contamination has been removed from the site to the levels specified by the regulating agency. This process involves a systematic survey of all remaining plant surface areas and surrounding environs, sampling, isotopic analysis, and documentation of the findings. The status of any plant components and materials not removed in the decommissioning process will also require confirmation and will add to the expense of surveying the facilities alone.

The remaining costs include allocations for heavy equipment and temporary services, as well as for other expenses such as regulatory fees and the premiums for nuclear insurance. While site operating costs are greatly reduced following the final cessation of plant operations, certain administrative functions do need to be maintained either at a basic functional or regulatory level.

TABLE 6.1
DECON ALTERNATIVE
DECOMMISSIONING COST ELEMENTS
(thousands of $2023)

Cost Element	Total	%
Decontamination	21,211	1.8%
Removal	151,865	13.0%
Packaging	35,868	3.1%
Transportation	20,538	1.8%
Waste Disposal	99,268	8.5%
Off-site Waste Processing	32,560	2.8%
Program Management [1]	297,023	25.4%
Site Security	238,025	20.3%
Spent Fuel Pool Isolation	16,480	1.4%
Spent Fuel Management - Direct Costs [2]	124,802	10.7%
Insurance and Regulatory Fees	35,382	3.0%
Energy	13,613	1.2%
Characterization and Licensing Surveys	21,048	1.8%
Property Taxes	51,584	4.4%
Miscellaneous Equipment	8,467	0.7%
Corporate Allocations	3,628	0.3%
Total [3]	1,171,364	100.0%

Cost Element	Total	%
License Termination	736,220	62.9%
Spent Fuel Management	364,576	31.1%
Site Restoration	70,567	6.0%
Total [3]	1,171,364	100.0%

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

TABLE 6.2
SAFSTOR ALTERNATIVE
DECOMMISSIONING COST ELEMENTS
(thousands of $2023)

Cost Element	Total	%
Decontamination	18,481	1.2%
Removal	164,663	10.8%
Packaging	22,550	1.5%
Transportation	17,141	1.1%
Waste Disposal	74,292	4.9%
Off-site Waste Processing	36,400	2.4%
Program Management [1]	461,712	30.3%
Site Security	360,895	23.7%
Spent Fuel Pool Isolation	16,480	1.1%
Spent Fuel Management - Direct Costs [2]	115,757	7.6%
Insurance and Regulatory Fees	63,335	4.2%
Energy	34,207	2.2%
Characterization and Licensing Surveys	23,470	1.5%
Property Taxes	81,735	5.4%
Miscellaneous Equipment	26,960	1.8%
Corporate Allocations	6,633	0.4%
Total [3]	1,524,712	100.0%

Cost Element	Total	%
License Termination	1,133,530	74.3%
Spent Fuel Management	318,571	20.9%
Site Restoration	72,611	4.8%
Total [3]	1,524,712	100.0%

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

7. REFERENCES

1. "Decommissioning Cost Analysis for the Wolf Creek Nuclear Plant," Document W11-1781-001, Rev. 0, TLG Services, Inc., August 2020

2. U.S. Code of Federal Regulations, Title 10, Parts 30, 40, 50, 51, 70 and 72, "General Requirements for Decommissioning Nuclear Facilities," Nuclear Regulatory Commission, 53 Fed. Reg. 24018, June 27, 1988 [Open]

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

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

5. U.S. Code of Federal Regulations, Title 10, Parts 20 and 50, "Entombment Options for Power Reactors," Advance Notice of Proposed Rulemaking, 66 Fed. Reg. 52551, October 16, 2001 [Open]

6. U.S. Code of Federal Regulations, Title 10, Parts 2, 50 and 51, "Decommissioning of Nuclear Power Reactors," Nuclear Regulatory Commission, 61 Fed. Reg. 39278, July 29, 1996 [Open]

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

8. "Nuclear Waste Policy Act of 1982, As Amended," 42 U.S. Code 10101, et seq. [Open]

9. Charter of the Blue Ribbon Commission on America's Nuclear Future, "Objectives and Scope of Activities" [Open]

10. "Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy," p. 27, 32, January 2012 [Open]

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

12. United States Court of Appeals for the District of Columbia Circuit, In Re: Aiken County, Et Al., August 2013 [Open]

7. REFERENCES
(continued)

13. U.S. Code of Federal Regulations, Title 10, Part 961.11, Article IV – Responsibilities of the Parties, B. DOE Responsibilities, 5.(a) [Open]

14. "Acceptance Priority Ranking & Annual Capacity Report," DOE/RW-0567, July 2004 [Open]

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

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

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

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

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

20. "Final Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste," (DOE/EIS-0375), January 2016 [Open]

21. U.S. Code of Federal Regulations, Title 10, Part 20, Subpart E, "Final Rule, Radiological Criteria for License Termination," 62 Fed. Reg. 39058, July 21, 1997 [Open]

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

23. U.S. Code of Federal Regulations, Title 40, Part 141.66, "Maximum contaminant levels for radionuclides" [Open]

24. "Memorandum of Understanding Between the Environmental Protection Agency and the Nuclear Regulatory Commission: Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites," OSWER 9295.8-06a, October 9, 2002 [Open]

7. REFERENCES
(continued)

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

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

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

28. "Building Construction Cost Data 2023," RSMeans (From the Gordian Group), Rockland, Massachusetts [Open]

29. "Decommissioning of Nuclear Power Reactors," Regulatory Guide 1.184, Nuclear Regulatory Commission, October 2013 [Open]

30. "Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors," Regulatory Guide 1.202, Nuclear Regulatory Commission, February 2005 [Open]

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

32. DOE/RW-0351, "Civilian Radioactive Waste Management System Waste Acceptance System Requirements Document", Revision 5, May 31, 2007 [Open]

33. U.S. Department of Transportation, Title 49 of the Code of Federal Regulations, "Transportation," Parts 173 through 178 [Open]

34. Tri-State Motor Transit Company, Radioactive Materials Tariffs, TSMT 7000, January 2023. [Open}

35. J.C. Evans et al., "Long-Lived Activation Products in Reactor Materials" NUREG/CR-3474, Pacific Northwest Laboratory for the Nuclear Regulatory Commission, August 1984 [Open]

36. R.I. Smith, G.J. Konzek, W.E. Kennedy, Jr., "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission, June 1978 [Open Main Report] [Open Appendices]

7. REFERENCES
(continued)

37. H.D. Oak, et al., "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," NUREG/CR-0672 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission, June 1980 [Open Main Report] [Open Appendices]

38. SECY-00-0145, "Integrated Rulemaking Plan for Nuclear Power Plant Decommissioning," June 2000 [Open]

39. "Microsoft Project Professional," Microsoft Corporation, Redmond, WA

40. "Atomic Energy Act of 1954," (68 Stat. 919) [Open]

APPENDIX A

UNIT COST FACTOR DEVELOPMENT

APPENDIX A
UNIT COST FACTOR DEVELOPMENT

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

1. SCOPE

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

2. CALCULATIONS

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

Duration adjustment(s):	
+ Respiratory protection adjustment (50% of critical duration)	128
+ Radiation/ALARA adjustment (37.1% 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 hour ***

* alpha designators indicate activities that can be performed in parallel

APPENDIX A
(continued)

3. LABOR REQUIRED

Crew	Number	Duration (hours)	Rate ($/hour)	Cost
Laborers	3.00	11.217	$30.88	$1,039.14
Craftsmen	2.00	11.217	$64.96	$1,457.31
Foreman	1.00	11.217	$67.83	$760.85
General Foreman	0.25	11.217	$69.57	$195.09
Fire Watch	0.05	11.217	$30.88	$17.32
Health Physics Technician	1.00	11.217	$45.06	$505.44
Total Labor Cost				$3,975.15

4. EQUIPMENT & CONSUMABLES COSTS

Equipment Costs	none
Consumables/Materials Costs	
-Universal Sorbent 50 @ $0.75 sq. ft. {1}	$37.50
-Tarpaulins (oil resistant/fire retardant) 50 @ $0.45/sq. ft. {2}	$22.50
-Gas torch consumables 1 @ $22.02/hr. x 1 hr. {3}	$22.02
Subtotal cost of equipment and materials	$82.02
Overhead & profit on equipment and materials @ 18.50 %	$15.17
Total costs, equipment & material	$97.19

TOTAL COST:

Removal of contaminated heat exchanger <3000 pounds:	$4,072.34
Total labor cost:	$3,975.15
Total equipment/material costs:	$97.19
Total craft labor man-hours required per unit:	81.88

5. NOTES AND REFERENCES

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

- References for equipment & consumables costs:

    1. www.mcmaster.com online catalog, McMaster Carr Spill Control (7193T88)
    2. R.S. Means (2023) Division 01 56, Section 13.60-0600, page 23
    3. R.S. Means (2023) Division 01 54 33, Section 40-6360, page 744

- Material and consumable costs were adjusted using the regional indices for Emporia, Kansas

APPENDIX B

UNIT COST FACTOR LISTING

(DECON: Power Block Structures Only)

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of clean instrument and sampling tubing, $/linear foot	0.40
Removal of clean pipe 0.25 to 2 inches diameter, $/linear foot	4.04
Removal of clean pipe >2 to 4 inches diameter, $/linear foot	6.14
Removal of clean pipe >4 to 8 inches diameter, $/linear foot	13.28
Removal of clean pipe >8 to 14 inches diameter, $/linear foot	24.43
Removal of clean pipe >14 to 20 inches diameter, $/linear foot	31.92
Removal of clean pipe >20 to 36 inches diameter, $/linear foot	46.93
Removal of clean pipe >36 inches diameter, $/linear foot	55.69
Removal of clean valve >2 to 4 inches	85.52
Removal of clean valve >4 to 8 inches	132.80
Removal of clean valve >8 to 14 inches	244.28
Removal of clean valve >14 to 20 inches	319.25
Removal of clean valve >20 to 36 inches	469.29
Removal of clean valve >36 inches	556.87
Removal of clean pipe hanger for small bore piping	29.79
Removal of clean pipe hanger for large bore piping	96.22
Removal of clean pump, <300 pound	227.38
Removal of clean pump, 300-1000 pound	658.18
Removal of clean pump, 1000-10,000 pound	2,531.23
Removal of clean pump, >10,000 pound	4,906.65
Removal of clean pump motor, 300-1000 pound	273.42
Removal of clean pump motor, 1000-10,000 pound	1,049.42
Removal of clean pump motor, >10,000 pound	2,361.20
Removal of clean heat exchanger <3000 pound	1,366.40
Removal of clean heat exchanger >3000 pound	3,455.30
Removal of clean feedwater heater/deaerator	9,689.64
Removal of clean moisture separator/reheater	19,852.38
Removal of clean tank, <300 gallons	292.08
Removal of clean tank, 300-3000 gallon	914.64
Removal of clean tank, >3000 gallons, $/square foot surface area	8.12

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of clean electrical equipment, <300 pound	121.42
Removal of clean electrical equipment, 300-1000 pound	445.15
Removal of clean electrical equipment, 1000-10,000 pound	890.32
Removal of clean electrical equipment, >10,000 pound	2,159.84
Removal of clean electrical transformer < 30 tons	1,499.99
Removal of clean electrical transformer > 30 tons	4,319.68
Removal of clean standby diesel generator, <100 kW	1,532.10
Removal of clean standby diesel generator, 100 kW to 1 MW	3,419.75
Removal of clean standby diesel generator, >1 MW	7,079.56
Removal of clean electrical cable tray, $/linear foot	11.54
Removal of clean electrical conduit, $/linear foot	5.05
Removal of clean mechanical equipment, <300 pound	121.42
Removal of clean mechanical equipment, 300-1000 pound	445.15
Removal of clean mechanical equipment, 1000-10,000 pound	890.32
Removal of clean mechanical equipment, >10,000 pound	2,159.84
Removal of clean HVAC equipment, <300 pound	146.81
Removal of clean HVAC equipment, 300-1000 pound	534.89
Removal of clean HVAC equipment, 1000-10,000 pound	1,066.03
Removal of clean HVAC equipment, >10,000 pound	2,159.84
Removal of clean HVAC ductwork, $/pound	0.42
Removal of contaminated instrument and sampling tubing, $/linear foot	1.28
Removal of contaminated pipe 0.25 to 2 inches diameter, $/linear foot	20.05
Removal of contaminated pipe >2 to 4 inches diameter, $/linear foot	33.35
Removal of contaminated pipe >4 to 8 inches diameter, $/linear foot	55.76
Removal of contaminated pipe >8 to 14 inches diameter, $/linear foot	104.95
Removal of contaminated pipe >14 to 20 inches diameter, $/linear foot	125.13
Removal of contaminated pipe >20 to 36 inches diameter, $/linear foot	171.00
Removal of contaminated pipe >36 inches diameter, $/linear foot	201.02
Removal of contaminated valve >2 to 4 inches	404.66
Removal of contaminated valve >4 to 8 inches	494.44

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated valve >8 to 14 inches	978.35
Removal of contaminated valve >14 to 20 inches	1,237.66
Removal of contaminated valve >20 to 36 inches	1,638.91
Removal of contaminated valve >36 inches	1,939.05
Removal of contaminated pipe hanger for small bore piping	126.94
Removal of contaminated pipe hanger for large bore piping	403.86
Removal of contaminated pump, <300 pound	888.06
Removal of contaminated pump, 300-1000 pound	2,130.65
Removal of contaminated pump, 1000-10,000 pound	6,726.75
Removal of contaminated pump, >10,000 pound	16,381.27
Removal of contaminated pump motor, 300-1000 pound	933.60
Removal of contaminated pump motor, 1000-10,000 pound	2,767.00
Removal of contaminated pump motor, >10,000 pound	6,212.50
Removal of contaminated heat exchanger <3000 pound	4,072.34
Removal of contaminated heat exchanger >3000 pound	11,895.08
Removal of contaminated tank, <300 gallons	1,483.25
Removal of contaminated tank, >300 gallons, $/square foot	29.41
Removal of contaminated electrical equipment, <300 pound	670.87
Removal of contaminated electrical equipment, 300-1000 pound	1,710.72
Removal of contaminated electrical equipment, 1000-10,000 pound	3,296.01
Removal of contaminated electrical equipment, >10,000 pound	6,598.67
Removal of contaminated electrical cable tray, $/linear foot	32.49
Removal of contaminated electrical conduit, $/linear foot	16.55
Removal of contaminated mechanical equipment, <300 pound	745.91
Removal of contaminated mechanical equipment, 300-1000 pound	1,887.83
Removal of contaminated mechanical equipment, 1000-10,000 pound	3,631.23
Removal of contaminated mechanical equipment, >10,000 pound	6,598.67
Removal of contaminated HVAC equipment, <300 pound	745.91
Removal of contaminated HVAC equipment, 300-1000 pound	1,887.83
Removal of contaminated HVAC equipment, 1000-10,000 pound	3,631.23

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated HVAC equipment, >10,000 pound	6,598.67
Removal of contaminated HVAC ductwork, $/pound	2.01
Removal/plasma arc cut of contaminated thin metal components, $/linear in.	3.68
Additional decontamination of surface by washing, $/square foot	6.95
Additional decontamination of surfaces by hydrolasing, $/square foot	38.02
Decontamination rig hook up and flush, $/ 250 foot length	6,256.58
Chemical flush of components/systems, $/gallon	30.74
Removal of clean standard reinforced concrete, $/cubic yard	73.17
Removal of grade slab concrete, $/cubic yard	83.15
Removal of clean concrete floors, $/cubic yard	381.17
Removal of sections of clean concrete floors, $/cubic yard	1,119.74
Removal of clean heavily rein concrete w/#9 rebar, $/cubic yard	105.36
Removal of contaminated heavily rein concrete w/#9 rebar, $/cubic yard	2,147.18
Removal of clean heavily rein concrete w/#18 rebar, $/cubic yard	142.69
Removal of contaminated heavily rein concrete w/#18 rebar, $/cubic yard	2,839.27
Removal heavily rein concrete w/#18 rebar & steel embedments, $/cubic yard	522.74
Removal of below-grade suspended floors, $/cubic yard	199.88
Removal of clean monolithic concrete structures, $/cubic yard	920.33
Removal of contaminated monolithic concrete structures, $/cubic yard	2,130.88
Removal of clean foundation concrete, $/cubic yard	725.56
Removal of contaminated foundation concrete, $/cubic yard	1,985.67
Explosive demolition of bulk concrete, $/cubic yard	52.42
Removal of clean hollow masonry block wall, $/cubic yard	29.62
Removal of contaminated hollow masonry block wall, $/cubic yard	75.96
Removal of clean solid masonry block wall, $/cubic yard	29.62
Removal of contaminated solid masonry block wall, $/cubic yard	75.96
Backfill of below-grade voids, $/cubic yard	37.71
Removal of subterranean tunnels/voids, $/linear foot	102.90
Placement of concrete for below-grade voids, $/cubic yard	179.18
Excavation of clean material, $/cubic yard	3.18

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Excavation of contaminated material, $/cubic yard	44.76
Removal of clean concrete rubble (tipping fee included), $/cubic yard	28.15
Removal of contaminated concrete rubble, $/cubic yard	27.76
Removal of building by volume, $/cubic foot	0.38
Removal of clean building metal siding, $/square foot	1.17
Removal of contaminated building metal siding, $/square foot	3.94
Removal of standard asphalt roofing, $/square foot	1.88
Removal of transite panels, $/square foot	2.19
Scarifying contaminated concrete surfaces (drill & spall), $/square foot	12.84
Scabbling contaminated concrete floors, $/square foot	7.29
Scabbling contaminated concrete walls, $/square foot	18.83
Scabbling contaminated ceilings, $/square foot	64.24
Scabbling structural steel, $/square foot	6.24
Removal of clean overhead crane/monorail < 10 ton capacity	661.08
Removal of contaminated overhead crane/monorail < 10 ton capacity	1,813.84
Removal of clean overhead crane/monorail >10-50 ton capacity	1,586.61
Removal of contaminated overhead crane/monorail >10-50 ton capacity	4,352.47
Removal of polar crane > 50 ton capacity	6,716.42
Removal of gantry crane > 50 ton capacity	24,118.21
Removal of structural steel, $/pound	0.28
Removal of clean steel floor grating, $/square foot	5.33
Removal of contaminated steel floor grating, $/square foot	14.85
Removal of clean free standing steel liner, $/square foot	12.18
Removal of contaminated free standing steel liner, $/square foot	34.24
Removal of clean concrete-anchored steel liner, $/square foot	6.09
Removal of contaminated concrete-anchored steel liner, $/square foot	39.94
Placement of scaffolding in clean areas, $/square foot	15.46
Placement of scaffolding in contaminated areas, $/square foot	23.86
Landscaping with topsoil, $/acre	27,304.51
Cost of CPC B-88 LSA box & preparation for use	2,170.11

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Cost of CPC B-25 LSA box & preparation for use	1,855.07
Cost of CPC B-12V 12 gauge LSA box & preparation for use	1,676.95
Cost of CPC B-144 LSA box & preparation for use	10,892.01
Cost of LSA drum & preparation for use	368.24
Cost of cask liner for CNSI 8 120A cask (resins)	14,805.10
Cost of cask liner for CNSI 8 120A cask (filters)	10,501.16
Decontamination of surfaces with vacuuming, $/square foot	0.82

APPENDIX C

DETAILED COST ANALYSIS

DECON

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(Thousands of 2023 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	-	-	-	-	-	-	170	25	195	195	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	262	39	301	301	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	601	90	692	692	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	170	25	195	195	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	981	147	1,128	1,128	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	405	61	466	466	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Prepare/submit Defueled Technical Specifications	-	-	-	-	-	-	981	147	1,128	1,128	-	-	-	-	-	-	-	-	-	7,500
1a.1.15	Perform Site-Specific Cost Study	-	-	-	-	-	-	654	98	752	752	-	-	-	-	-	-	-	-	-	5,000
1a.1.16	Prepare/submit Irradiated Fuel Management Plan	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	643	97	740	666	-	74	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	545	82	627	564	-	63	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	65	10	75	75	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	928	139	1,068	1,068	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	850	127	977	977	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Biological shield	-	-	-	-	-	-	65	10	75	75	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Steam generators	-	-	-	-	-	-	408	61	469	469	-	-	-	-	-	-	-	-	-	3,120
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	209	31	241	120	-	120	-	-	-	-	-	-	-	1,600
1a.1.17.9	Main Turbine	-	-	-	-	-	-	52	8	60	-	-	60	-	-	-	-	-	-	-	400
1a.1.17.10	Main Condensers	-	-	-	-	-	-	52	8	60	-	-	60	-	-	-	-	-	-	-	400
1a.1.17.11	Plant structures & buildings	-	-	-	-	-	-	408	61	469	235	-	235	-	-	-	-	-	-	-	3,120
1a.1.17.12	Waste management	-	-	-	-	-	-	601	90	692	692	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.13	Facility & site closeout	-	-	-	-	-	-	118	18	135	68	-	68	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	4,946	742	5,688	5,009	-	679	-	-	-	-	-	-	-	37,827
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	314	47	361	361	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	4,000	600	4,600	4,600	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	183	27	211	211	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,800	420	3,220	3,220	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	161	24	185	185	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	17,020	2,553	19,573	18,893	-	679	-	-	-	-	-	-	-	78,157
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	440	66	505	-	505	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	440	66	505	-	505	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	3,210	321	3,531	3,531	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	3,691	369	4,060	4,060	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	888	-	-	-	-	-	222	1,110	1,110	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	657	-	-	-	-	-	99	755	755	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	10	-	35	-	11	69	69	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	2,469	370	2,840	2,840	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,252	125	1,377	1,377	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	1,448	145	1,593	-	1,593	-	-	-	-	-	-	-	-	-
1a.4.9	INPO Fees	-	-	-	-	-	-	358	54	411	411	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	988	148	1,136	-	1,136	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	127	19	146	-	146	-	-	-	-	-	-	-	-	-
1a.4.12	Corporate A&G Cost	-	-	-	-	-	-	651	98	749	749	-	-	-	-	-	-	-	-	-	-
1a.4.13	NEI Annual Fees	-	-	-	-	-	-	577	87	664	664	-	-	-	-	-	-	-	-	-	-
1a.4.14	Security Staff Cost	-	-	-	-	-	-	17,743	2,661	20,404	20,404	-	-	-	-	-	-	-	-	-	277,740
1a.4.15	Utility Staff Cost	-	-	-	-	-	-	33,657	5,049	38,706	38,706	-	-	-	-	-	-	-	-	-	422,240
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,545	13	10	-	35	66,172	9,778	77,551	74,676	2,875	-	-	610	-	-	-	12,190	20	699,980
1a.0	TOTAL PERIOD 1a COST	-	1,545	13	10	-	35	83,631	12,397	97,629	93,569	3,381	679	-	610	-	-	-	12,190	20	778,137

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(Thousands of 2023 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 1b - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	619	93	712	641	-	71	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	327	49	376	376	-	-	-	-	-	-	-	-	-	2,500
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	177	26	203	51	-	152	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD cooling assembly	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	CRD housings & ICI tubes	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Incore instrumentation	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	475	71	546	546	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	157	24	180	90	-	90	-	-	-	-	-	-	-	1,200
1b.1.1.10	Missile shields	-	-	-	-	-	-	59	9	68	68	-	-	-	-	-	-	-	-	-	450
1b.1.1.11	Biological shield	-	-	-	-	-	-	157	24	180	180	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.12	Steam generators	-	-	-	-	-	-	601	90	692	692	-	-	-	-	-	-	-	-	-	4,600
1b.1.1.13	Reinforced concrete	-	-	-	-	-	-	131	20	150	75	-	75	-	-	-	-	-	-	-	1,000
1b.1.1.14	Main Turbine	-	-	-	-	-	-	204	31	235	-	-	235	-	-	-	-	-	-	-	1,560
1b.1.1.15	Main Condensers	-	-	-	-	-	-	204	31	235	-	-	235	-	-	-	-	-	-	-	1,560
1b.1.1.16	Auxiliary building	-	-	-	-	-	-	357	54	411	369	-	41	-	-	-	-	-	-	-	2,730
1b.1.1.17	Reactor building	-	-	-	-	-	-	357	54	411	369	-	41	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	4,347	652	4,999	4,059	-	940	-	-	-	-	-	-	-	33,243
1b.1.2	Decon primary loop	990	-	-	-	-	-	-	495	1,485	1,485	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	990	-	-	-	-	-	4,347	1,147	6,484	5,544	-	940	-	-	-	-	-	-	1,067	33,243
Period 1b Additional Costs																					
1b.2.1	Spent Fuel Pool Isolation	-	-	-	-	-	-	14,330	2,150	16,480	16,480	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	3,128	938	4,066	4,066	-	-	-	-	-	-	-	-	19,100	7,852
1b.2.3	Misc/Hazardous Waste	-	-	139	58	58	-	-	31	288	288	-	-	11,790	-	-	-	-	137,800	740	-
1b.2	Subtotal Period 1b Additional Costs	-	-	139	58	58	-	17,458	3,119	20,834	20,834	-	-	11,790	-	-	-	-	137,800	19,840	7,852
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	1,193	-	-	-	-	-	-	179	1,371	1,371	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,398	210	1,608	1,608	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process decommissioning water waste	49	-	35	59	-	135	-	71	349	349	-	-	-	283	-	-	-	16,999	55	-
1b.3.4	Process decommissioning chemical flush waste	2	-	93	289	-	2,825	-	760	3,970	3,970	-	-	-	-	788	-	-	83,917	147	-
1b.3.5	Small tool allowance	-	2	-	-	-	-	-	0	2	2	-	-	-	-	-	-	-	-	-	-
1b.3.6	Pipe cutting equipment	-	1,400	-	-	-	-	-	210	1,610	1,610	-	-	-	-	-	-	-	-	-	-
1b.3.7	Decon rig	2,489	-	-	-	-	-	-	373	2,862	2,862	-	-	-	-	-	-	-	-	-	-
1b.3.8	Spent Fuel Capital and Transfer	-	-	-	-	-	-	1,159	174	1,333	-	1,333	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	3,733	1,402	128	348	-	2,961	2,557	1,977	13,106	11,773	1,333	-	-	283	788	-	-	100,916	203	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	43	-	-	-	-	-	-	11	54	54	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	1,600	160	1,760	1,760	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	1,841	184	2,025	2,025	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	503	-	-	-	-	-	126	629	629	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	328	-	-	-	-	-	49	377	377	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	7	6	-	20	-	7	40	40	-	-	-	356	-	-	-	7,122	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	2,463	369	2,832	2,832	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	370	37	407	407	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	722	72	794	-	794	-	-	-	-	-	-	-	-	-
1b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	493	74	567	-	567	-	-	-	-	-	-	-	-	-
1b.4.11	ISFSI Operating Costs	-	-	-	-	-	-	63	9	73	-	73	-	-	-	-	-	-	-	-	-
1b.4.12	Corporate A&G Cost	-	-	-	-	-	-	326	49	375	375	-	-	-	-	-	-	-	-	-	-
1b.4.13	NEI Annual Fees	-	-	-	-	-	-	288	43	331	331	-	-	-	-	-	-	-	-	-	-
1b.4.14	Security Staff Cost	-	-	-	-	-	-	8,746	1,312	10,058	10,058	-	-	-	-	-	-	-	-	-	136,904
1b.4.15	DOC Staff Cost	-	-	-	-	-	-	6,215	932	7,147	7,147	-	-	-	-	-	-	-	-	-	63,266
1b.4.16	Utility Staff Cost	-	-	-	-	-	-	16,871	2,531	19,402	19,402	-	-	-	-	-	-	-	-	-	211,579
1b.4	Subtotal Period 1b Period-Dependent Costs	43	830	7	6	-	20	39,997	5,965	46,870	45,436	1,434	-	-	356	-	-	-	7,122	12	411,749
1b.0	TOTAL PERIOD 1b COST	4,766	2,233	275	412	58	2,981	64,360	12,209	87,293	83,586	2,767	940	11,790	639	788	-	-	245,838	21,120	452,844
PERIOD 1 TOTALS		4,766	3,777	287	422	58	3,016	147,991	24,605	184,923	177,155	6,148	1,620	11,790	1,249	788	-	-	258,028	21,140	1,230,980

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(Thousands of 2023 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
PERIOD 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Reactor Coolant Piping	201	185	40	122	-	735	-	353	1,635	1,635	-	-	-	2,046	-	-	-	142,726	6,863	-
2a.1.1.2	Pressurizer Relief Tank	34	26	11	34	-	208	-	82	395	395	-	-	-	578	-	-	-	40,338	1,077	-
2a.1.1.3	Reactor Coolant Pumps & Motors	102	95	175	266	-	1,584	-	528	2,752	2,752	-	-	-	4,664	-	-	-	816,140	4,188	100
2a.1.1.4	Pressurizer	-	65	798	187	-	1,270	-	442	2,761	2,761	-	-	-	3,739	-	-	-	293,734	1,666	1,875
2a.1.1.5	Steam Generators	-	8,153	5,479	4,207	3,622	7,885	-	5,732	35,078	35,078	-	-	40,845	23,217	-	-	-	3,619,368	23,331	5,750
2a.1.1.6	CRDMs/ICIs/Service Structure Removal	170	294	256	134	-	865	-	421	2,140	2,140	-	-	-	4,534	-	-	-	168,041	8,136	-
2a.1.1.7	Reactor Vessel Internals	73	7,546	15,283	1,391	-	15,682	371	17,761	58,108	58,108	-	-	-	4,194	963	393	-	340,568	31,273	1,409
2a.1.1.8	Reactor Vessel	116	9,402	3,013	1,730	-	4,837	371	10,770	30,240	30,240	-	-	-	13,620	-	-	-	972,936	31,273	1,409
2a.1.1	Totals	696	25,767	25,055	8,072	3,622	33,067	743	36,088	133,108	133,108	-	-	40,845	56,591	963	393	-	6,393,852	107,807	10,544
Removal of Major Equipment																					
2a.1.2	Main Turbine/Generator	-	521	397	154	834	834	-	526	3,266	3,266	-	-	4,844	2,698	-	-	-	462,027	9,734	-
2a.1.3	Main Condensers	-	1,456	229	233	995	1,052	-	834	4,798	4,798	-	-	7,701	3,216	-	-	-	550,847	27,762	-
Cascading Costs from Clean Building Demolition																					
2a.1.4.1	Reactor	-	549	-	-	-	-	-	82	631	631	-	-	-	-	-	-	-	-	4,871	-
2a.1.4.2	Auxiliary	-	299	-	-	-	-	-	45	344	344	-	-	-	-	-	-	-	-	2,194	-
2a.1.4.3	Hot Machine Shop	-	1	-	-	-	-	-	0	1	1	-	-	-	-	-	-	-	-	7	-
2a.1.4.4	Radwaste	-	56	-	-	-	-	-	8	64	64	-	-	-	-	-	-	-	-	387	-
2a.1.4.5	Fuel Building	-	118	-	-	-	-	-	18	135	135	-	-	-	-	-	-	-	-	773	-
2a.1.4	Totals	-	1,023	-	-	-	-	-	153	1,176	1,176	-	-	-	-	-	-	-	-	8,233	-
Disposal of Plant Systems																					
2a.1.5.1	AB - Main Steam	-	254	-	-	-	-	-	38	292	-	-	292	-	-	-	-	-	-	5,833	-
2a.1.5.2	AB - Main Steam RCA	-	78	4	32	251	-	-	63	428	428	-	-	2,156	-	-	-	-	87,550	1,515	-
2a.1.5.3	AC - Main Turbine	-	254	-	-	-	-	-	38	292	-	-	292	-	-	-	-	-	-	5,641	-
2a.1.5.4	AD - Condensate	-	287	-	-	-	-	-	43	330	-	-	330	-	-	-	-	-	-	6,144	-
2a.1.5.5	AE - Feedwater	-	195	-	-	-	-	-	29	224	-	-	224	-	-	-	-	-	-	4,271	-
2a.1.5.6	AF - Feedwater Hter Extrction, Drn & Vnt	-	235	-	-	-	-	-	35	270	-	-	270	-	-	-	-	-	-	5,352	-
2a.1.5.7	AK - Condensate Demineralizer	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	1,944	-
2a.1.5.8	AL - Auxiliary Feedwater	-	53	-	-	-	-	-	8	61	-	-	61	-	-	-	-	-	-	1,174	-
2a.1.5.9	AL-Auxiliary Feedwater Surge Tanks	-	3	-	-	-	-	-	0	4	-	-	4	-	-	-	-	-	-	72	-
2a.1.5.10	AN - Demineralized Wtr Storage & xfer	-	67	-	-	-	-	-	10	78	-	-	78	-	-	-	-	-	-	1,548	-
2a.1.5.11	AP - Condensate Storage & Transfer	-	85	-	-	-	-	-	13	98	-	-	98	-	-	-	-	-	-	1,660	-
2a.1.5.12	AQ - Condensate & Feedwater Chem Additn	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	468	-
2a.1.5.13	AX - Acid Feed	-	33	-	-	-	-	-	5	38	-	-	38	-	-	-	-	-	-	754	-
2a.1.5.14	Auxiliary Bldg Non-System Specific	-	115	6	16	55	92	-	63	349	349	-	-	474	282	-	-	-	37,164	2,282	-
2a.1.5.15	Auxiliary Bldg Non-System Specific RCA	-	713	15	113	889	-	-	330	2,060	2,060	-	-	7,629	-	-	-	-	309,812	13,471	-
2a.1.5.16	BL - Reactor Makeup Water	-	298	25	57	225	281	-	189	1,074	1,074	-	-	1,928	850	-	-	-	132,796	5,872	-
2a.1.5.17	BM - Steam Generator Blowdown	-	600	10	76	601	-	-	253	1,540	1,540	-	-	5,160	-	-	-	-	209,560	11,982	-
2a.1.5.18	CA - Steam Seal	-	20	-	-	-	-	-	3	23	-	-	23	-	-	-	-	-	-	455	-
2a.1.5.19	CB - Main Turbine Lube Oil	-	61	-	-	-	-	-	9	70	-	-	70	-	-	-	-	-	-	1,207	-
2a.1.5.20	CC - Generator Hydrogen & CO2	-	9	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	198	-
2a.1.5.21	CD - Generator Seal Oil	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	287	-
2a.1.5.22	CE - Stator Cooling Water	-	12	-	-	-	-	-	2	14	-	-	14	-	-	-	-	-	-	241	-
2a.1.5.23	CF - Lube Oil Strg, Xfer & Purification	-	37	-	-	-	-	-	6	43	-	-	43	-	-	-	-	-	-	812	-
2a.1.5.24	CG - Condenser Air Removal	-	30	-	-	-	-	-	5	35	-	-	35	-	-	-	-	-	-	657	-
2a.1.5.25	CH - Main Turbine Control Oil	-	63	-	-	-	-	-	9	72	-	-	72	-	-	-	-	-	-	1,219	-
2a.1.5.26	CL - Chlorination	-	26	-	-	-	-	-	4	30	-	-	30	-	-	-	-	-	-	569	-
2a.1.5.27	CO - Carbon Dioxide	-	5	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	121	-
2a.1.5.28	CW - Circulating Water	-	347	-	-	-	-	-	52	399	-	-	399	-	-	-	-	-	-	7,858	-
2a.1.5.29	CZ - Caustic Acid	-	5	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	111	-
2a.1.5.30	Control Bldg Non-System Specific	-	184	4	32	249	-	-	89	557	557	-	-	2,139	-	-	-	-	86,849	3,413	-
2a.1.5.31	Control Bldg Non-System Specific Cln	-	1,380	-	-	-	-	-	207	1,587	-	-	1,587	-	-	-	-	-	-	29,076	-
2a.1.5.32	DA - Circulating Water System	-	351	-	-	-	-	-	53	404	-	-	404	-	-	-	-	-	-	7,953	-
2a.1.5.33	DM - Equipment Drains	-	58	-	-	-	-	-	9	67	-	-	67	-	-	-	-	-	-	1,223	-
2a.1.5.34	DM - Equipment Drains RCA	-	148	31	229	1,800	-	-	344	2,552	2,552	-	-	15,445	-	-	-	-	627,223	2,840	-
2a.1.5.35	EB - Closed Cooling Water	-	55	-	-	-	-	-	8	64	-	-	64	-	-	-	-	-	-	1,267	-
2a.1.5.36	EG - Component Cooling Water RCA	-	722	29	210	1,650	-	-	462	3,073	3,073	-	-	14,161	-	-	-	-	575,071	13,646	-
2a.1.5.37	EJ - Residual Heat Removal	-	386	57	121	318	792	-	366	2,040	2,040	-	-	2,727	2,411	-	-	-	264,564	7,897	-
2a.1.5.38	EM - High Pressure Coolant Injection	-	310	19	40	147	215	-	161	891	891	-	-	1,260	648	-	-	-	92,828	6,201	-
2a.1.5.39	EN - Containment Spray	-	219	6	45	353	-	-	115	738	738	-	-	3,026	-	-	-	-	122,874	4,134	-
2a.1.5.40	EP - Accumulator Safety Injection	-	165	11	33	183	94	-	98	583	583	-	-	1,568	283	-	-	-	81,940	3,246	-
2a.1.5.41	FA - Auxiliary Steam Generator	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	521	-

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(Thousands of 2023 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
DIsposal of Plant Systems (continued)																					
2a.1.5.42	FB - Auxiliary Steam	-	92	-	-	-	-	-	14	106	-	-	106	-	-	-	-	-	-	2,106	-
2a.1.5.43	FB - Auxiliary Steam RCA	-	83	2	12	95	-	-	37	229	229	-	-	816	-	-	-	-	33,148	1,537	-
2a.1.5.44	FC - Auxiliary Turbines	-	61	-	-	-	-	-	9	70	-	-	70	-	-	-	-	-	-	1,301	-
2a.1.5.45	FE - Auxiliary Steam Chemical Addition	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	105	-
2a.1.5.46	FP - Fire Protection	-	171	-	-	-	-	-	26	196	-	-	196	-	-	-	-	-	-	3,826	-
2a.1.5.47	GA - Plant Heating	-	82	-	-	-	-	-	12	95	-	-	95	-	-	-	-	-	-	1,912	-
2a.1.5.48	GB - Central Chilled Water	-	78	-	-	-	-	-	12	89	-	-	89	-	-	-	-	-	-	1,803	-
2a.1.5.49	GE - Turbine Bldg HVAC	-	137	-	-	-	-	-	21	157	-	-	157	-	-	-	-	-	-	3,189	-
2a.1.5.50	GF - Miscellaneous Building HVAC	-	41	-	-	-	-	-	6	47	-	-	47	-	-	-	-	-	-	987	-
2a.1.5.51	GL - Auxiliary Building HVAC	-	464	15	83	590	75	-	237	1,464	1,464	-	-	5,064	228	-	-	-	220,197	8,491	-
2a.1.5.52	GS - Containment Hydrogen Control	-	76	5	13	77	35	-	42	247	247	-	-	658	104	-	-	-	33,502	1,559	-
2a.1.5.53	HE - Boron Recycle	435	506	40	86	303	466	-	523	2,359	2,359	-	-	2,600	1,411	-	-	-	196,130	16,660	-
2a.1.5.54	HF - Secondary Liquid Waste	810	997	88	199	721	1,057	-	1,065	4,938	4,938	-	-	6,186	3,203	-	-	-	456,359	31,896	-
2a.1.5.55	HY - Hydrogen	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	223	-
2a.1.5.56	KC - Fire Protection	-	410	-	-	-	-	-	61	471	-	-	471	-	-	-	-	-	-	9,256	-
2a.1.5.57	KH - Service Gas	-	29	-	-	-	-	-	4	33	-	-	33	-	-	-	-	-	-	644	-
2a.1.5.58	LA - Sanitary Drains	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	290	-
2a.1.5.59	LE - Oily Waste	-	113	-	-	-	-	-	17	130	-	-	130	-	-	-	-	-	-	2,575	-
2a.1.5.60	LE - Oily Waste RCA	-	194	3	25	200	-	-	83	506	506	-	-	1,718	-	-	-	-	69,785	3,518	-
2a.1.5.61	NT - Nitrogen	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	149	-
2a.1.5.62	OX - Oxygen	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	171	-
2a.1.5.63	RM - Process Sampling & Analysis	-	137	9	18	77	81	-	70	392	392	-	-	661	240	-	-	-	42,525	2,774	-
2a.1.5.64	Radwaste Bldg Non-System Specific	-	186	11	27	82	162	-	105	574	574	-	-	705	497	-	-	-	60,190	3,653	-
2a.1.5.65	SJ - Nuclear Sampling	-	80	6	13	49	62	-	45	255	255	-	-	423	184	-	-	-	29,191	1,620	-
2a.1.5.66	SW - Screen Wash	-	32	-	-	-	-	-	5	36	-	-	36	-	-	-	-	-	-	635	-
2a.1.5.67	SZ - Service Air	-	83	-	-	-	-	-	12	95	-	-	95	-	-	-	-	-	-	1,892	-
2a.1.5.68	Turbine Bldg Non-System Specific	-	749	-	-	-	-	-	112	862	-	-	862	-	-	-	-	-	-	15,405	-
2a.1.5.69	VA - I&C Shop HVAC	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	155	-
2a.1.5.70	VB - I&C Shop Computer Room HVAC	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	106	-
2a.1.5.71	VH - Circ Water & Makeup Water Scrnhs	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	272	-
2a.1.5.72	VJ - Shop Bldg Machine Shop Area Vent	-	3	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	57	-
2a.1.5.73	VL - Shop Building HVAC	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	101	-
2a.1.5.74	VV - Misc Bldg HVAC	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	148	-
2a.1.5.75	WG - Gland Water & Motor Cooling Water	-	24	-	-	-	-	-	4	28	-	-	28	-	-	-	-	-	-	593	-
2a.1.5.76	WL - Cooling Lake Makeup & Blowdown	-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	745	-
2a.1.5.77	WM - Makeup Demineralizer	-	177	-	-	-	-	-	27	203	-	-	203	-	-	-	-	-	-	3,929	-
2a.1.5.78	WS - Plant Services Water	-	147	-	-	-	-	-	22	169	-	-	169	-	-	-	-	-	-	3,297	-
2a.1.5.79	Yard Non-System Specific	-	30	-	-	-	-	-	4	34	-	-	34	-	-	-	-	-	-	603	-
2a.1.5	Totals	1,246	13,304	397	1,479	8,917	3,411	-	5,736	34,490	26,852	-	7,639	76,504	10,341	-	-	-	3,769,256	293,319	-
2a.1.6	Scaffolding in support of decommissioning	-	1,423	27	23	156	35	-	394	2,058	2,058	-	-	1,206	106	-	-	-	61,032	36,964	-
2a.1	Subtotal Period 2a Activity Costs	1,942	43,492	26,105	9,961	14,523	38,399	743	43,732	178,896	171,257	-	7,639	131,100	72,952	963	393	-	11,237,010	483,818	10,544
Period 2a Additional Costs																					
2a.2.1	Remedial Action Surveys	-	-	-	-	-	-	1,565	470	2,035	2,035	-	-	-	-	-	-	-	-	34,738	-
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	1,565	470	2,035	2,035	-	-	-	-	-	-	-	-	34,738	-
Period 2a Collateral Costs																					
2a.3.1	Process decommissioning water waste	220	-	158	265	-	612	-	318	1,573	1,573	-	-	-	1,280	-	-	-	76,774	249	-
2a.3.2	Process decommissioning chemical flush waste	1	-	49	150	-	348	-	115	664	664	-	-	-	410	-	-	-	43,711	77	-
2a.3.3	Small tool allowance	-	435	-	-	-	-	-	65	500	450	-	50	-	-	-	-	-	-	-	-
2a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	17,370	2,605	19,975	-	19,975	-	-	-	-	-	-	-	-	-
2a.3.5	On-site survey and release of 120.7 tons clean metallic waste	-	-	-	-	-	-	174	17	191	191	-	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	221	435	206	415	-	960	17,544	3,122	22,904	2,878	19,975	50	-	1,690	-	-	-	120,485	326	-
Period 2a Period-Dependent Costs																					
2a.4.1	Decon supplies	145	-	-	-	-	-	-	36	181	181	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	1,042	104	1,146	1,146	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	6,169	617	6,786	6,786	-	-	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	5,786	-	-	-	-	-	1,446	7,232	7,232	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	3,714	-	-	-	-	-	557	4,271	4,271	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	138	108	-	384	-	126	756	756	-	-	-	6,685	-	-	-	133,707	218	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	3,921	588	4,509	4,509	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	1,124	112	1,236	1,236	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,393	139	1,532	-	1,532	-	-	-	-	-	-	-	-	-
2a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	1,652	248	1,899	-	1,899	-	-	-	-	-	-	-	-	-
2a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	211	32	243	-	243	-	-	-	-	-	-	-	-	-

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(Thousands of 2023 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 2a Period-Dependent Costs (continued)																					
2a.4.12	Corporate A&G Cost	-	-	-	-	-	-	759	114	873	873	-	-	-	-	-	-	-	-	-	-
2a.4.13	NEI Annual Fees	-	-	-	-	-	-	965	145	1,109	1,109	-	-	-	-	-	-	-	-	-	-
2a.4.14	Security Staff Cost	-	-	-	-	-	-	26,817	4,023	30,840	30,840	-	-	-	-	-	-	-	-	-	413,664
2a.4.15	DOC Staff Cost	-	-	-	-	-	-	25,394	3,809	29,203	29,203	-	-	-	-	-	-	-	-	-	264,189
2a.4.16	Utility Staff Cost	-	-	-	-	-	-	40,934	6,140	47,074	47,074	-	-	-	-	-	-	-	-	-	491,877
2a.4	Subtotal Period 2a Period-Dependent Costs	145	9,500	138	108	-	384	110,379	18,236	138,889	135,214	3,675	-	-	6,685	-	-	-	133,707	218	1,169,729
2a.0	TOTAL PERIOD 2a COST	2,307	53,427	26,449	10,485	14,523	39,743	130,231	65,559	342,724	311,385	23,650	7,689	131,100	81,327	963	393	-	11,491,200	519,100	1,180,273
PERIOD 2b - Site Decontamination																					
Period 2b Direct Decommissioning Activities																					
Disposal of Plant Systems																					
2b.1.1.1	AN - Demineralized Wtr Strg & xfer RCA	-	19	0	2	14	-	-	7	42	42	-	-	120	-	-	-	-	4,855	334	-
2b.1.1.2	BB - Reactor Coolant	-	309	38	81	204	547	-	261	1,440	1,440	-	-	1,746	1,669	-	-	-	177,118	6,412	-
2b.1.1.3	BG - Chemical & Volume Control	1,038	946	121	237	571	1,622	-	1,294	5,830	5,830	-	-	4,899	4,925	-	-	-	513,906	27,846	-
2b.1.1.4	BN - Borated Refueling Water Storage	-	348	22	99	642	175	-	244	1,531	1,531	-	-	5,512	533	-	-	-	257,802	6,939	-
2b.1.1.5	DO - Diesel Oil	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	48	-
2b.1.1.6	EA - Service Water	-	116	-	-	-	-	-	17	133	-	-	133	-	-	-	-	-	-	2,592	-
2b.1.1.7	EF - Essential Service Water	-	166	-	-	-	-	-	25	191	-	-	191	-	-	-	-	-	-	3,800	-
2b.1.1.8	EF - Essential Service Water RCA	-	90	3	21	166	-	-	51	331	331	-	-	1,427	-	-	-	-	57,959	1,734	-
2b.1.1.9	FO - Fuel Oil	-	20	-	-	-	-	-	3	23	-	-	23	-	-	-	-	-	-	486	-
2b.1.1.10	FP - Fire Protection RCA	-	198	9	67	524	-	-	139	936	936	-	-	4,492	-	-	-	-	182,411	3,541	-
2b.1.1.11	GA - Plant Heating RCA	-	114	2	11	87	-	-	43	257	257	-	-	746	-	-	-	-	30,275	2,072	-
2b.1.1.12	GB - Central Chilled Water RCA	-	26	0	3	22	-	-	10	62	62	-	-	187	-	-	-	-	7,591	482	-
2b.1.1.13	GD - Esstl Srvc Wtr Pumphs Bldg HVAC	-	13	-	-	-	-	-	2	14	-	-	14	-	-	-	-	-	-	284	-
2b.1.1.14	GH - Radwaste Building HVAC	-	187	7	39	283	32	-	104	652	652	-	-	2,425	98	-	-	-	104,702	3,455	-
2b.1.1.15	GK - Control Building HVAC	-	156	-	-	-	-	-	23	179	-	-	179	-	-	-	-	-	-	3,959	-
2b.1.1.16	GM - Diesel Generator Building HVAC	-	27	-	-	-	-	-	4	31	-	-	31	-	-	-	-	-	-	695	-
2b.1.1.17	GN - Containment Cooling	-	508	28	130	857	211	-	331	2,065	2,065	-	-	7,354	643	-	-	-	339,572	9,502	-
2b.1.1.18	GP - Containmnt Integratd Leak Rate Test	-	40	1	9	68	-	-	22	139	139	-	-	580	-	-	-	-	23,570	750	-
2b.1.1.19	GR - Containment Atmospheric Control	-	20	3	17	127	13	-	30	211	211	-	-	1,086	41	-	-	-	46,686	392	-
2b.1.1.20	GT - Contaiment Purge HVAC	-	120	7	35	227	56	-	84	528	528	-	-	1,948	170	-	-	-	89,946	2,259	-
2b.1.1.21	HA - Gaseous Radwaste	-	364	25	64	324	223	-	207	1,207	1,207	-	-	2,782	666	-	-	-	156,216	7,037	-
2b.1.1.22	HB - Liquid Radwaste	863	877	81	174	646	908	-	1,009	4,558	4,558	-	-	5,544	2,742	-	-	-	401,460	30,762	-
2b.1.1.23	HC - Solid Radwaste	-	485	53	111	324	684	-	363	2,020	2,020	-	-	2,781	2,076	-	-	-	245,800	9,589	-
2b.1.1.24	HD - Decontamination	-	106	6	20	115	57	-	62	366	366	-	-	983	171	-	-	-	50,973	2,051	-
2b.1.1.25	JE - Emergency Fuel Oil	-	63	-	-	-	-	-	10	73	-	-	73	-	-	-	-	-	-	1,260	-
2b.1.1.26	KA - Compressed Air and Instrument	-	270	-	-	-	-	-	40	310	-	-	310	-	-	-	-	-	-	6,089	-
2b.1.1.27	KB - Breathing Air	-	47	-	-	-	-	-	7	54	-	-	54	-	-	-	-	-	-	1,075	-
2b.1.1.28	KC - Fire Protection RCA	-	351	12	88	693	-	-	206	1,350	1,350	-	-	5,944	-	-	-	-	241,384	6,383	-
2b.1.1.29	KD - Domestic Water	-	73	-	-	-	-	-	11	84	-	-	84	-	-	-	-	-	-	1,708	-
2b.1.1.30	KE - Fuel Hndlg & Strg Reactor Vssl Serv	-	20	4	15	77	52	-	32	200	200	-	-	661	158	-	-	-	36,889	375	-
2b.1.1.31	KJ - Standby Diesel Engine	-	332	-	-	-	-	-	50	382	-	-	382	-	-	-	-	-	-	6,749	-
2b.1.1.32	LA - Sanitary Drains RCA	-	26	1	4	32	-	-	12	74	74	-	-	272	-	-	-	-	11,053	422	-
2b.1.1.33	LB - Roof Drains	-	56	-	-	-	-	-	8	65	-	-	65	-	-	-	-	-	-	1,276	-
2b.1.1.34	LB - Roof Drains RCA	-	146	4	32	249	-	-	79	511	511	-	-	2,139	-	-	-	-	86,858	2,694	-
2b.1.1.35	LC - Yard Drains	-	5	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	96	-
2b.1.1.36	LD - Chemical & Detergent Waste	77	119	6	15	59	69	-	97	441	441	-	-	504	211	-	-	-	33,951	3,490	-
2b.1.1.37	LF - Floor & Equipment Drains	-	1,488	127	246	436	1,878	-	956	5,130	5,130	-	-	3,739	5,724	-	-	-	516,484	29,320	-
2b.1.1.38	Main Access Facility	-	17	-	-	-	-	-	3	20	-	-	20	-	-	-	-	-	-	339	-
2b.1.1.39	Radwaste Bldg Non-System Specific RCA	-	1,176	26	188	1,478	-	-	547	3,415	3,415	-	-	12,684	-	-	-	-	515,103	21,919	-
2b.1.1.40	Reactor Bldg Non-System Specific	-	93	4	10	31	61	-	45	245	245	-	-	269	186	-	-	-	22,727	1,760	-
2b.1.1.41	Reactor Bldg Non-System Specific RCA	-	593	10	71	556	-	-	243	1,472	1,472	-	-	4,768	-	-	-	-	193,612	10,425	-
2b.1.1.42	SBO Diesel Generator	-	177	-	-	-	-	-	27	204	-	-	204	-	-	-	-	-	-	3,610	-
2b.1.1.43	ST - Sewage Treatment	-	107	-	-	-	-	-	16	124	-	-	124	-	-	-	-	-	-	2,316	-
2b.1.1.44	VC - Health Physics Computer Room HVAC	-	10	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	208	-
2b.1.1.45	VS - Admin Bldg HVAC	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	262	-
2b.1.1.46	VT - Tech Support Building HVAC	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	87	-
2b.1.1.47	VW - Waste Water Treatment Ventilation	-	3	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	52	-
2b.1.1.48	WD - Domestic Water	-	37	-	-	-	-	-	6	43	-	-	43	-	-	-	-	-	-	870	-
2b.1.1.49	WS - Plant Services Water RCA	-	39	4	27	214	-	-	46	331	331	-	-	1,838	-	-	-	-	74,625	782	-
2b.1.1.50	WT - Waste Water Treatment	-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	769	-
2b.1.1.51	WZ - Radioactive Liquid Waste	-	47	5	10	14	85	-	37	199	199	-	-	120	258	-	-	-	21,303	879	-
2b.1.1	Totals	1,978	10,607	610	1,825	9,038	6,672	-	6,824	37,554	35,543	-	2,012	77,549	20,271	-	-	-	4,444,833	232,233	-
2b.1.2	Scaffolding in support of decommissioning	-	1,778	34	29	195	43	-	492	2,572	2,572	-	-	1,508	133	-	-	-	76,290	46,205	-

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(Thousands of 2023 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			
Decontamination of Site Buildings																					
2b.1.3.1	Reactor	1,230	1,175	64	518	694	2,354	-	1,686	7,721	7,721	-	-	5,955	17,517	-	-	-	997,209	44,353	-
2b.1.3.2	Auxiliary	613	408	28	238	255	444	-	596	2,582	2,582	-	-	2,185	6,943	-	-	-	417,552	19,560	-
2b.1.3.3	Communication Corridor - Contaminated	14	7	1	5	2	9	-	12	49	49	-	-	17	152	-	-	-	7,854	395	-
2b.1.3.4	Hot Machine Shop	17	14	1	6	-	11	-	16	64	64	-	-	-	188	-	-	-	8,892	597	-
2b.1.3.5	RWST Foundation Decon	-	8	1	10	-	20	-	9	49	49	-	-	-	335	-	-	-	15,840	108	-
2b.1.3.6	Radwaste	326	193	14	122	98	233	-	304	1,291	1,291	-	-	844	3,681	-	-	-	208,617	10,005	-
2b.1.3.7	Radwaste Drum Storage	37	20	2	13	8	26	-	33	138	138	-	-	66	413	-	-	-	22,243	1,093	-
2b.1.3.8	Radwaste Storage Building	94	41	4	33	-	66	-	79	316	316	-	-	-	1,090	-	-	-	51,480	2,634	-
2b.1.3	Totals	2,330	1,865	114	945	1,057	3,164	-	2,734	12,210	12,210	-	-	9,068	30,319	-	-	-	1,729,687	78,745	-
2b.1.4	Prepare/submit License Termination Plan	-	-	-	-	-	-	536	80	616	616	-	-	-	-	-	-	-	-	-	4,096
2b.1.5	Receive NRC approval of termination plan									a											
2b.1	Subtotal Period 2b Activity Costs	4,308	14,250	757	2,800	10,290	9,880	536	10,131	52,952	50,940	-	2,012	88,124	50,723	-	-	-	6,250,810	357,184	4,096
Period 2b Additional Costs																					
2b.2.1	Remedial Action Surveys	-	-	-	-	-	-	780	234	1,014	1,014	-	-	-	-	-	-	-	-	17,312	-
2b.2	Subtotal Period 2b Additional Costs	-	-	-	-	-	-	780	234	1,014	1,014	-	-	-	-	-	-	-	-	17,312	-
Period 2b Collateral Costs																					
2b.3.1	Process decommissioning water waste	212	-	153	258	-	595	-	308	1,526	1,526	-	-	-	1,244	-	-	-	74,611	242	-
2b.3.2	Process decommissioning chemical flush waste	4	-	158	491	-	1,136	-	375	2,165	2,165	-	-	-	1,338	-	-	-	142,540	250	-
2b.3.3	Small tool allowance	-	279	-	-	-	-	-	42	321	321	-	-	-	-	-	-	-	-	-	-
2b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	25,778	3,867	29,645	-	29,645	-	-	-	-	-	-	-	-	-
2b.3.5	On-site survey and release of 39.39 tons clean metallic waste	-	-	-	-	-	-	57	6	62	62	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	216	279	312	748	-	1,731	25,835	4,598	33,718	4,073	29,645	-	-	2,581	-	-	-	217,152	493	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	1,845	-	-	-	-	-	-	461	2,306	2,306	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	519	52	571	571	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	3,074	307	3,382	3,382	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	3,830	-	-	-	-	-	958	4,788	4,788	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	1,898	-	-	-	-	-	285	2,183	2,183	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	104	82	-	289	-	95	569	569	-	-	-	5,037	-	-	-	100,731	164	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	1,543	231	1,774	1,774	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	560	56	616	616	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	694	69	764	-	764	-	-	-	-	-	-	-	-	-
2b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	823	123	947	-	947	-	-	-	-	-	-	-	-	-
2b.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	208	31	239	239	-	-	-	-	-	-	-	-	-	-
2b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	105	16	121	-	121	-	-	-	-	-	-	-	-	-
2b.4.13	Corporate A&G Cost	-	-	-	-	-	-	362	54	417	417	-	-	-	-	-	-	-	-	-	-
2b.4.14	NEI Annual Fees	-	-	-	-	-	-	481	72	553	553	-	-	-	-	-	-	-	-	-	-
2b.4.15	Security Staff Cost	-	-	-	-	-	-	12,660	1,899	14,559	14,559	-	-	-	-	-	-	-	-	-	206,154
2b.4.16	DOC Staff Cost	-	-	-	-	-	-	12,211	1,832	14,042	14,042	-	-	-	-	-	-	-	-	-	126,464
2b.4.17	Utility Staff Cost	-	-	-	-	-	-	19,571	2,936	22,506	22,506	-	-	-	-	-	-	-	-	-	234,738
2b.4	Subtotal Period 2b Period-Dependent Costs	1,845	5,728	104	82	-	289	52,810	9,477	70,335	68,503	1,831	-	-	5,037	-	-	-	100,731	164	567,356
2b.0	TOTAL PERIOD 2b COST	6,368	20,257	1,173	3,630	10,290	11,900	79,961	24,440	158,018	124,531	31,476	2,012	88,124	58,341	-	-	-	6,568,693	375,153	571,452
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	690	76	266	207	-	2,045	-	933	4,217	4,217	-	-	-	6,250	-	-	-	397,077	1,722	-
Disposal of Plant Systems																					
2d.1.2.1	EC - Fuel Pool Cooling & Cleanup	-	403	29	75	303	358	-	250	1,417	1,417	-	-	2,600	1,088	-	-	-	175,058	8,041	-
2d.1.2.2	Fuel Bldg Non-System Specific	-	49	3	7	20	39	-	26	144	144	-	-	170	120	-	-	-	14,568	954	-
2d.1.2.3	Fuel Bldg Non-System Specific RCA	-	321	6	47	373	-	-	144	892	892	-	-	3,200	-	-	-	-	129,974	5,859	-
2d.1.2.4	Fuel Building Fire Protection	-	155	6	44	343	-	-	97	645	645	-	-	2,941	-	-	-	-	119,444	2,802	-
2d.1.2.5	GG - Fuel Building HVAC	-	256	11	60	435	51	-	152	964	964	-	-	3,729	155	-	-	-	161,297	4,673	-
2d.1.2	Totals	-	1,184	54	233	1,473	448	-	669	4,062	4,062	-	-	12,641	1,364	-	-	-	600,340	22,329	-
Decontamination of Site Buildings																					
2d.1.3.1	Fuel Building	862	877	14	91	315	142	-	748	3,052	3,052	-	-	2,705	1,864	-	-	-	199,762	31,564	-
2d.1.3	Totals	862	877	14	91	315	142	-	748	3,052	3,052	-	-	2,705	1,864	-	-	-	199,762	31,564	-
2d.1.4	Scaffolding in support of decommissioning	-	356	7	6	39	9	-	98	514	514	-	-	302	27	-	-	-	15,258	9,241	-

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(Thousands of 2023 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			
2d.1	Subtotal Period 2d Activity Costs	1,552	2,493	342	537	1,828	2,644	-	2,449	11,844	11,844	-	-	15,647	9,505	-	-	-	1,212,437	64,856	-
Period 2d Additional Costs																					
2d.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,688	507	2,195	2,195	-	-	-	-	-	-	-	-	-	12,480
2d.2.2	Operational Tools & Equipment	-	-	22	146	839	-	-	150	1,158	1,158	-	-	11,700	-	-	-	-	292,500	32	-
2d.2.3	Excavation of Underground Services	-	2,174	-	-	-	-	687	646	3,507	3,507	-	-	-	-	-	-	-	-	14,181	-
2d.2.4	Remedial Action Surveys	-	-	-	-	-	-	631	189	821	821	-	-	-	-	-	-	-	-	14,009	-
2d.2	Subtotal Period 2d Additional Costs	-	2,174	22	146	839	-	3,007	1,492	7,681	7,681	-	-	11,700	-	-	-	-	292,500	28,222	12,480
Period 2d Collateral Costs																					
2d.3.1	Process decommissioning water waste	112	-	82	137	-	317	-	164	811	811	-	-	-	662	-	-	-	39,712	129	-
2d.3.2	Process decommissioning chemical flush waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2d.3.3	Small tool allowance	-	80	-	-	-	-	-	12	92	92	-	-	-	-	-	-	-	-	-	-
2d.3.4	Decommissioning Equipment Disposition	-	-	135	132	775	173	-	193	1,408	1,408	-	-	6,000	529	-	-	-	303,608	147	-
2d.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	327	49	376	-	376	-	-	-	-	-	-	-	-	-
2d.3	Subtotal Period 2d Collateral Costs	112	80	217	269	775	490	327	418	2,686	2,310	376	-	6,000	1,191	-	-	-	343,320	276	-
Period 2d Period-Dependent Costs																					
2d.4.1	Decon supplies	281	-	-	-	-	-	-	70	351	351	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	420	42	462	462	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	1,018	102	1,120	1,120	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	1,269	-	-	-	-	-	317	1,586	1,586	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,536	-	-	-	-	-	230	1,766	1,766	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	43	33	-	119	-	39	234	234	-	-	-	2,066	-	-	-	41,322	67	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	666	100	766	766	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	427	43	470	470	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	562	56	618	-	618	-	-	-	-	-	-	-	-	-
2d.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	336	50	386	386	-	-	-	-	-	-	-	-	-	-
2d.4.11	ISFSI Operating Costs	-	-	-	-	-	-	85	13	98	-	98	-	-	-	-	-	-	-	-	-
2d.4.12	Corporate A&G Cost	-	-	-	-	-	-	207	31	238	238	-	-	-	-	-	-	-	-	-	-
2d.4.13	Security Staff Cost	-	-	-	-	-	-	7,324	1,099	8,423	5,079	3,344	-	-	-	-	-	-	-	-	113,551
2d.4.14	DOC Staff Cost	-	-	-	-	-	-	6,859	1,029	7,888	7,888	-	-	-	-	-	-	-	-	-	70,093
2d.4.15	Utility Staff Cost	-	-	-	-	-	-	11,531	1,730	13,260	12,279	981	-	-	-	-	-	-	-	-	133,878
2d.4	Subtotal Period 2d Period-Dependent Costs	281	2,804	43	33	-	119	29,434	4,950	37,664	32,623	5,041	-	-	2,066	-	-	-	41,322	67	317,522
2d.0	TOTAL PERIOD 2d COST	1,944	7,550	623	986	3,442	3,252	32,768	9,309	59,875	54,458	5,417	-	33,347	12,762	-	-	-	1,889,580	93,421	330,002
PERIOD 2f - License Termination																					
Period 2f Direct Decommissioning Activities																					
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	164	49	213	213	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license									a											
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	164	49	213	213	-	-	-	-	-	-	-	-	-	-
Period 2f Additional Costs																					
2f.2.1	License Termination Survey	-	-	-	-	-	-	8,039	2,412	10,450	10,450	-	-	-	-	-	-	-	-	153,690	6,240
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	8,039	2,412	10,450	10,450	-	-	-	-	-	-	-	-	153,690	6,240
Period 2f Collateral Costs																					
2f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,398	210	1,608	1,608	-	-	-	-	-	-	-	-	-	-
2f.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	363	54	418	-	418	-	-	-	-	-	-	-	-	-
2f.3	Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,761	264	2,025	1,608	418	-	-	-	-	-	-	-	-	-
Period 2f Period-Dependent Costs																					
2f.4.1	Insurance	-	-	-	-	-	-	483	48	532	532	-	-	-	-	-	-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	1,171	117	1,288	1,288	-	-	-	-	-	-	-	-	-	-
2f.4.3	Health physics supplies	-	1,333	-	-	-	-	-	333	1,667	1,667	-	-	-	-	-	-	-	-	-	-
2f.4.4	Disposal of DAW generated	-	-	8	6	-	21	-	7	41	41	-	-	-	365	-	-	-	7,304	12	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	383	57	440	440	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	522	52	574	574	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	646	65	711	-	711	-	-	-	-	-	-	-	-	-
2f.4.8	ISFSI Operating Costs	-	-	-	-	-	-	98	15	113	-	113	-	-	-	-	-	-	-	-	-
2f.4.9	Corporate A&G Cost	-	-	-	-	-	-	128	19	147	147	-	-	-	-	-	-	-	-	-	-
2f.4.10	Security Staff Cost	-	-	-	-	-	-	8,426	1,264	9,689	5,843	3,847	-	-	-	-	-	-	-	-	130,630
2f.4.11	DOC Staff Cost	-	-	-	-	-	-	5,964	895	6,858	6,858	-	-	-	-	-	-	-	-	-	58,864
2f.4.12	Utility Staff Cost	-	-	-	-	-	-	7,527	1,129	8,657	7,531	1,125	-	-	-	-	-	-	-	-	83,055
2f.4	Subtotal Period 2f Period-Dependent Costs	-	1,333	8	6	-	21	25,348	4,001	30,717	24,922	5,796	-	-	365	-	-	-	7,304	12	272,548
2f.0	TOTAL PERIOD 2f COST	-	1,333	8	6	-	21	35,312	6,726	43,406	37,193	6,214	-	-	365	-	-	-	7,304	153,702	278,788

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(Thousands of 2023 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 2 TOTALS		10,619	82,568	28,253	15,106	28,255	54,915	278,272	106,036	604,023	527,566	66,757	9,700	252,571	152,795	963	393	-	19,956,780	1,141,376	2,360,515
PERIOD 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor	-	3,121	-	-	-	-	-	468	3,589	-	-	3,589	-	-	-	-	-	-	27,724	-
3b.1.1.2	Access Vaults	-	11	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	59	-
3b.1.1.3	Administration	-	147	-	-	-	-	-	22	169	-	-	169	-	-	-	-	-	-	1,724	-
3b.1.1.4	Auxiliary	-	2,695	-	-	-	-	-	404	3,099	-	-	3,099	-	-	-	-	-	-	19,753	-
3b.1.1.5	Auxiliary Boiler	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	248	-
3b.1.1.6	Chemical Addition Structure	-	44	-	-	-	-	-	7	50	-	-	50	-	-	-	-	-	-	469	-
3b.1.1.7	Circ Water Pump Enclosure	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	164	-
3b.1.1.8	Circ Water Travel Screen Enclosure	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	160	-
3b.1.1.9	Circulating Water Discharge Structure	-	99	-	-	-	-	-	15	114	-	-	114	-	-	-	-	-	-	542	-
3b.1.1.10	Circulating Water Intake & Screenhouse	-	94	-	-	-	-	-	14	108	-	-	108	-	-	-	-	-	-	683	-
3b.1.1.11	Communication Corridor - Clean	-	970	-	-	-	-	-	145	1,115	-	-	1,115	-	-	-	-	-	-	8,280	-
3b.1.1.12	Communication Corridor - Contaminated	-	33	-	-	-	-	-	5	38	-	-	38	-	-	-	-	-	-	184	-
3b.1.1.13	Covered Walkways	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	242	-
3b.1.1.14	Diesel Generator	-	302	-	-	-	-	-	45	347	-	-	347	-	-	-	-	-	-	2,185	-
3b.1.1.15	E.S.W.S. Pumphouse	-	139	-	-	-	-	-	21	160	-	-	160	-	-	-	-	-	-	801	-
3b.1.1.16	ESWS Valve House	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	42	-
3b.1.1.17	FLEX Building No. 1 & 2	-	429	-	-	-	-	-	64	493	-	-	493	-	-	-	-	-	-	2,880	-
3b.1.1.18	GOB - Administration Building	-	235	-	-	-	-	-	35	270	-	-	270	-	-	-	-	-	-	2,962	-
3b.1.1.19	Hot Machine Shop	-	16	-	-	-	-	-	2	19	-	-	19	-	-	-	-	-	-	243	-
3b.1.1.20	M.M.O. Building	-	315	-	-	-	-	-	47	363	-	-	363	-	-	-	-	-	-	2,389	-
3b.1.1.21	Main Access Facility	-	500	-	-	-	-	-	75	575	-	-	575	-	-	-	-	-	-	4,717	-
3b.1.1.22	Material Center West	-	92	-	-	-	-	-	14	106	-	-	106	-	-	-	-	-	-	1,379	-
3b.1.1.23	Misc Structures and Additions	-	76	-	-	-	-	-	11	87	-	-	87	-	-	-	-	-	-	910	-
3b.1.1.24	Miscellaneous Site Foundations	-	225	-	-	-	-	-	34	259	-	-	259	-	-	-	-	-	-	1,242	-
3b.1.1.25	Miscellaneous Site Structures	-	1,799	-	-	-	-	-	270	2,069	-	-	2,069	-	-	-	-	-	-	13,693	-
3b.1.1.26	New Covered Walkway	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	79	-
3b.1.1.27	Oil Separator and Waste Tank	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	8	-
3b.1.1.28	Radwaste	-	1,091	-	-	-	-	-	164	1,254	-	-	1,254	-	-	-	-	-	-	8,111	-
3b.1.1.29	Radwaste Drum Storage	-	149	-	-	-	-	-	22	171	-	-	171	-	-	-	-	-	-	1,449	-
3b.1.1.30	Radwaste Storage Building	-	82	-	-	-	-	-	12	94	-	-	94	-	-	-	-	-	-	1,028	-
3b.1.1.31	SBO Diesel Generator	-	360	-	-	-	-	-	54	414	-	-	414	-	-	-	-	-	-	3,079	-
3b.1.1.32	Security Main Gate North	-	107	-	-	-	-	-	16	124	-	-	124	-	-	-	-	-	-	1,123	-
3b.1.1.33	Security Additions	-	46	-	-	-	-	-	7	53	-	-	53	-	-	-	-	-	-	405	-
3b.1.1.34	Security/Guardhouse	-	35	-	-	-	-	-	5	41	-	-	41	-	-	-	-	-	-	342	-
3b.1.1.35	Site Diesel Generator	-	3	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	18	-
3b.1.1.36	Support Complex	-	27	-	-	-	-	-	4	31	-	-	31	-	-	-	-	-	-	389	-
3b.1.1.37	Turbine Building	-	4,242	-	-	-	-	-	636	4,878	-	-	4,878	-	-	-	-	-	-	47,075	-
3b.1.1.38	Turbine Pedestal	-	527	-	-	-	-	-	79	607	-	-	607	-	-	-	-	-	-	2,934	-
3b.1.1.39	Waste Water Treatment	-	15	-	-	-	-	-	2	18	-	-	18	-	-	-	-	-	-	172	-
3b.1.1.40	Water Treatment Building North (Z110)	-	65	-	-	-	-	-	10	74	-	-	74	-	-	-	-	-	-	608	-
3b.1.1.41	Fuel Building	-	1,108	-	-	-	-	-	166	1,275	-	-	1,275	-	-	-	-	-	-	7,874	-
3b.1.1	Totals	-	19,264	-	-	-	-	-	2,890	22,154	-	-	22,154	-	-	-	-	-	-	168,368	-
Site Closeout Activities																					
3b.1.2	Remove Rubble	-	1,163	-	-	-	-	-	174	1,337	-	-	1,337	-	-	-	-	-	-	5,660	-
3b.1.3	Grade & landscape site	-	107	-	-	-	-	-	16	123	-	-	123	-	-	-	-	-	-	512	-
3b.1.4	Final report to NRC	-	-	-	-	-	-	204	31	235	235	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	20,535	-	-	-	-	204	3,111	23,849	235	-	23,615	-	-	-	-	-	-	174,540	1,560
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	1,168	-	-	-	-	19	178	1,365	-	-	1,365	-	-	-	-	-	-	4,700	-
Period 3b Additional Costs (continued)																					
3b.2.2	Circulating Water Intake Cofferdam	-	341	-	-	-	-	-	51	392	-	-	392	-	-	-	-	-	-	2,584	-
3b.2.3	Construction Debris	-	-	-	-	-	-	2,250	338	2,588	-	-	2,588	-	-	-	-	-	-	-	-
3b.2.4	E.S.W.S. Pumphouse Cofferdam	-	447	-	-	-	-	-	67	514	-	-	514	-	-	-	-	-	-	3,552	-
3b.2.5	Firing Range Closure	-	-	-	-	-	-	848	127	975	-	-	975	-	-	-	-	-	-	-	-
3b.2	Subtotal Period 3b Additional Costs	-	1,956	-	-	-	-	3,117	761	5,834	-	-	5,834	-	-	-	-	-	-	10,836	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	168	-	-	-	-	-	25	194	-	-	194	-	-	-	-	-	-	-	-
3b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	633	95	728	-	728	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	168	-	-	-	-	633	120	922	-	728	194	-	-	-	-	-	-	-	-

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(Thousands of 2023 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	Insurance	-	-	-	-	-	-	927	93	1,020	1,020	-	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	1,540	154	1,694	-	1,694	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	4,738	-	-	-	-	-	711	5,448	-	-	5,448	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	367	55	422	-	422	-	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	553	-	553	-	553	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	1,240	124	1,364	-	1,364	-	-	-	-	-	-	-	-	-
3b.4.7	ISFSI Operating Costs	-	-	-	-	-	-	188	28	216	-	216	-	-	-	-	-	-	-	-	-
3b.4.8	Corporate A&G Cost	-	-	-	-	-	-	130	20	150	37	113	-	-	-	-	-	-	-	-	-
3b.4.9	Security Staff Cost	-	-	-	-	-	-	8,635	1,295	9,931	(0)	7,388	2,542	-	-	-	-	-	-	-	126,869
3b.4.10	DOC Staff Cost	-	-	-	-	-	-	10,920	1,638	12,559	-	-	12,559	-	-	-	-	-	-	-	105,208
3b.4.11	Utility Staff Cost	-	-	-	-	-	-	7,354	1,103	8,457	(0)	2,157	6,300	-	-	-	-	-	-	-	84,321
3b.4	Subtotal Period 3b Period-Dependent Costs	-	4,738	-	-	-	-	31,855	5,221	41,814	1,057	13,907	26,850	-	-	-	-	-	-	-	316,398
3b.0	TOTAL PERIOD 3b COST	-	27,396	-	-	-	-	35,810	9,213	72,419	1,292	14,635	56,492	-	-	-	-	-	-	185,376	317,958
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
Period 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	14,415	2,162	16,577	-	16,577	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	14,415	2,162	16,577	-	16,577	-	-	-	-	-	-	-	-	-
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	16,738	1,674	18,411	-	18,411	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	27,791	2,779	30,571	-	30,571	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	9,983	-	9,983	-	9,983	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	22,386	2,239	24,624	-	24,624	-	-	-	-	-	-	-	-	-
3c.4.6	ISFSI Operating Costs	-	-	-	-	-	-	3,398	510	3,908	-	3,908	-	-	-	-	-	-	-	-	-
3c.4.7	Corporate A&G Cost	-	-	-	-	-	-	582	87	669	-	669	-	-	-	-	-	-	-	-	-
3c.4.8	Security Staff Cost	-	-	-	-	-	-	115,900	17,385	133,284	-	133,284	-	-	-	-	-	-	-	-	1,731,597
3c.4.9	Utility Staff Cost	-	-	-	-	-	-	33,876	5,081	38,958	-	38,958	-	-	-	-	-	-	-	-	377,041
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	230,654	29,755	260,408	-	260,408	-	-	-	-	-	-	-	-	2,108,639
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	245,069	31,917	276,986	-	276,986	-	-	-	-	-	-	-	-	2,108,639
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	1,163	-	-	14,438	-	2,456	18,056	18,056	-	-	-	-	-	-	2,217	433,180	-	-
3d.1.1	Totals	-	-	1,163	-	-	14,438	-	2,456	18,056	18,056	-	-	-	-	-	-	2,217	433,180	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	1,163	-	-	14,438	-	2,456	18,056	18,056	-	-	-	-	-	-	2,217	433,180	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	24	2	26	26	-	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	40	4	44	44	-	-	-	-	-	-	-	-	-	-
3d.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	10	-	10	-	10	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	32	3	35	-	35	-	-	-	-	-	-	-	-	-
3d.4.6	ISFSI Operating Costs	-	-	-	-	-	-	5	1	6	-	6	-	-	-	-	-	-	-	-	-
3d.4.7	Corporate A&G Cost	-	-	-	-	-	-	1	0	1	1	-	-	-	-	-	-	-	-	-	-
3d.4.8	Security Staff Cost	-	-	-	-	-	-	166	25	190	190	-	-	-	-	-	-	-	-	-	2,473
3d.4.9	Utility Staff Cost	-	-	-	-	-	-	48	7	56	56	-	-	-	-	-	-	-	-	-	539
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	325	42	367	317	51	-	-	-	-	-	-	-	-	3,012
3d.0	TOTAL PERIOD 3d COST	-	-	1,163	-	-	14,438	325	2,499	18,424	18,373	51	-	-	-	-	-	2,217	433,180	-	3,012
PERIOD 3e - ISFSI Decontamination																					
Period 3e Direct Decommissioning Activities																					
Period 3e Additional Costs																					
3e.2.1	License Termination ISFSI	-	65	221	1,895	-	4,096	1,989	2,067	10,333	10,333	-	-	-	23,409	-	-	-	2,971,239	8,091	2,225
3e.2	Subtotal Period 3e Additional Costs	-	65	221	1,895	-	4,096	1,989	2,067	10,333	10,333	-	-	-	23,409	-	-	-	2,971,239	8,091	2,225

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(Thousands of 2023 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 Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	140	35	175	175	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	343	86	429	429	-	-	-	-	-	-	-	-	-	-
3e.4.3	Plant energy budget	-	-	-	-	-	-	16	4	20	20	-	-	-	-	-	-	-	-	-	-
3e.4.4	Corporate A&G Cost	-	-	-	-	-	-	6	1	7	7	-	-	-	-	-	-	-	-	-	-
3e.4.5	Security Staff Cost	-	-	-	-	-	-	356	89	445	445	-	-	-	-	-	-	-	-	-	4,999
3e.4.6	Utility Staff Cost	-	-	-	-	-	-	339	85	424	424	-	-	-	-	-	-	-	-	-	3,792
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	1,201	300	1,501	1,501	-	-	-	-	-	-	-	-	-	8,792
3e.0	TOTAL PERIOD 3e COST	-	65	221	1,895	-	4,096	3,190	2,367	11,834	11,834	-	-	-	23,409	-	-	-	2,971,239	8,091	11,017
PERIOD 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
Period 3f Additional Costs																					
3f.2.1	Site Restoration ISFSI	-	1,292	-	-	-	-	612	286	2,189	-	-	2,189	-	-	-	-	-	-	5,501	160
3f.2	Subtotal Period 3f Additional Costs	-	1,292	-	-	-	-	612	286	2,189	-	-	2,189	-	-	-	-	-	-	5,501	160
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	7	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	7	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.2	Property taxes	-	-	-	-	-	-	170	17	187	-	-	187	-	-	-	-	-	-	-	-
3f.4.3	Plant energy budget	-	-	-	-	-	-	8	1	9	-	-	9	-	-	-	-	-	-	-	-
3f.4.4	Corporate A&G Cost	-	-	-	-	-	-	2	0	3	-	-	3	-	-	-	-	-	-	-	-
3f.4.5	Security Staff Cost	-	-	-	-	-	-	176	26	203	-	-	203	-	-	-	-	-	-	-	2,479
3f.4.6	Utility Staff Cost	-	-	-	-	-	-	136	20	156	-	-	156	-	-	-	-	-	-	-	1,539
3f.4	Subtotal Period 3f Period-Dependent Costs	-	-	-	-	-	-	493	65	558	-	-	558	-	-	-	-	-	-	-	4,018
3f.0	TOTAL PERIOD 3f COST	-	1,299	-	-	-	-	1,104	352	2,756	-	-	2,756	-	-	-	-	-	-	5,501	4,178
PERIOD 3 TOTALS		-	28,760	1,384	1,895	-	18,534	285,498	46,347	382,418	31,499	291,671	59,248	-	23,409	-	-	2,217	3,404,419	198,968	2,444,803
TOTAL COST TO DECOMMISSION		15,385	115,105	29,924	17,423	28,313	76,466	711,760	176,988	1,171,364	736,220	364,576	70,567	264,361	177,453	1,750	393	2,217	23,619,230	1,361,484	6,036,298

TOTAL COST TO DECOMMISSION WITH 17.8% CONTINGENCY:	**$1,171,364**	**thousands of 2023 dollars**
TOTAL NRC LICENSE TERMINATION COST IS 62.85% OR:	**$736,220**	**thousands of 2023 dollars**
SPENT FUEL MANAGEMENT COST IS 31.12% OR:	**$364,576**	**thousands of 2023 dollars**
NON-NUCLEAR DEMOLITION COST IS 6.02% OR:	**$70,567**	**thousands of 2023 dollars**
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	**179,596**	**Cubic Feet**
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	**2,217**	**Cubic Feet**
TOTAL SCRAP METAL REMOVED:	**69,944**	**Tons**
TOTAL CRAFT LABOR REQUIREMENTS:	**1,361,484**	**Man-hours**

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

APPENDIX D

DETAILED COST ANALYSIS

SAFSTOR

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2023 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	SAFSTOR site characterization survey	-	-	-	-	-	-	354	106	460	460	-	-	-	-	-	-	-	-	-	-
1a.1.2	Prepare preliminary decommissioning cost	-	-	-	-	-	-	170	25	195	195	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	262	39	301	301	-	-	-	-	-	-	-	-	-	2,000
1a.1.8	Review plant dwgs & specs.	-	-	-	-	-	-	170	25	195	195	-	-	-	-	-	-	-	-	-	1,300
1a.1.9	Perform detailed rad survey									a											
1a.1.10	Estimate by-product inventory	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	End product description	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
1a.1.12	Detailed by-product inventory	-	-	-	-	-	-	196	29	226	226	-	-	-	-	-	-	-	-	-	1,500
1a.1.13	Define major work sequence	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
1a.1.14	Perform SER and EA	-	-	-	-	-	-	405	61	466	466	-	-	-	-	-	-	-	-	-	3,100
1a.1.15	Perform Site-Specific Cost Study	-	-	-	-	-	-	654	98	752	752	-	-	-	-	-	-	-	-	-	5,000
Activity Specifications																					
1a.1.16.1	Prepare plant and facilities for SAFSTOR	-	-	-	-	-	-	643	97	740	740	-	-	-	-	-	-	-	-	-	4,920
1a.1.16.2	Plant systems	-	-	-	-	-	-	545	82	627	627	-	-	-	-	-	-	-	-	-	4,167
1a.1.16.3	Plant structures and buildings	-	-	-	-	-	-	408	61	469	469	-	-	-	-	-	-	-	-	-	3,120
1a.1.16.4	Waste management	-	-	-	-	-	-	262	39	301	301	-	-	-	-	-	-	-	-	-	2,000
1a.1.16.5	Facility and site dormancy	-	-	-	-	-	-	262	39	301	301	-	-	-	-	-	-	-	-	-	2,000
1a.1.16	Total	-	-	-	-	-	-	2,119	318	2,437	2,437	-	-	-	-	-	-	-	-	-	16,207
Detailed Work Procedures																					
1a.1.17.1	Plant systems	-	-	-	-	-	-	155	23	178	178	-	-	-	-	-	-	-	-	-	1,183
1a.1.17.2	Facility closeout & dormancy	-	-	-	-	-	-	157	24	180	180	-	-	-	-	-	-	-	-	-	1,200
1a.1.17	Total	-	-	-	-	-	-	312	47	358	358	-	-	-	-	-	-	-	-	-	2,383
1a.1.18	Procure vacuum drying system	-	-	-	-	-	-	13	2	15	15	-	-	-	-	-	-	-	-	-	100
1a.1.19	Drain/de-energize non-cont. systems									a											
1a.1.20	Drain & dry NSSS									a											
1a.1.21	Drain/de-energize contaminated systems									a											
1a.1.22	Decon/secure contaminated systems									a											
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	5,047	810	5,857	5,857	-	-	-	-	-	-	-	-	-	35,890
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	440	66	505	-	505	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	440	66	505	-	505	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	3,210	321	3,531	3,531	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	3,691	369	4,060	4,060	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	888	-	-	-	-	-	222	1,110	1,110	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	657	-	-	-	-	-	99	755	755	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	13	10	-	35	-	11	69	69	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	2,469	370	2,840	2,840	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	997	100	1,097	1,097	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	1,448	145	1,593	-	1,593	-	-	-	-	-	-	-	-	-
1a.4.9	INPO Fees	-	-	-	-	-	-	358	54	411	411	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	988	148	1,136	-	1,136	-	-	-	-	-	-	-	-	-
1a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	127	19	146	-	146	-	-	-	-	-	-	-	-	-
1a.4.12	Corporate A&G Cost	-	-	-	-	-	-	655	98	753	753	-	-	-	-	-	-	-	-	-	-
1a.4.13	NEI Annual Fees	-	-	-	-	-	-	577	87	664	664	-	-	-	-	-	-	-	-	-	-
1a.4.14	Security Staff Cost	-	-	-	-	-	-	17,743	2,661	20,404	20,404	-	-	-	-	-	-	-	-	-	277,740
1a.4.15	Utility Staff Cost	-	-	-	-	-	-	33,657	5,049	38,706	38,706	-	-	-	-	-	-	-	-	-	422,240
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,545	13	10	-	35	65,920	9,753	77,274	74,399	2,875	-	-	610	-	-	-	12,190	20	699,980
1a.0	TOTAL PERIOD 1a COST	-	1,545	13	10	-	35	71,406	10,629	83,637	80,256	3,381	-	-	610	-	-	-	12,190	20	735,870

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2023 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	1,213	-	-	-	-	-	-	607	1,820	1,820	-	-	-	-	-	-	-	-	24,102	-
1b.1.1.2	Auxiliary	577	-	-	-	-	-	-	288	865	865	-	-	-	-	-	-	-	-	12,527	-
1b.1.1.3	Communication Corridor - Contaminated	13	-	-	-	-	-	-	6	19	19	-	-	-	-	-	-	-	-	276	-
1b.1.1.4	Fuel Building	852	-	-	-	-	-	-	426	1,278	1,278	-	-	-	-	-	-	-	-	14,371	-
1b.1.1.5	Hot Machine Shop	16	-	-	-	-	-	-	8	24	24	-	-	-	-	-	-	-	-	344	-
1b.1.1.6	Radwaste	307	-	-	-	-	-	-	154	461	461	-	-	-	-	-	-	-	-	6,671	-
1b.1.1.7	Radwaste Drum Storage	35	-	-	-	-	-	-	17	52	52	-	-	-	-	-	-	-	-	750	-
1b.1.1.8	Radwaste Storage Building	88	-	-	-	-	-	-	44	132	132	-	-	-	-	-	-	-	-	1,901	-
1b.1.1	Totals	3,100	-	-	-	-	-	-	1,550	4,650	4,650	-	-	-	-	-	-	-	-	60,943	-
1b.1	Subtotal Period 1b Activity Costs	3,100	-	-	-	-	-	-	1,550	4,650	4,650	-	-	-	-	-	-	-	-	60,943	-
Period 1b Additional Costs																					
1b.2.1	Spent Fuel Pool Isolation	-	-	-	-	-	-	14,330	2,150	16,480	16,480	-	-	-	-	-	-	-	-	-	-
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	14,330	2,150	16,480	16,480	-	-	-	-	-	-	-	-	-	-
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	1,193	-	-	-	-	-	-	179	1,371	1,371	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process decommissioning water waste	190	-	134	225	-	520	-	272	1,341	1,341	-	-	-	1,087	-	-	-	65,213	212	-
1b.3.3	Process decommissioning chemical flush waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1b.3.4	Small tool allowance	-	51	-	-	-	-	-	8	59	59	-	-	-	-	-	-	-	-	-	-
1b.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	580	87	667	-	667	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	1,383	51	134	225	-	520	580	546	3,438	2,771	667	-	-	1,087	-	-	-	65,213	212	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	1,843	-	-	-	-	-	-	461	2,304	2,304	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	800	80	880	880	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	920	92	1,012	1,012	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	724	-	-	-	-	-	181	905	905	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	164	-	-	-	-	-	25	188	188	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	16	12	-	43	-	14	85	85	-	-	-	754	-	-	-	15,078	25	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	616	92	708	708	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	185	18	203	203	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	361	36	397	-	397	-	-	-	-	-	-	-	-	-
1b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	246	37	283	-	283	-	-	-	-	-	-	-	-	-
1b.4.11	ISFSI Operating Costs	-	-	-	-	-	-	32	5	36	-	36	-	-	-	-	-	-	-	-	-
1b.4.12	Corporate A&G Cost	-	-	-	-	-	-	163	24	188	188	-	-	-	-	-	-	-	-	-	-
1b.4.13	NEI Annual Fees	-	-	-	-	-	-	144	22	165	165	-	-	-	-	-	-	-	-	-	-
1b.4.14	Security Staff Cost	-	-	-	-	-	-	4,373	656	5,029	5,029	-	-	-	-	-	-	-	-	-	68,452
1b.4.15	Utility Staff Cost	-	-	-	-	-	-	8,391	1,259	9,650	9,650	-	-	-	-	-	-	-	-	-	105,271
1b.4	Subtotal Period 1b Period-Dependent Costs	1,843	888	16	12	-	43	16,232	3,002	22,035	21,319	717	-	-	754	-	-	-	15,078	25	173,723
1b.0	TOTAL PERIOD 1b COST	6,326	939	150	237	-	563	31,142	7,247	46,603	45,220	1,383	-	-	1,841	-	-	-	80,291	61,179	173,723
PERIOD 1c - Preparations for SAFSTOR Dormancy																					
Period 1c Direct Decommissioning Activities																					
1c.1.1	Prepare support equipment for storage	-	543	-	-	-	-	-	81	624	624	-	-	-	-	-	-	-	-	3,000	-
1c.1.2	Install containment pressure equal. lines	-	45	-	-	-	-	-	7	52	52	-	-	-	-	-	-	-	-	700	-
1c.1.3	Interim survey prior to dormancy	-	-	-	-	-	-	733	220	953	953	-	-	-	-	-	-	-	-	15,309	-
1c.1.4	Secure building accesses									a											
1c.1.5	Prepare & submit interim report	-	-	-	-	-	-	76	11	88	88	-	-	-	-	-	-	-	-	-	583
1c.1	Subtotal Period 1c Activity Costs	-	588	-	-	-	-	809	320	1,717	1,717	-	-	-	-	-	-	-	-	19,009	583
Period 1c Collateral Costs																					
1c.3.1	Process decommissioning water waste	207	-	146	245	-	566	-	296	1,460	1,460	-	-	-	1,184	-	-	-	71,035	231	-
1c.3.2	Process decommissioning chemical flush waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1c.3.3	Small tool allowance	-	4	-	-	-	-	-	1	5	5	-	-	-	-	-	-	-	-	-	-
1c.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	580	87	667	-	667	-	-	-	-	-	-	-	-	-
1c.3	Subtotal Period 1c Collateral Costs	207	4	146	245	-	566	580	384	2,132	1,465	667	-	-	1,184	-	-	-	71,035	231	-

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2023 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 1c Period-Dependent Costs																					
1c.4.1	Insurance	-	-	-	-	-	-	800	80	880	880	-	-	-	-	-	-	-	-	-	-
1c.4.2	Property taxes	-	-	-	-	-	-	920	92	1,012	1,012	-	-	-	-	-	-	-	-	-	-
1c.4.3	Health physics supplies	-	380	-	-	-	-	-	95	474	474	-	-	-	-	-	-	-	-	-	-
1c.4.4	Heavy equipment rental	-	164	-	-	-	-	-	25	188	188	-	-	-	-	-	-	-	-	-	-
1c.4.5	Disposal of DAW generated	-	-	3	2	-	9	-	3	17	17	-	-	-	152	-	-	-	3,039	5	-
1c.4.6	Plant energy budget	-	-	-	-	-	-	616	92	708	708	-	-	-	-	-	-	-	-	-	-
1c.4.7	NRC Fees	-	-	-	-	-	-	185	18	203	203	-	-	-	-	-	-	-	-	-	-
1c.4.8	Emergency Planning Fees	-	-	-	-	-	-	361	36	397	-	397	-	-	-	-	-	-	-	-	-
1c.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	246	37	283	-	283	-	-	-	-	-	-	-	-	-
1c.4.10	ISFSI Operating Costs	-	-	-	-	-	-	32	5	36	-	36	-	-	-	-	-	-	-	-	-
1c.4.11	Corporate A&G Cost	-	-	-	-	-	-	163	24	188	188	-	-	-	-	-	-	-	-	-	-
1c.4.12	NEI Annual Fees	-	-	-	-	-	-	144	22	165	165	-	-	-	-	-	-	-	-	-	-
1c.4.13	Security Staff Cost	-	-	-	-	-	-	4,373	656	5,029	5,029	-	-	-	-	-	-	-	-	-	68,452
1c.4.14	Utility Staff Cost	-	-	-	-	-	-	8,391	1,259	9,650	9,650	-	-	-	-	-	-	-	-	-	105,271
1c.4	Subtotal Period 1c Period-Dependent Costs	-	543	3	2	-	9	16,232	2,444	19,233	18,516	717	-	-	152	-	-	-	3,039	5	173,723
1c.0	TOTAL PERIOD 1c COST	207	1,136	149	248	-	575	17,620	3,147	23,082	21,698	1,383	-	-	1,336	-	-	-	74,074	19,245	174,306
PERIOD 1 TOTALS		6,532	3,620	311	495	-	1,173	120,168	21,023	153,322	147,174	6,148	-	-	3,786	-	-	-	166,555	80,444	1,083,899
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	-	-	-	-	-	-	268	40	308	308	-	-	-	-	-	-	-	-	-	-
2a.1.5	Maintenance supplies	-	-	-	-	-	-	398	100	498	498	-	-	-	-	-	-	-	-	-	-
2a.1	Subtotal Period 2a Activity Costs	-	-	-	-	-	-	666	140	806	806	-	-	-	-	-	-	-	-	-	-
Period 2a Collateral Costs																					
2a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	43,056	6,458	49,515	-	49,515	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	43,056	6,458	49,515	-	49,515	-	-	-	-	-	-	-	-	-
Period 2a Period-Dependent Costs																					
2a.4.1	Insurance	-	-	-	-	-	-	1,561	156	1,717	1,717	-	-	-	-	-	-	-	-	-	-
2a.4.2	Property taxes	-	-	-	-	-	-	9,243	924	10,168	10,168	-	-	-	-	-	-	-	-	-	-
2a.4.3	Health physics supplies	-	892	-	-	-	-	-	223	1,115	1,115	-	-	-	-	-	-	-	-	-	-
2a.4.4	Disposal of DAW generated	-	-	12	9	-	33	-	11	65	65	-	-	-	576	-	-	-	11,523	19	-
2a.4.5	Plant energy budget	-	-	-	-	-	-	1,237	186	1,422	1,422	-	-	-	-	-	-	-	-	-	-
2a.4.6	NRC Fees	-	-	-	-	-	-	726	73	799	799	-	-	-	-	-	-	-	-	-	-
2a.4.7	Emergency Planning Fees	-	-	-	-	-	-	2,087	209	2,296	-	2,296	-	-	-	-	-	-	-	-	-
2a.4.8	Spent Fuel Pool O&M	-	-	-	-	-	-	2,475	371	2,846	-	2,846	-	-	-	-	-	-	-	-	-
2a.4.9	ISFSI Operating Costs	-	-	-	-	-	-	317	48	364	-	364	-	-	-	-	-	-	-	-	-
2a.4.10	Corporate A&G Cost	-	-	-	-	-	-	319	48	367	367	-	-	-	-	-	-	-	-	-	-
2a.4.11	NEI Annual Fees	-	-	-	-	-	-	1,445	217	1,662	1,662	-	-	-	-	-	-	-	-	-	-
2a.4.12	Security Staff Cost	-	-	-	-	-	-	39,477	5,922	45,399	32,959	12,439	-	-	-	-	-	-	-	-	619,817
2a.4.13	Utility Staff Cost	-	-	-	-	-	-	16,957	2,543	19,500	15,873	3,627	-	-	-	-	-	-	-	-	205,738
2a.4	Subtotal Period 2a Period-Dependent Costs	-	892	12	9	-	33	75,844	10,929	87,719	66,147	21,573	-	-	576	-	-	-	11,523	19	825,555
2a.0	TOTAL PERIOD 2a COST	-	892	12	9	-	33	119,566	17,528	138,040	66,953	71,087	-	-	576	-	-	-	11,523	19	825,555
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	-	-	-	-	-	-	3,192	479	3,671	3,671	-	-	-	-	-	-	-	-	-	-
2b.1.5	Maintenance supplies	-	-	-	-	-	-	4,745	1,186	5,931	5,931	-	-	-	-	-	-	-	-	-	-
2b.1	Subtotal Period 2b Activity Costs	-	-	-	-	-	-	7,937	1,665	9,601	9,601	-	-	-	-	-	-	-	-	-	-
Period 2b Collateral Costs																					
2b.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	15,830	2,375	18,205	-	18,205	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	-	-	-	-	-	-	15,830	2,375	18,205	-	18,205	-	-	-	-	-	-	-	-	-

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2023 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	Insurance	-	-	-	-	-	-	18,592	1,859	20,451	20,451	-	-	-	-	-	-	-	-	-	-
2b.4.2	Property taxes	-	-	-	-	-	-	30,871	3,087	33,958	33,958	-	-	-	-	-	-	-	-	-	-
2b.4.3	Health physics supplies	-	5,153	-	-	-	-	-	1,288	6,441	6,441	-	-	-	-	-	-	-	-	-	-
2b.4.4	Disposal of DAW generated	-	-	68	53	-	189	-	62	373	373	-	-	-	3,297	-	-	-	65,938	108	-
2b.4.5	Plant energy budget	-	-	-	-	-	-	7,366	1,105	8,471	8,471	-	-	-	-	-	-	-	-	-	-
2b.4.6	NRC Fees	-	-	-	-	-	-	8,314	831	9,146	9,146	-	-	-	-	-	-	-	-	-	-
2b.4.7	Emergency Planning Fees	-	-	-	-	-	-	24,866	2,487	27,352	-	27,352	-	-	-	-	-	-	-	-	-
2b.4.8	ISFSI Operating Costs	-	-	-	-	-	-	3,775	566	4,341	-	4,341	-	-	-	-	-	-	-	-	-
2b.4.9	Corporate A&G Cost	-	-	-	-	-	-	1,539	231	1,770	1,770	-	-	-	-	-	-	-	-	-	-
2b.4.10	Security Staff Cost	-	-	-	-	-	-	173,151	25,973	199,124	50,976	148,148	-	-	-	-	-	-	-	-	2,543,914
2b.4.11	Utility Staff Cost	-	-	-	-	-	-	80,607	12,091	92,698	49,408	43,290	-	-	-	-	-	-	-	-	992,747
2b.4	Subtotal Period 2b Period-Dependent Costs	-	5,153	68	53	-	189	349,081	49,580	404,125	180,994	223,132	-	-	3,297	-	-	-	65,938	108	3,536,661
2b.0	TOTAL PERIOD 2b COST	-	5,153	68	53	-	189	372,848	53,620	431,931	190,595	241,336	-	-	3,297	-	-	-	65,938	108	3,536,661
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	-	-	-	-	-	-	2,132	320	2,452	2,452	-	-	-	-	-	-	-	-	-	-
2c.1.5	Maintenance supplies	-	-	-	-	-	-	3,169	792	3,962	3,962	-	-	-	-	-	-	-	-	-	-
2c.1	Subtotal Period 2c Activity Costs	-	-	-	-	-	-	5,301	1,112	6,414	6,414	-	-	-	-	-	-	-	-	-	-
Period 2c Period-Dependent Costs																					
2c.4.1	Insurance	-	-	-	-	-	-	7,796	780	8,576	8,576	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	20,621	2,062	22,683	22,683	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	3,238	-	-	-	-	-	809	4,047	4,047	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	42	33	-	116	-	38	229	229	-	-	-	2,028	-	-	-	40,565	66	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	4,920	738	5,659	5,659	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	5,092	509	5,601	5,601	-	-	-	-	-	-	-	-	-	-
2c.4.7	Corporate A&G Cost	-	-	-	-	-	-	562	84	647	647	-	-	-	-	-	-	-	-	-	-
2c.4.8	Security Staff Cost	-	-	-	-	-	-	46,718	7,008	53,725	53,725	-	-	-	-	-	-	-	-	-	621,692
2c.4.9	Utility Staff Cost	-	-	-	-	-	-	27,675	4,151	31,826	31,826	-	-	-	-	-	-	-	-	-	362,654
2c.4	Subtotal Period 2c Period-Dependent Costs	-	3,238	42	33	-	116	113,384	16,180	132,993	132,993	-	-	-	2,028	-	-	-	40,565	66	984,346
2c.0	TOTAL PERIOD 2c COST	-	3,238	42	33	-	116	118,685	17,292	139,406	139,406	-	-	-	2,028	-	-	-	40,565	66	984,346
PERIOD 2 TOTALS		-	9,283	122	96	-	339	611,099	88,439	709,377	396,954	312,423	-	-	5,901	-	-	-	118,026	192	5,346,562
PERIOD 3a - Reactivate Site Following SAFSTOR Dormancy																					
Period 3a Direct Decommissioning Activities																					
3a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	170	25	195	195	-	-	-	-	-	-	-	-	-	1,300
3a.1.2	Review plant dwgs & specs.	-	-	-	-	-	-	601	90	692	692	-	-	-	-	-	-	-	-	-	4,600
3a.1.3	Perform detailed rad survey									a											
3a.1.4	End product description	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
3a.1.5	Detailed by-product inventory	-	-	-	-	-	-	170	25	195	195	-	-	-	-	-	-	-	-	-	1,300
3a.1.6	Define major work sequence	-	-	-	-	-	-	981	147	1,128	1,128	-	-	-	-	-	-	-	-	-	7,500
3a.1.7	Perform SER and EA	-	-	-	-	-	-	405	61	466	466	-	-	-	-	-	-	-	-	-	3,100
3a.1.8	Prepare/submit Defueled Technical Specifications	-	-	-	-	-	-	981	147	1,128	1,128	-	-	-	-	-	-	-	-	-	7,500
3a.1.9	Perform Site-Specific Cost Study	-	-	-	-	-	-	654	98	752	752	-	-	-	-	-	-	-	-	-	5,000
3a.1.10	Prepare/submit Irradiated Fuel Management Plan	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
Activity Specifications																					
3a.1.11.1	Re-activate plant & temporary facilities	-	-	-	-	-	-	964	145	1,108	997	-	111	-	-	-	-	-	-	-	7,370
3a.1.11.2	Plant systems	-	-	-	-	-	-	545	82	627	564	-	63	-	-	-	-	-	-	-	4,167
3a.1.11.3	Reactor internals	-	-	-	-	-	-	928	139	1,068	1,068	-	-	-	-	-	-	-	-	-	7,100
3a.1.11.4	Reactor vessel	-	-	-	-	-	-	850	127	977	977	-	-	-	-	-	-	-	-	-	6,500
3a.1.11.5	Biological shield	-	-	-	-	-	-	65	10	75	75	-	-	-	-	-	-	-	-	-	500
3a.1.11.6	Steam generators	-	-	-	-	-	-	408	61	469	469	-	-	-	-	-	-	-	-	-	3,120
3a.1.11.7	Reinforced concrete	-	-	-	-	-	-	209	31	241	120	-	120	-	-	-	-	-	-	-	1,600
3a.1.11.8	Main Turbine	-	-	-	-	-	-	52	8	60	-	-	60	-	-	-	-	-	-	-	400
3a.1.11.9	Main Condensers	-	-	-	-	-	-	52	8	60	-	-	60	-	-	-	-	-	-	-	400
3a.1.11.10	Plant structures & buildings	-	-	-	-	-	-	408	61	469	235	-	235	-	-	-	-	-	-	-	3,120
3a.1.11.11	Waste management	-	-	-	-	-	-	601	90	692	692	-	-	-	-	-	-	-	-	-	4,600

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2023 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			
Activity Specifications (continued)																					
3a.1.11.12	Facility & site closeout	-	-	-	-	-	-	118	18	135	68	-	68	-	-	-	-	-	-	-	900
3a.1.11	Total	-	-	-	-	-	-	5,201	780	5,981	5,265	-	716	-	-	-	-	-	-	-	39,777
Planning & Site Preparations																					
3a.1.12	Prepare dismantling sequence	-	-	-	-	-	-	314	47	361	361	-	-	-	-	-	-	-	-	-	2,400
3a.1.13	Plant prep. & temp. svces	-	-	-	-	-	-	4,000	600	4,600	4,600	-	-	-	-	-	-	-	-	-	-
3a.1.14	Design water clean-up system	-	-	-	-	-	-	183	27	211	211	-	-	-	-	-	-	-	-	-	1,400
3a.1.15	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,800	420	3,220	3,220	-	-	-	-	-	-	-	-	-	-
3a.1.16	Procure casks/liners & containers	-	-	-	-	-	-	161	24	185	185	-	-	-	-	-	-	-	-	-	1,230
3a.1	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	16,882	2,532	19,415	18,699	-	716	-	-	-	-	-	-	-	77,107
Period 3a Additional Costs																					
3a.2.1	Site Characterization	-	-	-	-	-	-	3,128	938	4,066	4,066	-	-	-	-	-	-	-	-	19,100	7,852
3a.2.2	Misc/Hazardous Waste	-	-	139	58	58	-	-	31	288	288	-	-	11,790	-	-	-	-	137,800	740	-
3a.2	Subtotal Period 3a Additional Costs	-	-	139	58	58	-	3,128	970	4,354	4,354	-	-	11,790	-	-	-	-	137,800	19,840	7,852
Period 3a Period-Dependent Costs																					
3a.4.1	Insurance	-	-	-	-	-	-	391	39	430	430	-	-	-	-	-	-	-	-	-	-
3a.4.2	Property taxes	-	-	-	-	-	-	1,035	103	1,138	1,138	-	-	-	-	-	-	-	-	-	-
3a.4.3	Health physics supplies	-	782	-	-	-	-	-	196	978	978	-	-	-	-	-	-	-	-	-	-
3a.4.4	Heavy equipment rental	-	657	-	-	-	-	-	99	755	755	-	-	-	-	-	-	-	-	-	-
3a.4.5	Disposal of DAW generated	-	-	11	8	-	30	-	10	58	58	-	-	-	514	-	-	-	10,287	17	-
3a.4.6	Plant energy budget	-	-	-	-	-	-	2,469	370	2,840	2,840	-	-	-	-	-	-	-	-	-	-
3a.4.7	NRC Fees	-	-	-	-	-	-	417	42	459	459	-	-	-	-	-	-	-	-	-	-
3a.4.8	Corporate A&G Cost	-	-	-	-	-	-	400	60	460	460	-	-	-	-	-	-	-	-	-	-
3a.4.9	Security Staff Cost	-	-	-	-	-	-	4,346	652	4,998	4,998	-	-	-	-	-	-	-	-	-	65,000
3a.4.10	Utility Staff Cost	-	-	-	-	-	-	21,108	3,166	24,274	24,274	-	-	-	-	-	-	-	-	-	257,920
3a.4	Subtotal Period 3a Period-Dependent Costs	-	1,439	11	8	-	30	30,167	4,737	36,391	36,391	-	-	-	514	-	-	-	10,287	17	322,920
3a.0	TOTAL PERIOD 3a COST	-	1,439	150	67	58	30	50,177	8,239	60,160	59,443	-	716	11,790	514	-	-	-	148,087	19,856	407,879
PERIOD 3b - Decommissioning Preparations																					
Period 3b Direct Decommissioning Activities																					
Detailed Work Procedures																					
3b.1.1.1	Plant systems	-	-	-	-	-	-	619	93	712	641	-	71	-	-	-	-	-	-	-	4,733
3b.1.1.2	Reactor internals	-	-	-	-	-	-	327	49	376	376	-	-	-	-	-	-	-	-	-	2,500
3b.1.1.3	Remaining buildings	-	-	-	-	-	-	177	26	203	51	-	152	-	-	-	-	-	-	-	1,350
3b.1.1.4	CRD cooling assembly	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.5	CRD housings & ICI tubes	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.6	Incore instrumentation	-	-	-	-	-	-	131	20	150	150	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.7	Reactor vessel	-	-	-	-	-	-	475	71	546	546	-	-	-	-	-	-	-	-	-	3,630
3b.1.1.8	Facility closeout	-	-	-	-	-	-	157	24	180	90	-	90	-	-	-	-	-	-	-	1,200
3b.1.1.9	Missile shields	-	-	-	-	-	-	59	9	68	68	-	-	-	-	-	-	-	-	-	450
3b.1.1.10	Biological shield	-	-	-	-	-	-	157	24	180	180	-	-	-	-	-	-	-	-	-	1,200
3b.1.1.11	Steam generators	-	-	-	-	-	-	601	90	692	692	-	-	-	-	-	-	-	-	-	4,600
3b.1.1.12	Reinforced concrete	-	-	-	-	-	-	131	20	150	75	-	75	-	-	-	-	-	-	-	1,000
3b.1.1.13	Main Turbine	-	-	-	-	-	-	204	31	235	-	-	235	-	-	-	-	-	-	-	1,560
3b.1.1.14	Main Condensers	-	-	-	-	-	-	204	31	235	-	-	235	-	-	-	-	-	-	-	1,560
3b.1.1.15	Auxiliary building	-	-	-	-	-	-	357	54	411	369	-	41	-	-	-	-	-	-	-	2,730
3b.1.1.16	Reactor building	-	-	-	-	-	-	357	54	411	369	-	41	-	-	-	-	-	-	-	2,730
3b.1.1	Total	-	-	-	-	-	-	4,216	632	4,849	3,908	-	940	-	-	-	-	-	-	-	32,243
3b.1	Subtotal Period 3b Activity Costs	-	-	-	-	-	-	4,216	632	4,849	3,908	-	940	-	-	-	-	-	-	-	32,243
Period 3b Collateral Costs																					
3b.3.1	Decon equipment	1,193	-	-	-	-	-	-	179	1,371	1,371	-	-	-	-	-	-	-	-	-	-
3b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,398	210	1,608	1,608	-	-	-	-	-	-	-	-	-	-
3b.3.3	Pipe cutting equipment	-	1,400	-	-	-	-	-	210	1,610	1,610	-	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	1,193	1,400	-	-	-	-	1,398	599	4,589	4,589	-	-	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Decon supplies	43	-	-	-	-	-	-	11	54	54	-	-	-	-	-	-	-	-	-	-
3b.4.2	Insurance	-	-	-	-	-	-	311	31	342	342	-	-	-	-	-	-	-	-	-	-
3b.4.3	Property taxes	-	-	-	-	-	-	516	52	568	568	-	-	-	-	-	-	-	-	-	-
3b.4.4	Health physics supplies	-	426	-	-	-	-	-	107	533	533	-	-	-	-	-	-	-	-	-	-
3b.4.5	Heavy equipment rental	-	328	-	-	-	-	-	49	377	377	-	-	-	-	-	-	-	-	-	-

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2023 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 (continued)																					
3b.4.6	Disposal of DAW generated	-	-	6	5	-	17	-	5	33	33	-	-	-	290	-	-	-	5,802	9	-
3b.4.7	Plant energy budget	-	-	-	-	-	-	1,231	185	1,416	1,416	-	-	-	-	-	-	-	-	-	-
3b.4.8	NRC Fees	-	-	-	-	-	-	208	21	229	229	-	-	-	-	-	-	-	-	-	-
3b.4.9	Corporate A&G Cost	-	-	-	-	-	-	199	30	229	229	-	-	-	-	-	-	-	-	-	-
3b.4.10	Security Staff Cost	-	-	-	-	-	-	2,167	325	2,492	2,492	-	-	-	-	-	-	-	-	-	32,411
3b.4.11	DOC Staff Cost	-	-	-	-	-	-	5,674	851	6,525	6,525	-	-	-	-	-	-	-	-	-	58,080
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	10,525	1,579	12,104	12,104	-	-	-	-	-	-	-	-	-	128,607
3b.4	Subtotal Period 3b Period-Dependent Costs	43	754	6	5	-	17	20,831	3,245	24,901	24,901	-	-	-	290	-	-	-	5,802	9	219,098
3b.0	TOTAL PERIOD 3b COST	1,236	2,154	6	5	-	17	26,445	4,476	34,338	33,398	-	940	-	290	-	-	-	5,802	9	251,341
PERIOD 3 TOTALS		1,236	3,593	156	71	58	46	76,623	12,715	94,498	92,842	-	1,656	11,790	804	-	-	-	153,889	19,866	659,220
PERIOD 4a - Large Component Removal																					
Period 4a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
4a.1.1.1	Reactor Coolant Piping	33	169	40	76	185	368	-	194	1,065	1,065	-	-	967	1,023	-	-	-	135,750	3,982	-
4a.1.1.2	Pressurizer Relief Tank	6	24	11	22	52	104	-	47	265	265	-	-	273	289	-	-	-	38,367	602	-
4a.1.1.3	Reactor Coolant Pumps & Motors	19	84	87	248	-	1,584	-	472	2,496	2,496	-	-	-	4,664	-	-	-	816,140	2,474	80
4a.1.1.4	Pressurizer	-	65	512	172	-	1,270	-	411	2,429	2,429	-	-	-	3,739	-	-	-	241,053	1,346	1,500
4a.1.1.5	Steam Generators	-	8,153	4,022	4,146	3,622	7,657	-	5,520	33,120	33,120	-	-	40,845	22,546	-	-	-	3,398,523	20,611	4,500
4a.1.1.6	CRDMs/ICIs/Service Structure Removal	28	259	249	95	130	595	-	286	1,643	1,643	-	-	1,227	3,012	-	-	-	160,939	5,371	-
4a.1.1.7	Reactor Vessel Internals	40	6,975	9,221	871	-	11,122	295	13,379	41,903	41,903	-	-	-	4,670	501	406	-	336,363	24,023	1,119
4a.1.1.8	Vessel & Internals GTCC Disposal	-	-	-	-	-	14,438	-	2,166	16,603	16,603	-	-	-	-	-	-	2,217	433,180	-	-
4a.1.1.9	Reactor Vessel	-	8,773	1,977	1,240	-	5,309	295	10,083	27,677	27,677	-	-	-	15,631	-	-	-	979,036	24,023	1,119
4a.1.1	Totals	126	24,503	16,118	6,870	3,989	42,446	590	32,558	127,200	127,200	-	-	43,312	55,575	501	406	2,217	6,539,352	82,432	8,319
Removal of Major Equipment																					
4a.1.2	Main Turbine/Generator	-	460	268	111	878	-	-	290	2,007	2,007	-	-	5,099	-	-	-	-	305,952	8,585	-
4a.1.3	Main Condensers	-	1,306	167	133	1,047	-	-	520	3,173	3,173	-	-	8,106	-	-	-	-	364,767	24,802	-
Cascading Costs from Clean Building Demolition																					
4a.1.4.1	Reactor	-	549	-	-	-	-	-	82	631	631	-	-	-	-	-	-	-	-	4,871	-
4a.1.4.2	Auxiliary	-	299	-	-	-	-	-	45	344	344	-	-	-	-	-	-	-	-	2,194	-
4a.1.4.3	Fuel Building	-	118	-	-	-	-	-	18	135	135	-	-	-	-	-	-	-	-	773	-
4a.1.4.4	Hot Machine Shop	-	1	-	-	-	-	-	0	1	1	-	-	-	-	-	-	-	-	7	-
4a.1.4.5	Radwaste	-	56	-	-	-	-	-	8	64	64	-	-	-	-	-	-	-	-	387	-
4a.1.4	Totals	-	1,023	-	-	-	-	-	153	1,176	1,176	-	-	-	-	-	-	-	-	8,233	-
Disposal of Plant Systems																					
4a.1.5.1	AB - Main Steam	-	254	-	-	-	-	-	38	292	-	-	292	-	-	-	-	-	-	5,833	-
4a.1.5.2	AB - Main Steam RCA	-	78	4	32	251	-	-	63	428	428	-	-	2,156	-	-	-	-	87,550	1,515	-
4a.1.5.3	AC - Main Turbine	-	254	-	-	-	-	-	38	292	-	-	292	-	-	-	-	-	-	5,641	-
4a.1.5.4	AD - Condensate	-	287	-	-	-	-	-	43	330	-	-	330	-	-	-	-	-	-	6,144	-
4a.1.5.5	AE - Feedwater	-	195	-	-	-	-	-	29	224	-	-	224	-	-	-	-	-	-	4,271	-
4a.1.5.6	AF - Feedwater Hter Extrction, Drn & Vnt	-	235	-	-	-	-	-	35	270	-	-	270	-	-	-	-	-	-	5,352	-
4a.1.5.7	AK - Condensate Demineralizer	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	1,944	-
4a.1.5.8	AL - Auxiliary Feedwater	-	53	-	-	-	-	-	8	61	-	-	61	-	-	-	-	-	-	1,174	-
4a.1.5.9	AL-Auxiliary Feedwater Surge Tanks	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	87	-
4a.1.5.10	AQ - Condensate & Feedwater Chem Additn	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	468	-
4a.1.5.11	AX - Acid Feed	-	33	-	-	-	-	-	5	38	-	-	38	-	-	-	-	-	-	754	-
4a.1.5.12	Auxiliary Bldg Non-System Specific	-	104	2	13	96	10	-	45	271	271	-	-	824	31	-	-	-	35,454	2,031	-
4a.1.5.13	Auxiliary Bldg Non-System Specific RCA	-	713	15	113	889	-	-	330	2,060	2,060	-	-	7,629	-	-	-	-	309,812	13,471	-
4a.1.5.14	BL - Reactor Makeup Water	-	270	16	52	295	139	-	156	926	926	-	-	2,529	418	-	-	-	129,620	5,227	-
4a.1.5.15	BM - Steam Generator Blowdown	-	545	10	76	601	-	-	239	1,472	1,472	-	-	5,160	-	-	-	-	209,560	10,703	-
4a.1.5.16	CA - Steam Seal	-	20	-	-	-	-	-	3	23	-	-	23	-	-	-	-	-	-	455	-
4a.1.5.17	CB - Main Turbine Lube Oil	-	61	-	-	-	-	-	9	70	-	-	70	-	-	-	-	-	-	1,207	-
4a.1.5.18	CC - Generator Hydrogen & CO2	-	9	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	198	-
4a.1.5.19	CD - Generator Seal Oil	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	287	-
4a.1.5.20	CE - Stator Cooling Water	-	12	-	-	-	-	-	2	14	-	-	14	-	-	-	-	-	-	241	-
4a.1.5.21	CF - Lube Oil Strg, Xfer & Purification	-	37	-	-	-	-	-	6	43	-	-	43	-	-	-	-	-	-	812	-
4a.1.5.22	CG - Condenser Air Removal	-	30	-	-	-	-	-	5	35	-	-	35	-	-	-	-	-	-	657	-
4a.1.5.23	CH - Main Turbine Control Oil	-	63	-	-	-	-	-	9	72	-	-	72	-	-	-	-	-	-	1,219	-
4a.1.5.24	CL - Chlorination	-	26	-	-	-	-	-	4	30	-	-	30	-	-	-	-	-	-	569	-
4a.1.5.25	CO - Carbon Dioxide	-	5	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	121	-

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2023 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)																					
4a.1.5.26	CW - Circulating Water	-	347	-	-	-	-	-	52	399	-	-	399	-	-	-	-	-	-	7,858	-
4a.1.5.27	CZ - Caustic Acid	-	5	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	111	-
4a.1.5.28	DA - Circulating Water System	-	351	-	-	-	-	-	53	404	-	-	404	-	-	-	-	-	-	7,953	-
4a.1.5.29	DM - Equipment Drains	-	58	-	-	-	-	-	9	67	-	-	67	-	-	-	-	-	-	1,223	-
4a.1.5.30	DM - Equipment Drains RCA	-	148	31	229	1,800	-	-	344	2,552	2,552	-	-	15,445	-	-	-	-	627,223	2,840	-
4a.1.5.31	EG - Component Cooling Water RCA	-	722	29	210	1,650	-	-	462	3,073	3,073	-	-	14,161	-	-	-	-	575,071	13,646	-
4a.1.5.32	EJ - Residual Heat Removal	-	350	34	105	520	383	-	280	1,672	1,672	-	-	4,461	1,166	-	-	-	255,554	7,018	-
4a.1.5.33	EM - High Pressure Coolant Injection	-	283	4	32	252	-	-	114	684	684	-	-	2,159	-	-	-	-	87,663	5,527	-
4a.1.5.34	EN - Containment Spray	-	219	6	45	353	-	-	115	738	738	-	-	3,026	-	-	-	-	122,874	4,134	-
4a.1.5.35	FB - Auxiliary Steam	-	92	-	-	-	-	-	14	106	-	-	106	-	-	-	-	-	-	2,106	-
4a.1.5.36	FB - Auxiliary Steam RCA	-	83	2	12	95	-	-	37	229	229	-	-	816	-	-	-	-	33,148	1,537	-
4a.1.5.37	FC - Auxiliary Turbines	-	61	-	-	-	-	-	9	70	-	-	70	-	-	-	-	-	-	1,301	-
4a.1.5.38	FE - Auxiliary Steam Chemical Addition	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	105	-
4a.1.5.39	GE - Turbine Bldg HVAC	-	137	-	-	-	-	-	21	157	-	-	157	-	-	-	-	-	-	3,189	-
4a.1.5.40	GF - Miscellaneous Building HVAC	-	41	-	-	-	-	-	6	47	-	-	47	-	-	-	-	-	-	987	-
4a.1.5.41	GS - Containment Hydrogen Control	-	69	2	12	93	-	-	33	209	209	-	-	801	-	-	-	-	32,539	1,395	-
4a.1.5.42	HF - Secondary Liquid Waste	-	906	55	178	983	525	-	537	3,184	3,184	-	-	8,431	1,588	-	-	-	444,251	17,832	-
4a.1.5.43	HY - Hydrogen	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	223	-
4a.1.5.44	KH - Service Gas	-	29	-	-	-	-	-	4	33	-	-	33	-	-	-	-	-	-	644	-
4a.1.5.45	LE - Oily Waste	-	113	-	-	-	-	-	17	130	-	-	130	-	-	-	-	-	-	2,575	-
4a.1.5.46	LE - Oily Waste RCA	-	194	3	25	200	-	-	83	506	506	-	-	1,718	-	-	-	-	69,785	3,518	-
4a.1.5.47	NT - Nitrogen	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	149	-
4a.1.5.48	OX - Oxygen	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	171	-
4a.1.5.49	SW - Screen Wash	-	32	-	-	-	-	-	5	36	-	-	36	-	-	-	-	-	-	635	-
4a.1.5.50	Turbine Bldg Non-System Specific	-	749	-	-	-	-	-	112	862	-	-	862	-	-	-	-	-	-	15,405	-
4a.1.5.51	VH - Circ Water & Makeup Water Scrnhs	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	272	-
4a.1.5.52	VV - Misc Bldg HVAC	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	148	-
4a.1.5.53	WG - Gland Water & Motor Cooling Water	-	24	-	-	-	-	-	4	28	-	-	28	-	-	-	-	-	-	593	-
4a.1.5.54	WL - Cooling Lake Makeup & Blowdown	-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	745	-
4a.1.5	Totals	-	8,509	213	1,134	8,079	1,056	-	3,412	22,403	18,006	-	4,397	69,317	3,203	-	-	-	3,020,102	174,218	-
4a.1.6	Scaffolding in support of decommissioning	-	1,306	27	23	156	35	-	365	1,912	1,912	-	-	1,206	106	-	-	-	61,032	33,925	-
4a.1	Subtotal Period 4a Activity Costs	126	37,106	16,794	8,272	14,149	43,537	590	37,299	157,872	153,475	-	4,397	127,040	58,884	501	406	2,217	10,291,210	332,195	8,319
Period 4a Additional Costs																					
4a.2.1	Remedial Action Surveys	-	-	-	-	-	-	1,237	371	1,608	1,608	-	-	-	-	-	-	-	-	27,449	-
4a.2	Subtotal Period 4a Additional Costs	-	-	-	-	-	-	1,237	371	1,608	1,608	-	-	-	-	-	-	-	-	27,449	-
Period 4a Collateral Costs																					
4a.3.1	Process decommissioning water waste	5	-	9	16	-	36	-	15	81	81	-	-	-	76	-	-	-	4,560	15	-
4a.3.2	Process decommissioning chemical flush waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4a.3.3	Small tool allowance	-	300	-	-	-	-	-	45	346	311	-	35	-	-	-	-	-	-	-	-
4a.3.4	On-site survey and release of 116.8 tons clean metallic waste	-	-	-	-	-	-	168	17	185	185	-	-	-	-	-	-	-	-	-	-
4a.3	Subtotal Period 4a Collateral Costs	5	300	9	16	-	36	168	77	612	577	-	35	-	76	-	-	-	4,560	15	-
Period 4a Period-Dependent Costs																					
4a.4.1	Decon supplies	114	-	-	-	-	-	-	29	143	143	-	-	-	-	-	-	-	-	-	-
4a.4.2	Insurance	-	-	-	-	-	-	823	82	905	905	-	-	-	-	-	-	-	-	-	-
4a.4.3	Property taxes	-	-	-	-	-	-	1,367	137	1,503	1,503	-	-	-	-	-	-	-	-	-	-
4a.4.4	Health physics supplies	-	4,114	-	-	-	-	-	1,028	5,142	5,142	-	-	-	-	-	-	-	-	-	-
4a.4.5	Heavy equipment rental	-	2,935	-	-	-	-	-	440	3,375	3,375	-	-	-	-	-	-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	103	81	-	286	-	94	563	563	-	-	-	4,980	-	-	-	99,597	162	-
4a.4.7	Plant energy budget	-	-	-	-	-	-	3,098	465	3,563	3,563	-	-	-	-	-	-	-	-	-	-
4a.4.8	NRC Fees	-	-	-	-	-	-	720	72	792	792	-	-	-	-	-	-	-	-	-	-
4a.4.9	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	658	99	757	757	-	-	-	-	-	-	-	-	-	-
4a.4.10	Corporate A&G Cost	-	-	-	-	-	-	532	80	612	612	-	-	-	-	-	-	-	-	-	-
4a.4.11	Security Staff Cost	-	-	-	-	-	-	5,740	861	6,601	6,601	-	-	-	-	-	-	-	-	-	85,836
4a.4.12	DOC Staff Cost	-	-	-	-	-	-	17,935	2,690	20,625	20,625	-	-	-	-	-	-	-	-	-	189,525
4a.4.13	Utility Staff Cost	-	-	-	-	-	-	28,191	4,229	32,420	32,420	-	-	-	-	-	-	-	-	-	343,343
4a.4	Subtotal Period 4a Period-Dependent Costs	114	7,048	103	81	-	286	59,064	10,305	77,001	77,001	-	-	-	4,980	-	-	-	99,597	162	618,703
4a.0	TOTAL PERIOD 4a COST	245	44,455	16,906	8,368	14,149	43,859	61,059	48,052	237,093	232,661	-	4,432	127,040	63,940	501	406	2,217	10,395,360	359,820	627,022

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2023 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 4b - Site Decontamination																					
Period 4b Direct Decommissioning Activities																					
4b.1.1	Remove spent fuel racks	627	76	266	207	-	2,045	-	901	4,123	4,123	-	-	-	6,250	-	-	-	397,077	1,722	-
Disposal of Plant Systems																					
4b.1.2.1	AN - Demineralized Wtr Storage & xfer	-	67	-	-	-	-	-	10	78	-	-	78	-	-	-	-	-	-	1,548	-
4b.1.2.2	AN - Demineralized Wtr Strg & xfer RCA	-	19	0	2	14	-	-	7	42	42	-	-	120	-	-	-	-	4,855	334	-
4b.1.2.3	AP - Condensate Storage & Transfer	-	85	-	-	-	-	-	13	98	-	-	98	-	-	-	-	-	-	1,660	-
4b.1.2.4	BB - Reactor Coolant	-	279	28	74	293	367	-	220	1,261	1,261	-	-	2,511	1,121	-	-	-	173,293	5,731	-
4b.1.2.5	BG - Chemical & Volume Control	-	862	77	207	950	853	-	610	3,560	3,560	-	-	8,155	2,586	-	-	-	496,849	17,005	-
4b.1.2.6	BN - Borated Refueling Water Storage	-	312	12	93	729	-	-	202	1,348	1,348	-	-	6,255	-	-	-	-	254,024	6,161	-
4b.1.2.7	Control Bldg Non-System Specific	-	184	4	32	249	-	-	89	557	557	-	-	2,139	-	-	-	-	86,849	3,413	-
4b.1.2.8	Control Bldg Non-System Specific Cln	-	1,380	-	-	-	-	-	207	1,587	-	-	1,587	-	-	-	-	-	-	29,076	-
4b.1.2.9	DO - Diesel Oil	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	48	-
4b.1.2.10	EA - Service Water	-	116	-	-	-	-	-	17	133	-	-	133	-	-	-	-	-	-	2,592	-
4b.1.2.11	EB - Closed Cooling Water	-	55	-	-	-	-	-	8	64	-	-	64	-	-	-	-	-	-	1,267	-
4b.1.2.12	EC - Fuel Pool Cooling & Cleanup	-	367	8	61	480	-	-	174	1,089	1,089	-	-	4,115	-	-	-	-	167,129	7,154	-
4b.1.2.13	EF - Essential Service Water	-	166	-	-	-	-	-	25	191	-	-	191	-	-	-	-	-	-	3,800	-
4b.1.2.14	EF - Essential Service Water RCA	-	90	3	21	166	-	-	51	331	331	-	-	1,427	-	-	-	-	57,959	1,734	-
4b.1.2.15	EP - Accumulator Safety Injection	-	150	4	29	228	-	-	77	488	488	-	-	1,958	-	-	-	-	79,502	2,904	-
4b.1.2.16	FA - Auxiliary Steam Generator	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	521	-
4b.1.2.17	FO - Fuel Oil	-	20	-	-	-	-	-	3	23	-	-	23	-	-	-	-	-	-	486	-
4b.1.2.18	FP - Fire Protection	-	171	-	-	-	-	-	26	196	-	-	196	-	-	-	-	-	-	3,826	-
4b.1.2.19	FP - Fire Protection RCA	-	198	9	67	524	-	-	139	936	936	-	-	4,492	-	-	-	-	182,411	3,541	-
4b.1.2.20	Fuel Bldg Non-System Specific	-	45	1	5	37	4	-	19	111	111	-	-	322	12	-	-	-	13,829	850	-
4b.1.2.21	Fuel Bldg Non-System Specific RCA	-	321	6	47	373	-	-	144	892	892	-	-	3,200	-	-	-	-	129,974	5,859	-
4b.1.2.22	Fuel Building Fire Protection	-	155	6	44	343	-	-	97	645	645	-	-	2,941	-	-	-	-	119,444	2,802	-
4b.1.2.23	GA - Plant Heating	-	82	-	-	-	-	-	12	95	-	-	95	-	-	-	-	-	-	1,912	-
4b.1.2.24	GA - Plant Heating RCA	-	114	2	11	87	-	-	43	257	257	-	-	746	-	-	-	-	30,275	2,072	-
4b.1.2.25	GB - Central Chilled Water	-	78	-	-	-	-	-	12	89	-	-	89	-	-	-	-	-	-	1,803	-
4b.1.2.26	GB - Central Chilled Water RCA	-	26	0	3	22	-	-	10	62	62	-	-	187	-	-	-	-	7,591	482	-
4b.1.2.27	GD - Esstl Srvc Wtr Pumphs Bldg HVAC	-	13	-	-	-	-	-	2	14	-	-	14	-	-	-	-	-	-	284	-
4b.1.2.28	GG - Fuel Building HVAC	-	233	8	58	460	-	-	137	896	896	-	-	3,945	-	-	-	-	160,195	4,052	-
4b.1.2.29	GH - Radwaste Building HVAC	-	171	5	38	299	-	-	94	606	606	-	-	2,561	-	-	-	-	104,012	3,004	-
4b.1.2.30	GK - Control Building HVAC	-	156	-	-	-	-	-	23	179	-	-	179	-	-	-	-	-	-	3,959	-
4b.1.2.31	GL - Auxiliary Building HVAC	-	423	11	80	627	-	-	213	1,354	1,354	-	-	5,381	-	-	-	-	218,514	7,364	-
4b.1.2.32	GM - Diesel Generator Building HVAC	-	27	-	-	-	-	-	4	31	-	-	31	-	-	-	-	-	-	695	-
4b.1.2.33	GN - Containment Cooling	-	464	16	122	962	-	-	280	1,844	1,844	-	-	8,250	-	-	-	-	335,052	8,317	-
4b.1.2.34	GP - Containmnt Integratd Leak Rate Test	-	40	1	9	68	-	-	22	139	139	-	-	580	-	-	-	-	23,570	750	-
4b.1.2.35	GR - Containment Atmospheric Control	-	18	2	17	133	-	-	27	198	198	-	-	1,143	-	-	-	-	46,407	350	-
4b.1.2.36	GT - Contaiment Purge HVAC	-	109	4	32	255	-	-	71	471	471	-	-	2,185	-	-	-	-	88,746	1,973	-
4b.1.2.37	HA - Gaseous Radwaste	-	333	7	55	431	-	-	157	983	983	-	-	3,699	-	-	-	-	150,219	6,296	-
4b.1.2.38	HB - Liquid Radwaste	-	800	54	158	856	482	-	478	2,828	2,828	-	-	7,343	1,450	-	-	-	391,794	15,380	-
4b.1.2.39	HC - Solid Radwaste	-	443	36	100	465	400	-	299	1,743	1,743	-	-	3,986	1,211	-	-	-	239,489	8,570	-
4b.1.2.40	HD - Decontamination	-	96	2	18	142	-	-	48	307	307	-	-	1,220	-	-	-	-	49,558	1,828	-
4b.1.2.41	HE - Boron Recycle	-	462	27	78	403	263	-	256	1,489	1,489	-	-	3,460	794	-	-	-	191,531	8,970	-
4b.1.2.42	JE - Emergency Fuel Oil	-	63	-	-	-	-	-	10	73	-	-	73	-	-	-	-	-	-	1,260	-
4b.1.2.43	KA - Compressed Air and Instrument	-	270	-	-	-	-	-	40	310	-	-	310	-	-	-	-	-	-	6,089	-
4b.1.2.44	KB - Breathing Air	-	47	-	-	-	-	-	7	54	-	-	54	-	-	-	-	-	-	1,075	-
4b.1.2.45	KC - Fire Protection	-	410	-	-	-	-	-	61	471	-	-	471	-	-	-	-	-	-	9,256	-
4b.1.2.46	KC - Fire Protection RCA	-	351	12	88	693	-	-	206	1,350	1,350	-	-	5,944	-	-	-	-	241,384	6,383	-
4b.1.2.47	KD - Domestic Water	-	73	-	-	-	-	-	11	84	-	-	84	-	-	-	-	-	-	1,708	-
4b.1.2.48	KE - Fuel Hndlg & Strg Reactor Vssl Serv	-	18	2	13	103	-	-	22	157	157	-	-	882	-	-	-	-	35,813	332	-
4b.1.2.49	KJ - Standby Diesel Engine	-	332	-	-	-	-	-	50	382	-	-	382	-	-	-	-	-	-	6,749	-
4b.1.2.50	LA - Sanitary Drains	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	290	-
4b.1.2.51	LA - Sanitary Drains RCA	-	26	1	4	32	-	-	12	74	74	-	-	272	-	-	-	-	11,053	422	-
4b.1.2.52	LB - Roof Drains	-	56	-	-	-	-	-	8	65	-	-	65	-	-	-	-	-	-	1,276	-
4b.1.2.53	LB - Roof Drains RCA	-	146	4	32	249	-	-	79	511	511	-	-	2,139	-	-	-	-	86,858	2,694	-
4b.1.2.54	LC - Yard Drains	-	5	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	96	-
4b.1.2.55	LD - Chemical & Detergent Waste	-	108	2	12	93	-	-	43	258	258	-	-	797	-	-	-	-	32,369	2,139	-
4b.1.2.56	LF - Floor & Equipment Drains	-	1,357	88	219	776	1,189	-	795	4,424	4,424	-	-	6,660	3,627	-	-	-	501,387	26,164	-
4b.1.2.57	Main Access Facility	-	17	-	-	-	-	-	3	20	-	-	20	-	-	-	-	-	-	339	-
4b.1.2.58	RM - Process Sampling & Analysis	-	123	2	15	115	-	-	51	306	306	-	-	990	-	-	-	-	40,200	2,450	-
4b.1.2.59	Radwaste Bldg Non-System Specific	-	169	4	21	155	16	-	73	438	438	-	-	1,329	50	-	-	-	57,145	3,253	-
4b.1.2.60	Radwaste Bldg Non-System Specific RCA	-	1,176	26	188	1,478	-	-	547	3,415	3,415	-	-	12,684	-	-	-	-	515,103	21,919	-
4b.1.2.61	Reactor Bldg Non-System Specific	-	85	1	8	59	6	-	33	192	192	-	-	502	19	-	-	-	21,590	1,569	-
4b.1.2.62	Reactor Bldg Non-System Specific RCA	-	593	10	71	556	-	-	243	1,472	1,472	-	-	4,768	-	-	-	-	193,612	10,425	-

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2023 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Disposal of Plant Systems (continued)																					
4b.1.2.63	SBO Diesel Generator	-	177	-	-	-	-	-	27	204	-	-	204	-	-	-	-	-	-	3,610	-
4b.1.2.64	SJ - Nuclear Sampling	-	71	1	10	79	-	-	31	193	193	-	-	677	-	-	-	-	27,501	1,430	-
4b.1.2.65	ST - Sewage Treatment	-	107	-	-	-	-	-	16	124	-	-	124	-	-	-	-	-	-	2,316	-
4b.1.2.66	SZ - Service Air	-	83	-	-	-	-	-	12	95	-	-	95	-	-	-	-	-	-	1,892	-
4b.1.2.67	VA - I&C Shop HVAC	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	155	-
4b.1.2.68	VB - I&C Shop Computer Room HVAC	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	106	-
4b.1.2.69	VC - Health Physics Computer Room HVAC	-	10	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	208	-
4b.1.2.70	VJ - Shop Bldg Machine Shop Area Vent	-	3	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	57	-
4b.1.2.71	VL - Shop Building HVAC	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	101	-
4b.1.2.72	VS - Admin Bldg HVAC	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	262	-
4b.1.2.73	VT - Tech Support Building HVAC	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	87	-
4b.1.2.74	VW - Waste Water Treatment Ventilation	-	3	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	52	-
4b.1.2.75	WD - Domestic Water	-	37	-	-	-	-	-	6	43	-	-	43	-	-	-	-	-	-	870	-
4b.1.2.76	WM - Makeup Demineralizer	-	177	-	-	-	-	-	27	203	-	-	203	-	-	-	-	-	-	3,929	-
4b.1.2.77	WS - Plant Services Water	-	147	-	-	-	-	-	22	169	-	-	169	-	-	-	-	-	-	3,297	-
4b.1.2.78	WS - Plant Services Water RCA	-	39	4	27	214	-	-	46	331	331	-	-	1,838	-	-	-	-	74,625	782	-
4b.1.2.79	WT - Waste Water Treatment	-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	769	-
4b.1.2.80	WZ - Radioactive Liquid Waste	-	43	4	9	29	55	-	31	170	170	-	-	247	167	-	-	-	20,647	783	-
4b.1.2.81	Yard Non-System Specific	-	30	-	-	-	-	-	4	34	-	-	34	-	-	-	-	-	-	603	-
4b.1.2	Totals	-	15,592	493	2,177	14,225	3,636	-	6,859	42,981	37,727	-	5,254	122,048	11,036	-	-	-	5,662,357	307,568	-
4b.1.3	Scaffolding in support of decommissioning	-	1,959	41	35	234	52	-	547	2,868	2,868	-	-	1,809	160	-	-	-	91,548	50,887	-
Decontamination of Site Buildings																					
4b.1.4.1	Reactor	1,106	976	60	480	694	872	-	1,197	5,384	5,384	-	-	5,955	13,318	-	-	-	874,477	38,225	-
4b.1.4.2	Auxiliary	541	248	17	134	255	236	-	451	1,882	1,882	-	-	2,185	3,518	-	-	-	255,780	15,363	-
4b.1.4.3	Communication Corridor - Contaminated	12	3	0	3	2	5	-	9	34	34	-	-	17	76	-	-	-	4,296	306	-
4b.1.4.4	Fuel Building	770	744	12	65	315	89	-	651	2,646	2,646	-	-	2,705	984	-	-	-	158,200	27,457	-
4b.1.4.5	Hot Machine Shop	15	6	0	3	-	6	-	11	41	41	-	-	-	94	-	-	-	4,446	421	-
4b.1.4.6	RWST Foundation Decon	-	4	1	5	-	10	-	4	24	24	-	-	-	168	-	-	-	7,920	48	-
4b.1.4.7	Radwaste	288	110	8	67	98	122	-	228	921	921	-	-	844	1,857	-	-	-	122,469	7,815	-
4b.1.4.8	Radwaste Drum Storage	32	11	1	7	8	13	-	25	97	97	-	-	66	208	-	-	-	12,565	850	-
4b.1.4.9	Radwaste Storage Building	82	18	2	16	-	33	-	57	209	209	-	-	-	545	-	-	-	25,740	2,013	-
4b.1.4	Totals	2,846	2,121	101	780	1,372	1,385	-	2,632	11,237	11,237	-	-	11,773	20,770	-	-	-	1,465,893	92,498	-
4b.1.5	Prepare/submit License Termination Plan	-	-	-	-	-	-	536	80	616	616	-	-	-	-	-	-	-	-	-	4,096
4b.1.6	Receive NRC approval of termination plan									a											
4b.1	Subtotal Period 4b Activity Costs	3,473	19,747	901	3,199	15,831	7,118	536	11,021	61,825	56,572	-	5,254	135,630	38,216	-	-	-	7,616,876	452,675	4,096
Period 4b Additional Costs																					
4b.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,688	507	2,195	2,195	-	-	-	-	-	-	-	-	-	12,480
4b.2.2	Operational Tools & Equipment	-	-	22	146	839	-	-	150	1,158	1,158	-	-	11,700	-	-	-	-	292,500	32	-
4b.2.3	Excavation of Underground Services	-	2,174	-	-	-	-	687	646	3,507	3,507	-	-	-	-	-	-	-	-	14,181	-
4b.2.4	License Termination ISFSI	-	65	221	1,895	-	4,096	3,190	2,367	11,834	11,834	-	-	-	23,409	-	-	-	2,971,239	8,091	11,017
4b.2.5	Remedial Action Surveys	-	-	-	-	-	-	2,515	754	3,269	3,269	-	-	-	-	-	-	-	-	55,808	-
4b.2	Subtotal Period 4b Additional Costs	-	2,238	244	2,041	839	4,096	8,080	4,424	21,963	21,963	-	-	11,700	23,409	-	-	-	3,263,739	78,112	23,497
Period 4b Collateral Costs																					
4b.3.1	Process decommissioning water waste	13	-	25	42	-	98	-	40	218	218	-	-	-	204	-	-	-	12,265	40	-
4b.3.2	Process decommissioning chemical flush waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4b.3.3	Small tool allowance	-	379	-	-	-	-	-	57	436	436	-	-	-	-	-	-	-	-	-	-
4b.3.4	Decommissioning Equipment Disposition	-	-	135	132	775	173	-	193	1,408	1,408	-	-	6,000	529	-	-	-	303,608	147	-
4b.3.5	On-site survey and release of 44.30 tons clean metallic waste	-	-	-	-	-	-	64	6	70	70	-	-	-	-	-	-	-	-	-	-
4b.3	Subtotal Period 4b Collateral Costs	13	379	160	174	775	271	64	296	2,133	2,133	-	-	6,000	733	-	-	-	315,873	187	-
Period 4b Period-Dependent Costs																					
4b.4.1	Decon supplies	2,054	-	-	-	-	-	-	513	2,567	2,567	-	-	-	-	-	-	-	-	-	-
4b.4.2	Insurance	-	-	-	-	-	-	1,673	167	1,841	1,841	-	-	-	-	-	-	-	-	-	-
4b.4.3	Property taxes	-	-	-	-	-	-	2,779	278	3,056	3,056	-	-	-	-	-	-	-	-	-	-
4b.4.4	Health physics supplies	-	6,640	-	-	-	-	-	1,660	8,299	8,299	-	-	-	-	-	-	-	-	-	-
4b.4.5	Heavy equipment rental	-	6,118	-	-	-	-	-	918	7,036	7,036	-	-	-	-	-	-	-	-	-	-
4b.4.6	Disposal of DAW generated	-	-	136	107	-	379	-	125	747	747	-	-	-	6,610	-	-	-	132,195	216	-
4b.4.7	Plant energy budget	-	-	-	-	-	-	4,973	746	5,718	5,718	-	-	-	-	-	-	-	-	-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	1,464	146	1,611	1,611	-	-	-	-	-	-	-	-	-	-
4b.4.9	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	1,338	201	1,539	1,539	-	-	-	-	-	-	-	-	-	-
4b.4.10	Corporate A&G Cost	-	-	-	-	-	-	1,022	153	1,175	1,175	-	-	-	-	-	-	-	-	-	-

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2023 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 4b Period-Dependent Costs (continued)																					
4b.4.11	Security Staff Cost	-	-	-	-	-	-	11,670	1,750	13,420	13,420	-	-	-	-	-	-	-	-	-	174,521
4b.4.12	DOC Staff Cost	-	-	-	-	-	-	35,643	5,346	40,989	40,989	-	-	-	-	-	-	-	-	-	374,172
4b.4.13	Utility Staff Cost	-	-	-	-	-	-	54,374	8,156	62,531	62,531	-	-	-	-	-	-	-	-	-	658,990
4b.4	Subtotal Period 4b Period-Dependent Costs	2,054	12,758	136	107	-	379	114,936	20,160	150,530	150,530	-	-	-	6,610	-	-	-	132,195	216	1,207,682
4b.0	TOTAL PERIOD 4b COST	5,540	35,123	1,441	5,521	17,445	11,864	123,616	35,901	236,451	231,197	-	5,254	153,330	68,968	-	-	-	11,328,680	531,189	1,235,275
PERIOD 4f - License Termination																					
Period 4f Direct Decommissioning Activities																					
4f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	164	49	213	213	-	-	-	-	-	-	-	-	-	-
4f.1.2	Terminate license									a											
4f.1	Subtotal Period 4f Activity Costs	-	-	-	-	-	-	164	49	213	213	-	-	-	-	-	-	-	-	-	-
Period 4f Additional Costs																					
4f.2.1	License Termination Survey	-	-	-	-	-	-	8,039	2,412	10,450	10,450	-	-	-	-	-	-	-	-	153,690	6,240
4f.2	Subtotal Period 4f Additional Costs	-	-	-	-	-	-	8,039	2,412	10,450	10,450	-	-	-	-	-	-	-	-	153,690	6,240
Period 4f Collateral Costs																					
4f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,398	210	1,608	1,608	-	-	-	-	-	-	-	-	-	-
4f.3	Subtotal Period 4f Collateral Costs	-	-	-	-	-	-	1,398	210	1,608	1,608	-	-	-	-	-	-	-	-	-	-
Period 4f Period-Dependent Costs																					
4f.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4f.4.2	Property taxes	-	-	-	-	-	-	802	80	883	883	-	-	-	-	-	-	-	-	-	-
4f.4.3	Health physics supplies	-	1,329	-	-	-	-	-	332	1,661	1,661	-	-	-	-	-	-	-	-	-	-
4f.4.4	Disposal of DAW generated	-	-	7	6	-	21	-	7	41	41	-	-	-	361	-	-	-	7,229	12	-
4f.4.5	Plant energy budget	-	-	-	-	-	-	383	57	440	440	-	-	-	-	-	-	-	-	-	-
4f.4.6	NRC Fees	-	-	-	-	-	-	522	52	574	574	-	-	-	-	-	-	-	-	-	-
4f.4.7	Corporate A&G Cost	-	-	-	-	-	-	119	18	137	137	-	-	-	-	-	-	-	-	-	-
4f.4.8	Security Staff Cost	-	-	-	-	-	-	1,392	209	1,601	1,601	-	-	-	-	-	-	-	-	-	19,353
4f.4.9	DOC Staff Cost	-	-	-	-	-	-	5,964	895	6,858	6,858	-	-	-	-	-	-	-	-	-	58,864
4f.4.10	Utility Staff Cost	-	-	-	-	-	-	6,957	1,044	8,001	8,001	-	-	-	-	-	-	-	-	-	76,604
4f.4	Subtotal Period 4f Period-Dependent Costs	-	1,329	7	6	-	21	16,139	2,694	20,196	20,196	-	-	-	361	-	-	-	7,229	12	154,820
4f.0	TOTAL PERIOD 4f COST	-	1,329	7	6	-	21	25,740	5,364	32,467	32,467	-	-	-	361	-	-	-	7,229	153,702	161,060
PERIOD 4 TOTALS		5,785	80,907	18,354	13,895	31,594	55,744	210,415	89,317	506,011	496,325	-	9,686	280,370	133,269	501	406	2,217	21,731,270	1,044,712	2,023,357
PERIOD 5b - Site Restoration																					
Period 5b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
5b.1.1.1	Reactor	-	3,121	-	-	-	-	-	468	3,589	-	-	3,589	-	-	-	-	-	-	27,724	-
5b.1.1.2	Access Vaults	-	11	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	59	-
5b.1.1.3	Administration	-	147	-	-	-	-	-	22	169	-	-	169	-	-	-	-	-	-	1,724	-
5b.1.1.4	Auxiliary	-	2,695	-	-	-	-	-	404	3,099	-	-	3,099	-	-	-	-	-	-	19,753	-
5b.1.1.5	Auxiliary Boiler	-	22	-	-	-	-	-	3	25	-	-	25	-	-	-	-	-	-	248	-
5b.1.1.6	Chemical Addition Structure	-	44	-	-	-	-	-	7	50	-	-	50	-	-	-	-	-	-	469	-
5b.1.1.7	Circ Water Pump Enclosure	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	164	-
5b.1.1.8	Circ Water Travel Screen Enclosure	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	160	-
5b.1.1.9	Circulating Water Discharge Structure	-	99	-	-	-	-	-	15	114	-	-	114	-	-	-	-	-	-	542	-
5b.1.1.10	Circulating Water Intake & Screenhouse	-	94	-	-	-	-	-	14	108	-	-	108	-	-	-	-	-	-	683	-
5b.1.1.11	Communication Corridor - Clean	-	970	-	-	-	-	-	145	1,115	-	-	1,115	-	-	-	-	-	-	8,280	-
5b.1.1.12	Communication Corridor - Contaminated	-	33	-	-	-	-	-	5	38	-	-	38	-	-	-	-	-	-	184	-
5b.1.1.13	Covered Walkways	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	242	-
5b.1.1.14	Diesel Generator	-	302	-	-	-	-	-	45	347	-	-	347	-	-	-	-	-	-	2,185	-
5b.1.1.15	E.S.W.S. Pumphouse	-	139	-	-	-	-	-	21	160	-	-	160	-	-	-	-	-	-	801	-
5b.1.1.16	ESWS Valve House	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	42	-
5b.1.1.17	FLEX Building NO. 1 & 2	-	429	-	-	-	-	-	64	493	-	-	493	-	-	-	-	-	-	2,880	-
5b.1.1.18	Fuel Building	-	1,108	-	-	-	-	-	166	1,275	-	-	1,275	-	-	-	-	-	-	7,874	-
5b.1.1.19	GOB - Administration Building	-	235	-	-	-	-	-	35	270	-	-	270	-	-	-	-	-	-	2,962	-
5b.1.1.20	Hot Machine Shop	-	16	-	-	-	-	-	2	19	-	-	19	-	-	-	-	-	-	243	-
5b.1.1.21	M.M.O. Building	-	315	-	-	-	-	-	47	363	-	-	363	-	-	-	-	-	-	2,389	-
5b.1.1.22	Main Access Facility	-	500	-	-	-	-	-	75	575	-	-	575	-	-	-	-	-	-	4,717	-
5b.1.1.23	Material Center West	-	92	-	-	-	-	-	14	106	-	-	106	-	-	-	-	-	-	1,379	-

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2023 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			
Demolition of Remaining Site Buildings (continued)																					
5b.1.1.24	Misc Structures and Additions	-	76	-	-	-	-	-	11	87	-	-	87	-	-	-	-	-	-	910	-
5b.1.1.25	Miscellaneous Site Foundations	-	225	-	-	-	-	-	34	259	-	-	259	-	-	-	-	-	-	1,242	-
5b.1.1.26	Miscellaneous Site Structures	-	1,799	-	-	-	-	-	270	2,069	-	-	2,069	-	-	-	-	-	-	13,693	-
5b.1.1.27	New Covered Walkway	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	79	-
5b.1.1.28	Oil Separator and Waste Tank	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	8	-
5b.1.1.29	Radwaste	-	1,091	-	-	-	-	-	164	1,254	-	-	1,254	-	-	-	-	-	-	8,111	-
5b.1.1.30	Radwaste Drum Storage	-	149	-	-	-	-	-	22	171	-	-	171	-	-	-	-	-	-	1,449	-
5b.1.1.31	Radwaste Storage Building	-	82	-	-	-	-	-	12	94	-	-	94	-	-	-	-	-	-	1,028	-
5b.1.1.32	SBO Diesel Generator	-	360	-	-	-	-	-	54	414	-	-	414	-	-	-	-	-	-	3,079	-
5b.1.1.33	Security Main Gate North	-	107	-	-	-	-	-	16	124	-	-	124	-	-	-	-	-	-	1,123	-
5b.1.1.34	Security Additions	-	46	-	-	-	-	-	7	53	-	-	53	-	-	-	-	-	-	405	-
5b.1.1.35	Security/Guardhouse	-	35	-	-	-	-	-	5	41	-	-	41	-	-	-	-	-	-	342	-
5b.1.1.36	Site Diesel Generator	-	3	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	18	-
5b.1.1.37	Support Complex	-	27	-	-	-	-	-	4	31	-	-	31	-	-	-	-	-	-	389	-
5b.1.1.38	Turbine Building	-	4,242	-	-	-	-	-	636	4,878	-	-	4,878	-	-	-	-	-	-	47,075	-
5b.1.1.39	Turbine Pedestal	-	527	-	-	-	-	-	79	607	-	-	607	-	-	-	-	-	-	2,934	-
5b.1.1.40	Waste Water Treatment	-	15	-	-	-	-	-	2	18	-	-	18	-	-	-	-	-	-	172	-
5b.1.1.41	Water Treatment Building North (Z110)	-	65	-	-	-	-	-	10	74	-	-	74	-	-	-	-	-	-	608	-
5b.1.1	Totals	-	19,264	-	-	-	-	-	2,890	22,154	-	-	22,154	-	-	-	-	-	-	168,368	-
Site Closeout Activities																					
5b.1.2	Remove Rubble	-	1,163	-	-	-	-	-	174	1,337	-	-	1,337	-	-	-	-	-	-	5,660	-
5b.1.3	Grade & landscape site	-	107	-	-	-	-	-	16	123	-	-	123	-	-	-	-	-	-	512	-
5b.1.4	Final report to NRC	-	-	-	-	-	-	204	31	235	235	-	-	-	-	-	-	-	-	-	1,560
5b.1	Subtotal Period 5b Activity Costs	-	20,535	-	-	-	-	204	3,111	23,849	235	-	23,615	-	-	-	-	-	-	174,540	1,560
Period 5b Additional Costs																					
5b.2.1	Concrete Crushing	-	1,168	-	-	-	-	19	178	1,365	-	-	1,365	-	-	-	-	-	-	4,700	-
5b.2.2	Circulating Water Intake Cofferdam	-	341	-	-	-	-	-	51	392	-	-	392	-	-	-	-	-	-	2,584	-
5b.2.3	Construction Debris	-	-	-	-	-	-	2,250	338	2,588	-	-	2,588	-	-	-	-	-	-	-	-
5b.2.4	Site Restoration ISFSI	-	1,292	-	-	-	-	612	286	2,189	-	-	2,189	-	-	-	-	-	-	5,501	160
5b.2.5	E.S.W.S. Cofferdam	-	447	-	-	-	-	-	67	514	-	-	514	-	-	-	-	-	-	3,552	-
5b.2.6	Firing Range Closure	-	-	-	-	-	-	848	127	975	-	-	975	-	-	-	-	-	-	-	-
5b.2	Subtotal Period 5b Additional Costs	-	3,247	-	-	-	-	3,729	1,046	8,023	-	-	8,023	-	-	-	-	-	-	16,337	160
Period 5b Collateral Costs																					
5b.3.1	Small tool allowance	-	176	-	-	-	-	-	26	202	-	-	202	-	-	-	-	-	-	-	-
5b.3	Subtotal Period 5b Collateral Costs	-	176	-	-	-	-	-	26	202	-	-	202	-	-	-	-	-	-	-	-
Period 5b Period-Dependent Costs																					
5b.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5b.4.2	Property taxes	-	-	-	-	-	-	1,540	154	1,694	-	-	1,694	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	4,738	-	-	-	-	-	711	5,448	-	-	5,448	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	367	55	422	-	-	422	-	-	-	-	-	-	-	-
5b.4.5	Corporate A&G Cost	-	-	-	-	-	-	94	14	108	-	-	108	-	-	-	-	-	-	-	-
5b.4.6	Security Staff Cost	-	-	-	-	-	-	2,672	401	3,072	-	-	3,072	-	-	-	-	-	-	-	37,132
5b.4.7	DOC Staff Cost	-	-	-	-	-	-	10,920	1,638	12,559	-	-	12,559	-	-	-	-	-	-	-	105,208
5b.4.8	Utility Staff Cost	-	-	-	-	-	-	5,327	799	6,126	-	-	6,126	-	-	-	-	-	-	-	60,340
5b.4	Subtotal Period 5b Period-Dependent Costs	-	4,738	-	-	-	-	20,920	3,772	29,429	-	-	29,429	-	-	-	-	-	-	-	202,680
5b.0	TOTAL PERIOD 5b COST	-	28,696	-	-	-	-	24,853	7,955	61,504	235	-	61,269	-	-	-	-	-	-	190,877	204,400
PERIOD 5 TOTALS		-	28,696	-	-	-	-	24,853	7,955	61,504	235	-	61,269	-	-	-	-	-	-	190,877	204,400
TOTAL COST TO DECOMMISSION		13,553	126,098	18,943	14,557	31,652	57,302	1,043,157	219,450	1,524,712	1,133,530	318,571	72,611	292,159	143,761	501	406	2,217	22,169,740	1,336,091	9,317,438

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(Thousands of 2023 Dollars)

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

TOTAL COST TO DECOMMISSION WITH 16.81% CONTINGENCY:	**$1,524,712**	**thousands of 2023 dollars**	
TOTAL NRC LICENSE TERMINATION COST IS 74.34% OR:	**$1,133,530**	**thousands of 2023 dollars**	
SPENT FUEL MANAGEMENT COST IS 20.89% OR:	**$318,571**	**thousands of 2023 dollars**	
NON-NUCLEAR DEMOLITION COST IS 4.76% OR:	**$72,611**	**thousands of 2023 dollars**	
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	**144,668**	**Cubic Feet**	
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	**2,217**	**Cubic Feet**	
TOTAL SCRAP METAL REMOVED:	**70,087**	**Tons**	
TOTAL CRAFT LABOR REQUIREMENTS:	**1,336,091**	**Man-hours**	

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

APPENDIX E

ISFSI DECOMMISSIONING COST SUMMARY

Table E
Wolf Creek Generating Station
ISFSI Decommissioning Cost Estimate
(thousands of 2023 dollars)

Activity Description	Removal Costs	Packaging Costs	Transport Costs	LLRW Disposal Costs	Other Costs	Total Costs	Burial Volume Class A (cubic feet)	Craft Manhours	Oversight and Contractor Manhours
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	243	243	-	-	1,072
Decontamination (activated disposition)	65	221	1,895	4,096	-	6,277	23,409	378	-
License Termination (radiological surveys)	-	-	-	-	1,223	1,223	-	7,713	-
Subtotal	**65**	**221**	**1,895**	**4,096**	**1,466**	**7,743**	**23,409**	**8,091**	**1,072**
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	523	523	-	-	1,153
Insurance	-	-	-	-	140	140	-	-	-
Property taxes	-	-	-	-	343	343	-	-	-
Plant energy budget	-	-	-	-	16	16	-	-	-
Corporate A&G Cost	-	-	-	-	6	6	-	-	-
Security Staff Cost	-	-	-	-	356	356	-	-	4,999
Utility Staff Cost	-	-	-	-	339	339	-	-	3,792
Subtotal	-	-	-	-	**1,724**	**1,724**	-	-	**9,945**
Total (w/o contingency)	**65**	**221**	**1,895**	**4,096**	**3,190**	**9,467**	**23,409**	**8,091**	**11,017**
Total (w/25% contingency)	**81**	**277**	**2,369**	**5,121**	**3,987**	**11,834**			

Note: Columns/Rows may not add due to rounding.

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)

APPENDIX F

COST SENSITIVITY OF SHORT-TERM

POOL-BASED SPENT FUEL STORAGE

APPENDIX F
COST SENSITIVITY OF SHORT-TERM POOL-BASED SPENT FUEL STORAGE

Introduction

As discussed in the last Decommissioning Cost Analysis (DCA) for Wolf Creek, issued in August 2020, developments in the area of spent nuclear fuel disposal suggest a possibility that the federal government may not have removed all of Wolf Creek's spent nuclear fuel and high-level radioactive waste (hereafter, simply "spent fuel") from the station by the time the plant is ready for decommissioning. As such, the scenario where the spent fuel remains on site for an extended period following decommissioning of the power block has become the most likely to occur. This is the base case for the 2023 DCA. The alternative case in the 2023 DCA for Wolf Creek includes five years wet storage and complete transfer to DOE by the end of 2050, five and one-half years after final shutdown of Wolf Creek in 2045. While there is still much uncertainty in this area, the probability that the 2023 DCA alternative scenario occurs has become unlikely.

For continuity and comparison with the 2020 estimate, the five years wet storage with complete transfer to DOE is presented in this Appendix, updated to 2023 dollars. There still is much uncertainty in this area. Because the assumptions used in this Appendix F analysis are speculative at this point, the hypothetical cost effects shown here have not been included in the overall updated cost estimate in this report.

Completion of the decommissioning process (release of the entire site for unrestricted use) is highly dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. DOE's repository program is currently based upon the premise that spent fuel allocations would be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order in which it was discharged from the reactor (i.e., establishing a national "queue"). Even if spent fuel could be transferred to a federal facility for interim storage (in the absence of a permanent disposal facility), the nature of the queue would be expected to result in a long backlog of spent fuel at each site. Under the current system, as can be seen at sites where reactors have been decommissioned, the owner(s) can anticipate several decades of continuing, on-site storage of the spent fuel before the transfer could be expected to be complete.

Base Analyses

The estimate described in this Appendix is based in general upon 1) a 2031 start date for DOE initiating transfer of commercial spent fuel to a federal facility, and 2) a 2038 start date for the transfer of spent fuel from the Wolf Creek site based on an "oldest fuel first" priority, and the DOE achieving an annual rate of transfer (3,000 metric tons of uranium per year) as reflected in DOE's latest Acceptance Priority Ranking and Annual Capacity Report.[1]

The assumed 2031 DOE start date is nominally based on the last position stated by the DOE. Completion of the decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. DOE's repository program had originally assumed that spent fuel allocations would be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor.[2] However, the Blue Ribbon Commission, in its final report, noted that: "[A]ccepting spent fuel according to the OFF [Oldest Fuel First] priority ranking instead of giving priority to shutdown reactor sites could greatly reduce the cost savings that could be achieved through consolidated storage if priority could be given to accepting spent fuel from shutdown reactor sites before accepting fuel from still-operating plants. …. The magnitude of the cost savings that could be achieved by giving priority to shutdown sites appears to be large enough (i.e., in the billions of dollars) to warrant DOE exercising its right under the Standard Contract to move this fuel first."

Under this scenario, once Wolf Creek permanently ceases operation, DOE would expedite the removal of spent fuel from the site. The cost estimates described in the main body of this report assumed that:

- The spent fuel pool would contain 814 fuel assemblies at shutdown, including the final core discharge
- Shipment of fuel from the Wolf Creek site would give priority to the spent fuel stored in the pool, followed by shipment from the ISFSI.

---

1 "Acceptance Priority Ranking and Annual Capacity Report," U.S. DOE, Office of Civilian Radioactive Waste Management, DOE/RW-0567, July 2004

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

- The spent fuel pool would be emptied within the first four years following plant shutdown. This would allow decommissioning to be completed and the site released for unrestricted use within a relatively short time.
- The DOE is assumed to use its Transport, Aging and Disposal canister to empty the wet storage pool.[3] The canisters would be provided to WCNOC at no cost, however, Wolf Creek staff/or contractors would load, seal and transfer the multi-purpose canisters into a DOE-provided transport cask. It is estimated that post-shutdown shipment via TADs to DOE will consist 262 of fuel assemblies.
- All remaining spent fuel in the fuel pool not shipped directly to the DOE will be transferred to the onsite ISFSI. It is estimated that this will consist of 552 fuel assemblies.
- Following shutdown and decommissioning of the spent fuel pool, periodic transfers of spent fuel canisters from the ISFSI to the DOE occur. Between two and three 37-assembly canisters will ship yearly to the DOE from the ISFSI. This occurs over the period of 2050 to 2078.
- Greater-than-Class C (GTCC)[4] material generated during decommissioning will be packaged into the equivalent of dry fuel storage canisters and placed in the ISFSI, awaiting eventual transfer to the DOE. After the last of the spent fuel canisters are transferred to the DOE, the GTCC canisters will then be transferred as well, in the final year of ISFSI operations.
- The ISFSI would then be decommissioned.

Alternative Analysis

The assumed 2031 DOE start date is nominally based on the last position stated by the DOE. More importantly, the estimates assume that the DOE would give priority to fuel at shutdown sites,[5] i.e., it assumed that Congress would "(1)…direct the Department to take spent nuclear fuel from decommissioned commercial nuclear power reactors as soon as possible; (2) to establish an expedited siting process; and (3) to authorize the Department to construct and operate the facility under its regulatory

---

3 "Transport, Aging and Disposal Canister System Performance Specification," U.S. DOE, Civilian Radioactive Waste Management System, DOC ID: WMO-TADCS-000001, Rev.1, March 2008

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

5 "Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy," https://www.energy.gov/ne/articles/blue-ribbon-commission-americas-nuclear-future-report-secretary-energy, p. 42, January 2012

authority, or, if the facility were to be constructed and operated under a U.S. Nuclear Regulatory Commission license, to provide for an expedited siting and licensing process."[6]

It is generally necessary that spent fuel be cooled and stored for a minimum period at the generating site prior to transfer. As such, the NRC requires that licensees establish a program to manage and provide funding for the management of all irradiated fuel at the reactor site until title of the fuel is transferred to the DOE, pursuant to 10 CFR Part 50.54(bb). [7] The post-shutdown costs incurred to satisfy this requirement include the isolation and continued operation of the spent fuel pool and the ISFSI during the five and one-half years following the cessation of plant operations.

At shutdown, the spent fuel pool is expected to contain freshly discharged assemblies (from the most recent refueling cycles) as well as the final reactor core. Over the following five and one-half years the assemblies are packaged into multipurpose canisters for transfer to the DOE.

Interim storage of the fuel, until the DOE has completed the transfer, will be in the wet storage pool located in the fuel building (as well as on the ISFSI). The pool will be isolated, allowing WCNOC to proceed with decommissioning (or safe-storage preparations) in the shortest time possible. Note however that this five and one-half year period is longer than the base case scenario, incurring an additional one and one-half years of such period-dependent costs as staffing, security, insurance, and taxes among others.

This alternative analysis examines the cost impact of the spent fuel management model described previously for the caretaking and removal of the spent fuel generated during plant operations.[8] The alternative analysis scenario includes the following assumptions:

- DOE pickup of spent fuel would begin in 2038, and would end five and one-half years after final shutdown of Wolf Creek in 2045, including assemblies already present in the on-site ISFSI prior to shutdown.
- WCNOC would operate the ISFSI and manage the spent fuel until such time that the DOE could complete the transfer to an off-site facility

---

6 "Report to Congress on the Demonstration of the Interim Storage of Spent Nuclear Fuel from Decommissioned Nuclear Power Reactor Sites" DOE/RW-0596, December 2008

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

8 This analysis does not consider that the cost incurred would most likely be reimbursable as a result of DOE's breach of contract due to it non-performance

- The DOE would accept the multi-purpose canister without the need for repackaging the assemblies, i.e., the DOE transport cask could accommodate the multi-purpose canister without modification
- WCNOC staff or WCNOC contracted staff would transfer the multi- purpose canister into the DOE-provided transport cask
- The concrete storage overpack and ISFSI pad would be decommissioned with the balance of the nuclear island and the NRC license terminated for the entire site at the end of Period 2 in 2052.

The impact of these assumptions, as compared to the Base Analysis, is summarized as follows.

	Base Case	Alternative
Spent fuel pool inventory at shutdown (assemblies)	814	814
ISFSI inventory at shutdown (assemblies)	1,887	1,887
Spent fuel transferred to the DOE during plant ops	663	663
Spent fuel transferred to the DOE from pool during decommissioning (assemblies)	262	903
Spent fuel transferred to the ISFSI for interim storage within 4 years after shutdown (assemblies)	552	0
Number of additional dry-storage modules needed to support decommissioning (excluding GTCC)	15	0
Transfer of Spent Fuel to DOE Complete (year)	2078	2050

The schedule of expenditure in the following table delineates the cost contributors by year of expenditures as well as escalation category (e.g., labor, materials, and waste disposal). Costs are reported in 2023 dollars and are not inflated, escalated, or discounted over the period of expenditure.

The cost for disposal of GTCC material is realized as the material is generated during reactor vessel segmentation in this alternative analysis (Table F, during years 2046-2048).

While this analysis attempts to capture the cost for short-term pool-based spent fuel management at the Wolf Creek site, under the scenario outlined above, it is WCNOC's position that the DOE has a contractual obligation to accept Wolf Creek's fuel earlier than the projections set out above consistent with its contract commitments. No assumption made in this analysis should be interpreted to be inconsistent with this claim.

TABLE F
DECON ALTERNATIVE WITH SHORT-TERM POOL-BASED SPENT FUEL MANAGEMENT SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2023 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	63,175	2,157	2,303	35	11,093	78,764
2046	89,122	27,351	4,211	17,166	34,066	171,917
2047	90,728	44,557	2,698	42,788	26,238	207,009
2048	80,163	25,095	2,340	22,705	16,446	146,749
2049	73,426	12,623	2,130	11,412	10,918	110,509
2050	68,745	22,722	1,825	13,870	11,753	118,915
2051	40,715	5,890	776	7,151	6,644	61,176
2052	25,077	12,910	325	5	3,214	41,531
2053	14,421	9,126	178	0	2,076	25,801
Total	545,572	162,431	16,786	115,132	122,448	962,370

Note: Columns may not add due to rounding

APPENDIX G

U.S. DECOMMISSIONING EXPERIENCE TO DATE

PROVIDED AS KANSAS CORPORATION COMMISSION

REQUESTED INFORMATION UNDER DOCKET 15-WCNE-093-GIE

Decommissioning

Kansas Corporation Commission has requested additional background information on decommissioning efforts to date for U.S. nuclear plants including (i) decommissioning methods employed; (ii) the reason for decommissioning if performed prior to the end of plant expectancy, and (iii) a comparison of actual costs of decommissioning to previous cost estimates for decommissioned plants. The following analysis is based on publicly available information.

1. Decommissioning Methods Employed

As discussed in more detail in Sections 1 and 2 of this document, when a power company decides to permanently close a nuclear power plant, the facility must be decommissioned by safely removing it from service and reducing residual radioactivity to a level that permits release of the property and termination of the operating license. Licensees may choose from three decommissioning strategies: DECON, SAFSTOR, or ENTOMB.

- DECON (immediate dismantling) - soon after the nuclear facility closes, equipment, structures, and portions of the facility containing radioactive contaminants are removed or decontaminated to a level that permits release of the property and termination of the NRC license (assuming that the spent fuel has been removed from the site).
- SAFSTOR (safe-storage and deferred dismantling) - a nuclear facility is maintained and monitored in a condition that allows the radioactivity to decay; afterwards, the plant is dismantled and the property decontaminated.
- ENTOMB - radioactive contaminants are permanently encased on site in structurally sound material such as concrete. The facility is maintained and monitored until the radioactivity decays to a level permitting restricted release of the property. (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.)

The licensee may also choose to adopt a combination of the first two choices in which some portions of the facility are dismantled or decontaminated while other parts of the facility are left in SAFSTOR. The decision may be based on factors besides radioactive decay, such as availability of waste disposal sites. Decommissioning must be completed within 60 years of the plant ceasing operations. A time beyond that would be considered only when necessary to protect public health and safety in accordance with NRC regulations.

As described in Table G, the decommissioning methods employed by the 25 commercial nuclear power reactors that have shut down since 1989 have varied: 11 have employed DECON, 10 have employed SAFSTOR and 4 have employed combined SAFSTOR/DECON. Moreover, not all DECON sites have terminated their licenses. License termination is contingent upon the removal of the spent fuel from the site. For example, the plants listed in Table G that elected the DECON option still have fuel on site (excluding Shoreham) in a licensed Independent Spent Fuel Storage Installation or ISFSI. While the decommissioning of these plants is considered complete, only those portions of the site, exclusive of the ISFSI, have been released for alternative and unrestricted use.

Table G
Decommissioning Alternative(s) Selected
for Commercial Nuclear Power Reactors
(since 1989) [1]

Unit	Location	MWt	Shut Down	Decommissioning Alternative Selected
Rancho Seco	Herald, CA	2,772	7-Jun-89	SAFSTOR/DECON [2]
Shoreham	Wading River, NY	2,436	28-Jun-89	DECON
Fort St. Vrain	Platteville, CO	842	18-Aug-89	DECON
Yankee-Rowe	Rowe, MA	600	1-Oct-91	DECON
Trojan	Rainier, OR	3,411	9-Nov-92	DECON
San Onofre 1	San Clemente, CA	1,347	30-Nov-92	SAFSTOR/DECON [3]
Zion 2	Zion, Il	3,250	19-Sep-96	SAFSTOR/DECON [4]
Connecticut Yankee	Haddam Neck, CT	1,825	5-Dec-96	DECON
Maine Yankee	Wiscasset, ME	2,700	6-Dec-96	DECON
Zion 1	Zion, Il	3,250	21-Feb-97	SAFSTOR/DECON [4]
Big Rock Point	Charlevoix, MI	240	29-Aug-97	DECON
Millstone 1	Waterford, CT	2,011	21-Jul-98	SAFSTOR
Crystal River 3	Crystal River, FL	2,609	20-Feb-13	SAFSTOR
Kewaunee	Carlton, WI	1,772	7-May-13	SAFSTOR
San Onofre 2	San Clemente, CA	3,438	12-Jun-13	DECON
San Onofre 3	San Clemente, CA	3,438	12-Jun-13	DECON
Vermont Yankee	Vernon, VT	1,912	29-Dec-14	SAFSTOR [5]
Fort Calhoun	Fort Calhoun, NE	1,500	24-Oct-16	SAFSTOR
Oyster Creek	Forked River, NJ	1,930	17-Sep-18	SAFSTOR
Pilgrim	Plymouth, MA	2,028	31-May-19	SAFSTOR [6]
Three Mile Island 1	Middletown, PA	2,568	20-Sep-19	SAFSTOR
Indian Point 2	Buchanan, NY	3,216	30-April-20	DECON [7]
Duane Arnold	Palo, IA	1,912	10-Aug-20	SAFSTOR
Indian Point 3	Buchanan, NY	3,216	30-Apr-21	DECON
Palisades	Covert, MI	2,565	31-May-22	SAFSTOR

Table G Notes:

1. Source: Table G data and information on reactors shut down since 1989 extracted from Appendix C of NRC's Information Digest 2022-2023, NUREG-1350, Volume 34, February 2023. Reactors shut down prior to 1989 include TMI-2 (accident) in 1979 and a number of smaller facilities constructed in the late 1950s and 1960s, under the Atomic Energy Commission, to demonstrate the peacetime use of nuclear power. These include the GE VBWR, GE EVESR, Pathfinder, Savannah, N.S. (ship), Saxton, Fermi-1, Indian Point- 1, Peach Bottom-1, Humboldt Bay-3, Dresden-1, and La Crosse reactors. All of the facilities were initially placed into safe-storage (SAFSTOR). The reactors at Pathfinder, Saxton, Fermi-1, Humboldt Bay-3, and La Crosse were subsequently decommissioned or are currently in the process of being decommissioned.
2. The Sacramento Municipal Utility District initially placed the reactor into safe-storage (until 2008). However, on January 9, 1997, the Board of Directors approved an "incremental decommissioning" project for Rancho Seco accelerating the decommissioning timeline.
3. Southern California Edison initially placed the reactor into safe-storage, planning to decommission Unit 1 along with Units 2 and 3, at the end of their licenses (2013). In 1998, the company notified the NRC that it would commence decommissioning operations in June 1999.
4. Commonwealth Edison initially placed the two reactors into safe-storage. On August 23, 2010, the Nuclear Regulatory Commission approved the transfer of Exelon's (ComEd's parent company) license to ZionSolutions for "prompt" decommissioning.
5. Entergy initially placed the reactor into safe-storage after the December 2014 shutdown. On February 9, 2016, NorthStar Group Services filed an application (along with Entergy) with the NRC to acquire the license of the shutdown plant for "prompt" decommissioning.
6. Entergy initially placed the reactor into safe-storage after the May 2019 shutdown. In August 2019, the NRC approved the transfer of the license of the shutdown plant from Entergy to Comprehensive Decommissioning International for "prompt" decommissioning.
7. Entergy made the decision to modify its license renewal efforts for Indian Point Units 2 and 3. The license extension agreements were granted approval for expiration in 2024 and 2025 for the respective units. The company also decided to cease operation of Unit 2 in 2020 and Unit 3 in 2021.

2. Reason for Premature Decommissioning

The reactors identified in Table G all ceased operations prior to the expiration of their operating licenses (premature shutdown). As such, the opportunity to preplan the decommissioning was limited and often hampered by a shortfall in the funds available for decommissioning (since rate collections also disrupted).

The majority of the owners of reactors in Table G terminated operations due to economics, although poor operating histories and the prospect of expensive plant modification and repairs, and competition from less expensive generation also contributed to the decisions.

Rancho Seco Nuclear Generating Station

Reactor Type: Type: Pressurized Water Reactor
Operating License Issued: 16 August 1974
Shutdown: 07 June 1989

The plant operated commercially from April 1975 to June 1989, but at a lifetime capacity under 50%. A number of incidents at the plant precipitated an NRC mandated re-start program that would have involved a significant effort and cost. In accordance with the results of a public referendum on June 6, 1989, the Sacramento Municipal Utility District decided to permanently shut down the plant on June 7, 1989.

Shoreham Nuclear Power Station

Reactor Type: Boiling Water Reactor
Operating License Issued: 21 April 1989
Shutdown: 28 June 1989

The plant was completed in 1984 and received federal permission for low-power (5 percent) testing. The owner, Long Island Lighting Company (LILCO), faced considerable public opposition after the 1979 Three Mile Island accident, with Suffolk County legislators claiming that the county could not be safely evacuated in the event of an accident. Governor Mario Cuomo ordered state officials not to approve any LILCO-sponsored evacuation plan - effectively preventing the plant from operating at full capacity. On May 19, 1989, LILCO agreed not to operate the plant in a deal with the state under which most of the $6 billion construction cost was passed on to Long Island ratepayers.

Fort St. Vrain Nuclear Generating Station

Reactor Type: Gas-Cooled Reactor
License Issued: 21 December 1973
Shutdown: 18 August 1989

The helium cooled, graphite moderated reactor went into commercial operation on July 1, 1979 and operated for a little more than 10 years. On August 18, 1989, while the plant was shut down to repair a stuck control rod pair, numerous cracks were discovered in several steam generator main steam ring headers. The required repairs were determined by the Public Service Company of Colorado Board of Directors to be too extensive to justify continued operation. On August 29, 1989, the Board decided to termination operations.

Yankee Nuclear Power Station

Reactor Type: Pressurized Water Reactor
Operating License Issued: 24 December 1963
Shutdown: 01 October 1991

The small, 185 megawatt nuclear reactor operated from 1961-1992 when it was permanently shut-down on February 26, 1992 by the Board of Directors of the Yankee Atomic Electric Company (Yankee Atomic). Although economics was cited in the decision by the board, it was the perceived viability of the plant's reactor vessel and related questions raised by the NRC's staff that likely contributed to the permanent shutdown. The inability to accurately quantify the actual level of embrittlement in the Yankee Rowe reactor vessel cast doubt on the vessel's ability to survive a thermal shock when cold water is injected during an accident condition. Potential fixes (e.g., replacing or annealing the vessel in situ) were both untried and unproven options and very costly.

Trojan Nuclear Plant

Reactor Type: Pressurized Water Reactor
Operating License Issued: 21 November 1975
Shutdown: 09 November 1992

In announcing the permanent cessation of operations in early 1993, the Directors of Portland General Electric (PGE), cited the cost of replacing the plant's steam generators (estimated then at $200 million) as the basis for the decision. The generators had experienced significant tube degradation and failures, beginning shortly after the plant went on line. (In a 1997 Technical Issues summary, the NRC noted that steam generator tube degradation was responsible for multiple

steam generator tube rupture events across the industry, extensive repairs, forced outages, replacement of the generators at 15 plants and contributed to the decision to shut down two nuclear power plants: San Onofre, Unit 1, and Trojan.)

There was also significant environmental opposition to the operation of the Trojan plant, with the owners surviving multiple state referendums that attempted to close the plant.

San Onofre Nuclear Generating Station, Unit 1

Reactor Type: Pressurized Water Reactor
Operating License Issued: 27 March 1967
Shutdown: 31 November 1992

Unit 1 entered commercial operation in January of 1968. It had a capacity factor of approximately 73 percent over its first twelve years of operation, but half that value over the succeeding thirteen years (through 1992). The change in performance was due to several extended outages for major plant repairs (e.g., steam generator tube sleeving and redesign of the reactor vessel thermal shield supports) and upgrades (e.g., in seismic design, fire protection, and from post- Three Mile Island (TMI) requirements). Southern California Edison's (SCE) attempt to convert its Provisional Operating License to a Full-Term Operating License was hindered by its high costs and the opposition of the Ratepayer Advocate to recover such costs in rates, arguing declining performance and possible need to replace the steam generators. Ultimately, a settlement was reached to permanently shut down the unit and recoup sunk costs.

Zion Nuclear Power Station

Reactor Type: Pressurized Water Reactor
Operating License Issued: 19 October 1973 / 14 November 1973
Shutdown: 21 February 1997 / 19 September 1996

The 1998 press release announcing the permanent shutdown of the Zion reactors after nearly 25 years of operations, cited economics as the rationale. "A thorough analysis of the projected costs to produce power at the station and the expected price of electricity in a deregulated market led us to one conclusion: Zion Station will not be able to produce competitively priced power in a deregulated marketplace over the remaining useful life of the plant. The analysis was based on three factors: the cost of operating and supporting the plant, the amount of power it was expected to generate and the projected price of electricity in a deregulated market. "

The station had had a troubled past and was on the NRC's "watch list" prior to its announcement to permanent cease operations (along with two other nuclear stations operated by Commonwealth Edison). The decision to shut down followed an earlier announcement not to replace the plants steam generators. The shutdown decision was viewed by investors as an opportunity for the owner/operator to reallocate its resources to its other troubled facilities.

Connecticut Yankee Atomic Power Station

Reactor Type: Pressurized Water Reactor
Operating License Issued: 30 June 1967 (Provisional)
Operating License Issued: 27 December 1974 (Full Term)
Shutdown: 05 December 1996

The Connecticut Yankee Atomic Power Company Board of Directors voted to permanently close the Haddam Neck plant in December 1996. Press releases by the company identified three factors: the age of the plant, its relatively small size, and its high operating cost compared to alternative energy sources (e.g., oil and natural gas). The plant also had a troubled past, having been shut down since the previous July for safety reasons (as reported by the NRC in its 1997 notice of violation and referenced inspections in 1995 and 1996).

Maine Yankee Atomic Power Station

Reactor Type: Pressurized Water Reactor
Operating License Issued: 29 June 1973
Shutdown: 06 December 1996

While the plant's operating history had been one of successful low-cost, reliable generation, the two years preceding its closure were marked by unscheduled outages, increased regulatory scrutiny, and considerable media attention. As a result of extensive outages in 1995 and 1996, and growing concerns about steam generator reliability, the plant owners conducted detailed economic analyses on the viability of continuing plant operation, versus permanently closing the facility. The Maine Yankee Atomic Power Company Board voted on August 6, 1997 to decommission the plant. David Flanagan, chair of the Maine Yankee Atomic Power Company Board, stated that "an economic analysis of operations, rising expenses for plant upgrades and the projections for stable power costs fueled the decision by Maine Yankee's eight owners to explore permanent shutdown."

Big Rock Point Nuclear Plant

Reactor Type: Boiling Water Reactor
Operating License Issued: 01 May 1964
Shutdown: 29 August 1997

Consumers Energy announced on June 11, 1997, that the nation's longest running and oldest operating unit would be permanently shut down on August 30, 1997. The announcement cited the plant's relatively small generating capacity (67 megawatts), high cost of operation in an increasingly competitive environment, improvements to the plant that would be needed to meet future regulatory requirements and the limited time left on its operating license (3 years).

Millstone Power Station, Unit 1

Reactor Type: Boiling Water Reactor
Operating License Issued: 31 October 1970 (Provisional)
Operation License Issued: 31 October 1986 (Full Term)
Shutdown: 21 July 1998

On July 17, 1998, Northeast Utility decided to permanently shut down the Unit 1 reactor (it had been shut down for refueling in November of 1995 and not restarted). The company concluded that the cost to restore the plant to full operations would only bring a slight economic benefit to its customers. Once recognized as one of the best performing boiling water reactors, Unit 1, along with the adjacent two units at the site were on the NRC's watch list at the time the decision was made to close and the company had been assessed the largest fine ever imposed by the NRC (citing more than 50 violations from October 24, 1995 to December 31, 1996). Restart of any of the three units was contingent, at that time, on approval from an independent consultant and a vote from the regulatory agency.

Crystal River Nuclear Plant, Unit 3

Reactor Type: Pressurized Water Reactor
Operating License Issued: 03 December 1976
Shutdown: 20 February 2013

In 2009, Progress Energy replaced the unit's two steam generators during a scheduled maintenance and refueling outage. In the process, engineers discovered a delamination, or separation of concrete, within the reactor building that surrounds the reactor vessel. Although the initial damage was successfully

repaired, additional delamination was discovered in two different areas of the reactor building in 2011.

An independent review commissioned in 2012 confirmed that repairing the containment building was technically feasible but included significant risks that could raise the cost of the repair and extend the repair schedule significantly. On February 5, 2013, Duke Energy (having acquired Progress Energy in 2012) announced its decision to retire the nuclear unit instead of pursuing repair to the plant's containment building.

Kewaunee Power Station

Reactor Type: Pressurized Water Reactor
Operating License Issued: 21 December 1973
Shutdown: 07 May 2013

On October 22, 2012, Dominion Resource Inc. announced that they would shut down the nuclear unit in mid-2013 after they were unable to find a buyer for the plant. The announcement cited the low price of natural gas, (e.g., from record shale production), expiring purchase power agreements, the plant's age, and Dominion's inability to grow its nuclear fleet in the Midwest (which would have provided some economics in operations).

San Onofre Nuclear Generating Station, Units 2 and 3

Reactor Type: Pressurized Water Reactor
Operating License Issued: 16 February 1982 / 15 November 1982
Shutdown: 13 June 2013

On June 7, 2013, Southern California Edison (SCE) decided to permanently retire Units 2 and 3 at its San Onofre Nuclear Generating Station (San Onofre). The Chairman and CEO of Edison International cited continuing uncertainty about when or if the units might return to service as the deciding factor. In particular, ongoing regulatory and administrative processes and appeals were expected to cause extended delays. Both units had been shut down since January 2012, Unit 2 for refueling and Unit 3 after small leaks were detected in the newly replaced steam generators (the steam generators had been replaced in Unit 2 in 2009 and in Unit 3 in 2010). A subsequent investigation concluded that the steam generators, manufactured by Mitsubishi Heavy Industries, had design flaws.

Vermont Yankee Nuclear Power Station

Reactor Type: Boiling Water Reactor
Operating License Issued: 21 March 1972
Shutdown: 29 December 2014

On August 27, 2013, Entergy Corporation announced that Vermont Yankee would cease operations in the fourth quarter of 2014 for economic reasons. Reasons cited included; sustained, low natural gas prices and wholesale energy prices, a high cost structure for the single unit plant (since 2002, the company invested more than $400 million in the safe and reliable operation of the facility), the financial impact of cumulative regulation, and artificially low energy and capacity prices in the region that did not provide adequate compensation to merchant nuclear plants for the fuel diversity benefits they provide.

Fort Calhoun Station

Reactor Type: PRESSURIZED WATER REACTOR
Operating License Issued: 09 August 1973
Shutdown: 24 October 2016

On June 16, 2016, the Omaha Public Power District's Board of Directors determined that it was in the best financial interest of the District and its customer-owners to retire Fort Calhoun Station by the end of 2016. Market conditions were cited as a primary factor in the decision, including historically low natural gas prices and a reduced demand for electricity. Fort Calhoun was also the smallest rated commercial unit in the United States at the time, making it difficult to absorb the higher, fixed production costs.

Oyster Creek Nuclear Generating Station

Reactor Type: Boiling Water Reactor
Operating License Issued: 09 April 1969
Shutdown: 17 September 2018

In January 2010, the New Jersey Department of Environmental Protection (NJDEP) revised rules on water use such that once-through cooling is no longer allowed for large industrial facilities which included Oyster Creek Station. Oyster Creek entered negotiations with the State of New Jersey throughout 2010 and announced in December of 2010 that the facility would be closed by year end 2019 to preclude installation of cooling towers as mandated by the new NJDEP regulations and standards. Due to growing costs and external economic factors (mainly driven by the expiring/expired price agreements due to the announced

closure), in February 2018, Exelon announced an accelerated plant closure date of October 2018. The unit was permanently shut down on September 17, 2018.

Pilgrim Nuclear Power Station

Reactor Type: Boiling Water Reactor
Operating License Issued: 08 June 1972
Shutdown: 31 May 2019

In 2015, Entergy announced a strategy to reduce risk and shrink its footprint of Entergy Wholesale Commodities (EWC) merchant nuclear power business. On October 10, 2015, Entergy announced it would close Pilgrim Nuclear Power Station no later than June 1, 2019. The company cited poor market conditions, reduced revenues, and increased operational costs as reason for the closure. Specifically noted were the low current and forecast wholesale energy prices, design flaws in the wholesale energy market, and increased costs associated with addressing the NRC placing the unit in regulatory Column 4. On August 23, 2019, the NRC approved the license transfer of Pilgrim to Holtec.

Three Mile Island Nuclear Station Unit 1

Reactor Type: PRESSURIZED WATER REACTOR
Operating License Issued: 19 April 1974
Shutdown: 20 September 2019

In May 2017, Exelon Generation announced that without Pennsylvania state policy reforms, Three Mile Island Nuclear Station (TMI) Unit 1 would close in September 2019. Exelon representatives cited the reason for closing to be economic challenges and inability to compete with other state-subsidized energy sources as Pennsylvania energy policies do not currently recognize nuclear as clean energy. On May 8, 2019 the decision was made final to shutdown TMI Unit 1 by September 30, 2019. In early 2022, the owner of TMI Unit 1 was changed to Constellation Energy Company by an indirect transfer.

Indian Point Energy Center Unit 2

Reactor Type: Pressurized Water Reactor
Operating License Issued: 28 September 1973
Shutdown: 30 April 2020

On January 9, 2017 Entergy announced it would cease operating both operating units at Indian Point Energy Center in 2020 (Unit 2) and 2021 (Unit 3). The early shutdown of the Units as part of a settlement under which the State of New York

has agreed to drop legal challenges and support renewal of the operating licenses for both Indian Point Units. The company noted the early shutdown is in alignment with their EWC footprint reduction and cited sustained low current and projected wholesale energy prices which reduced revenues, as well as increased operational costs. The company additionally noted the $200 million spent in license renewal and associated legal costs with no foreseeable resolution as a reason for the early closure. On November 23, 2020 the NRC approved the transfer of the facility operating licenses for all units and the general license for the ISFSI from Entergy to Holtec.

Duane Arnold Energy Center

Reactor Type: Boiling Water Reactor
Operating License Issued: 22 June 1970
Shutdown: 10 August 2020

NextEra Energy had expected to permanently cease operations at Duane Arnold Energy Center (DAEC) in 2025 following the expiration of the plant's power purchase agreement (PPA) with Alliant Energy. However, in 2018, NextEra and Alliant reached a settlement to shorten the term of the PPA by five years, moving the expected shutdown date to October 2020. In August 2020, DAEC suffered damages to non-safety related portions of the plant, including the cooling towers, due to a derecho, a land-based hurricane. Consequently, DAEC permanently shut down on August 10, 2020.

Indian Point Energy Center Unit 3

Reactor Type: Pressurized Water Reactor
Operating License Issued: 12 December 1975
Shutdown: 20 April 2021

In 2015, Entergy announced a strategy to reduce risk and shrink its footprint of Entergy Wholesale Commodities (EWC) merchant nuclear power business. On January 9, 2017 Entergy announced it would cease operation of both operating units at Indian Point Energy Center in 2020 (Unit 2) and 2021 (Unit 3). The early shutdown of the Units is part of a settlement under which the State of New York has agreed to drop legal challenges and support renewal of the operating licenses for both Indian Point Units. The company noted the early shutdown is in alignment with their EWC footprint reduction and cited sustained low current and projected wholesale energy prices which reduced revenues, as well as increased operational costs. The company additionally noted the $200 million spent in license renewal and associated legal costs with no foreseeable resolution as a reason for the early closure. On November 23, 2020 the NRC approved the transfer of the facility

operating licenses for all units and the general license for the ISFSI from Entergy to Holtec.

Palisades Nuclear Plant

Reactor Type: Pressurized Water Reactor
Operating License Issued: 24-February 1971 (Provisional)
Operating License Issued: 21 February 1991 (Full-Term)
Shutdown: 31 May 2022

In 2015, Entergy announced a strategy to reduce risk and shrink its footprint of Entergy Wholesale Commodities (EWC) merchant nuclear power business. In 2017 it was decided the Palisades Nuclear Plant would shut down on May 31, 2022 at the expiration of the plant's power purchase agreement with Consumers Energy, marking the completion of Entergy's strategy. On May 20, 2022 the plant was removed from service early due to the performance of a control rod drive seal. On June 28, 2022 the NRC approved the transfer of the facility operating license from Entergy to Holtec.

3. Actual v. Projected Cost of Decommissioning

In general, the financial information available on the decommissioning projects that have been completed is limited, beyond that provided in periodic NRC-required filings on financial assurance. Decommissioning contractors believe that the release of detailed cost information can cause irreparable harm to their competitive position in bidding future work and plant owners generally release only what is required by regulators. As such, cost data in the public record is typically presented at a very high level or heavily redacted.

The NRC's regulations require licensees to demonstrate financial assurance throughout the operating life of the reactor, including biennial comparisons to the NRC's threshold funding amounts. In addition, licensees are required to file several, site-specific estimates as the plant nears its end of operating life and following the permanent cessation of operations:

- a preliminary decommissioning cost estimate at or about 5 years prior to the projected end of operations (10 CFR 50.75(f)(2)) which includes an up-to-date assessment of the major factors that could affect the cost to decommission;
- an estimate of expected costs for the activities being proposed in the Post-Shutdown Decommissioning Activities Report (PSDAR), submitted prior to or within 2 years following permanent cessation of operations;

- a site-specific decommissioning cost estimate within 2 years following permanent cessation of operations. This requirement may be satisfied by including a site-specific estimate as part of the PSDAR. (10 CFR 50.82(a)(8)(iii)); and
- an updated site-specific estimate of remaining decommissioning costs as part of a License Termination Plan (LTP) at least 2 years before termination of the license (10 CFR 50.82(a)(9)(ii)(F)).

The following chronologies were extracted from the licensee's NRC filings and referenced documents, as available, for projects that have been recently completed or are nearing completion. Decommissioning, for purposes of this discussion, is tied to the completion of the radiological remediation work at the site since, in most instances, the site will remain under a NRC license until the spent fuel can be removed by the Department of Energy (DOE), i.e., there is still an ongoing caretaking cost being reported at most sites for the operation of an ISFSI.

The chronologies reflect a degree of volatility in the early decommissioning cost estimates (prepared in the late 1980s and early 1990s). This can be attributed to issues such as:

- Premature shutdown adding costs with longer and less efficient transitions from plant operations to decommissioning (since little or no pre-planning had been done).
- Minimal regulatory guidance as the NRC had not anticipated the wave of early plant closures. Decommissioning planning was also more cumbersome in the pre-PSDAR era and regulatory relief was on a case-by-case basis.
- ISFSIs were required to off-load storage pools and reduce plant operating costs (earlier decommissioning estimates had assumed that the spent fuel would be removed by the DOE in accordance with the standard contract).
- The decommissioning trust funds were not fully funded due to the abbreviated operating periods – limiting options and favoring deferred action or temporary actions while funding was secured.
- Low-level radioactive waste disposal costs were in flux with the failed attempts to create state compacts and develop new disposal sites.

In 1996, in an effort to streamline the regulatory process for those plants that had prematurely ceased operations, the NRC published revisions to its general requirements for decommissioning nuclear power plants. The rule was intended to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process. The 1996 rule, along with

other NRC staff guidance (for example, Regulatory Guide 1.184 issued in July 2000), provided a more predictable path to license termination and added an additional degree of certainty to later decommissioning estimates.

Rancho Seco Nuclear Generating Station

On May 20, 1991, the District submitted a proposed Decommissioning Plan to the NRC. The plan outlined a scenario that placed the plant into "Hardened SAFSTOR". The spent fuel would be moved into dry storage and the plant placed into a safe, dormant condition with a small site maintenance staff until 2008 (original license expiration) when a Decommissioning Operations Contractor would be brought in to complete decommissioning. The timeline allowed for the Decommissioning Trust Fund to be fully funded before dismantlement began. The NRC issued a decommissioning order and approved the Rancho Seco decommissioning funding plan on March 20, 1995.

Shortly thereafter, the District engaged TLG Services, Inc. (TLG) to develop alternatives to the SAFSTOR scenario (due to delays and increased cost of the dry

fuel storage project), including using the on-site staff for limited decontamination and dismantling activities. In January of 1997, Board of Directors (the Board) approved a trial project involving the limited physical dismantlement of the facility. In 1999, the Board approved expansion of the Incremental Decommissioning Project to include all activities necessary for license termination.

The cost estimate prepared by TLG in 1999 represented both the shift to a plant area-based approach and the schedule change associated with accelerating the decommissioning timeline. With the commencement of active decommissioning came the requirement to perform annual updates to the cost estimate. In 2000, TLG prepared an update to the 1999 area-based cost estimate. By that time, relatively long-term contracts were in place to provide labor, technical staff, transportation, radwaste packaging materials, radwaste processing, and radwaste disposal to support the decommissioning process. TLG used this actual information when preparing the 2000 cost estimate.

1999 TLG Estimate (license termination) TLG Document No. S11-1337-003, Rev. 0	$420.178 million ($1999)
2000 TLG Estimate (license termination) TLG Document No. S11-1360-002, Rev. 0	$495.416 million ($2000)
Update of Site-Specific Decommissioning Costs Rancho Seco License Termination Plan, Rev. 2 October 2014	$534.185 million ($2005)

2011 Decommissioning Cost Estimate 18 June 2012 Letter to NRC (DPG 12-305)	$517.1 million ($2011)[1]
Report on Decommissioning Funding Status 14 March 2016 Letter to NRC (DPG 16-0620	$518.34 million[2]

Rancho Seco Notes:

1. $487.2 spent to date for site remediation (site is released except for that area around the Interim Onsite Storage Building). Future costs for remaining activities are estimated at $29.9 million for a total 2011 Decommissioning Cost Estimate of $517.1 million. Remaining activities include: the transfer of Greater Than Class "C" (GTCC) Radioactive Waste to the DOE in 2027; disposal of Class B & C low- level radioactive waste (LLRW) in 2016 and oversight of the LLRW until disposal; and license termination activities following disposal of the LLRW.
2. Remaining activities include: the transfer of the used nuclear fuel and GTCC, license termination activities for the area licensed under Part 50 begun in 2015 and scheduled to be completed in 2016; and, license termination activities for the Part 72 licensed facility following removal of the material from the ISFSI.

Yankee Nuclear Power Station

The Decommissioning Plan, which was submitted in December 1993 by the Yankee Atomic, involved placing the plant into SAFSTOR until a low-level waste disposal facility was available (expected in 2000), when dismantlement (DECON) would begin. The Decommissioning Plan included a cost study for operating the facility through a safe storage period, decommissioning the facility, restoring the site, and storing spent fuel until its transfer to the DOE. In October 1994, Yankee Atomic completed a revised cost study to assist the NRC in its review of the Decommissioning Plan and to fulfill a commitment to Federal Energy Regulatory Commission (FERC). This 1994 cost study was also based on the assumption that dismantlement activities would not begin until a low-level radioactive waste disposal site became available.

In June 1995, the State of South Carolina re-opened the low-level waste facility in Barnwell, South Carolina, to radioactive waste generators throughout the United States. In response, Yankee Atomic updated the cost estimate to reflect several significant changes in parameters affecting decommissioning costs. This study, called the 1995 Cost Study, was filed with FERC in August 1995. In this study, the 1994 Cost Study was adjusted for differences in decommissioning timing, waste disposal costs, and one year of escalation. The 1995 Cost Study estimate of "to-go" costs remaining as of January 1995 was $303.2 million. In addition, as part of the final December 1995 FERC settlement, Yankee Atomic was allowed to collect another $3.2 million in the decommissioning trust fund to adjust for adjudicatory delays during re-approval of the Decommissioning Plan, bringing the total January 1995 "to-go" cost to $306.4 million (1995 dollars).

As required by the FERC settlement, an updated cost estimate was filed in December 1999.

Yankee Atomic submitted a new decommissioning cost estimate to FERC in April 2003 seeking additional revenue. The 2003 estimate superseded the 1999 "to go" cost estimate. It was reported that, as of January 1, 2003, the remaining cost to complete the NRC required decommissioning activities was estimated at $121.1 million, stated in 2003 dollars.

Decommissioning was completed and the plant's operating license was amended (for continued ISFSI operations) in August 2007.

1995 Cost Study ("to go" costs)	$306.4 million (1995 dollars)
1999 Cost Estimate	$453.0 million (1999 dollars)[3]
Yankee Atomic LTP, Rev. 1 YAEC to NRC, BYR 2004-133 19 November 2004	$636.4 million ($2003)[4]

Yankee-Rowe Notes:

3. The total includes $207.1 million spent to date, $147.7 million in projected expenditures for dismantling and $98.3 million in spent fuel storage costs.
4. The total includes $347.9 million spent to date, $288.5 million in projected expenditures (2003 - 2022) in 2003 dollars. The $288.5 million included the remaining cost to complete the required decommissioning activities ($121.1 million), contingency, long term spent fuel storage costs through 2022, and site restoration.

Trojan Nuclear Plant

Portland General Electric (PGE) reported that the decommissioning cost estimate in the initial Decommissioning Plan was based largely on a site-specific cost estimate performed for PGE by TLG Services, Inc. in May 1994.

In a March 8, 2005 meeting before the Oregon Public Utility Commission, PGE reported that radiological decommissioning was expected to be complete by June 2005 and that their overall radiological decommissioning cost performance was approximately 8% under budget.

Decommissioning was completed and the plant's operating license terminated (ISFSI operations continue under a separate license) in May of 2005.

TLG Document No. P15-25-002, Rev. 1 18 August 1994 (excludes the cost of the large component removal project, i.e., disposition of the reactor vessel, steam generators, pressurizer)	$289.8 million ($1993)
PGE Decommissioning Plan and LTP, Rev. 16 27 March 2003	$429.7 million ($1997)[5]

PGE Decommissioning Plan and LTP, Rev. 21 31 March 2005	$421.9 million ($1997)[6]

Trojan Notes:

5. Total cost includes radiological, non-radiological, dry spent fuel management and financing costs.
6. Total cost includes $211.7 million for radiological decommissioning activities, $40.2 million for non-radiological, $169.9 million for dry spent fuel management and $16 thousand for financing costs.

Zion Nuclear Power Station

Commonwealth Edison Company (now Exelon Generation Company) submitted a PSDAR on February 14, 2000, following the permanent cessation of operations of the two nuclear units at the Zion Nuclear Power Station in 1998.

On January 25, 2008, Exelon and Zion Solutions, LLC (a wholly-owned subsidiary of EnergySolutions, LLC) submitted an Application for License Transfers to the NRC requesting that the NRC consent to the transfer of the plant to ZionSolutions. On March 18, 2008, ZionSolutions submitted an amended PSDAR stating their intention to accelerate the decommissioning schedule if the application for license transfers was approved.

The decommissioning cost estimate presented in the ZionSolutions PSDAR was based upon the plant commodities developed for an earlier TLG cost estimate completed in 2006 for Exelon.

Commonwealth Edison, PSDAR 14 February 2000	$904.3 million ($1996)
2006 TLG Estimate TLG Document No. E16-1555-004, Rev. 0	$1.043 billion ($2006)
ZionSolutions, Amended PSDAR 18 March 2008	$978.0 million ($2007)[7]
Report on Decommissioning Funding Status 30 March 2016 Letter to NRC (ZS-2015-0044)	$677.2 million ($2014)
Report on Decommissioning Funding Status 29 March 2016 Letter to NRC (ZS-2016-0036)	$667.3 million ($2015)[8]

Zion Notes:

7. The $978.0 million in 2007 dollars includes provisions for storage of spent fuel and GTCC wastes on the Zion site until 2018, as well as site restoration costs for all areas except the ISFSI.
8. Includes $486.8 million spent to date (through December 31, 2015), $158.9 million estimated costs to complete decommissioning and $21.6 million for managing irradiated fuel at the site until 2020 when the site is scheduled to transition back to Exelon.

Maine Yankee Atomic Power Station

Maine Yankee submitted its site-specific decommissioning cost estimate to the NRC on November 3, 1998. The accompanying report, "Decommissioning Cost Analysis for the Maine Yankee Atomic Power Station," prepared by TLG and dated October 1997, provided the detailed analysis of the projected costs for the decommissioning activities (radiological decontamination, spent fuel management and site remediation/restoration).

The License Termination Plan (Rev. 2), submitted by Maine Yankee and dated October 15, 2002, escalated the TLG 1997 cost to 2001 dollars for comparison with the costs spent to date.

On March 30, 2005, Maine Yankee provided a decommissioning funding status report to the NRC (MN-05-014). In that submittal, the company reported that the plant "is nearing completion of decommissioning" and that "as of December 31, 2004, $554 million has been expended for all decommissioning costs, of which $405 million has been estimated as the allocation of actual expenditures for decommissioning activities, as defined by the NRC expenditures for decommissioning activities, as defined by the NRC in 10 CFR 50.2."

Decommissioning was completed and the plant's operating license was amended (for continued ISFSI operations) in September of 2005.

TLG Document No. M01-1258-002, Rev. 1 28 October 1997	$508.2 million ($1997)[9]
License Termination Plan, Rev. 3 15 October 2002	$589.3 million ($2001)[10]
NRC Decommissioning Funding Status Report 30 March 2005	$554 million (YOE)[11]

Maine Yankee Notes:

9. Total cost for radiological decontamination, spent fuel management and site remediation/restoration.
10. $508 million escalated to $2001.
11. Total cost as of 31 December 2004 including $405 million of decommissioning costs, excluding Department of Energy contract settlement credits.

Big Rock Point

Consumers Energy filed a revision to their PSDAR on March 26, 1998. The decommissioning costs reported in that document were based on a detailed, site-specific cost estimate that was prepared by TLG. Pursuant to State of Michigan requirements to prepare and file decommissioning cost estimate updates with the Michigan Public Service Commission (MPSC) at three-year intervals, an update was prepared by TLG in 2000 and filed in March 2001 as a follow-up to a site-specific decommissioning cost estimate filed with the MPSC in March 1998.

The 2000 estimate, updated with actual costs incurred through 2002 and the latest forecast costs, served as the cost basis for the License Termination Plan submitted in 2003. The $400.6 million estimated in 2001 was revised downward by Consumers Energy to $382.4 million in year 2000 constant dollars. The $18.2 million reduction was the result of a reduction in contingency dollars from $45.0 million to $13.0 million and an increase in projected spent fuel management costs from $50.9 million to $64.7 million.

Consumers Power noted in its LTP submittal that "entering the third year since the 2000 estimate was prepared, actual project cost performance has been on target and is expected to trend unchanged.

On March 31 2005, Consumers Power filed an update to the PSDAR (Rev. 4). The update included discussion on a revised cost estimate that had been presented to the MPSC in March 2004. The estimated cost to decommission the plant was based on the 2003 estimate study prepared by TLG. The estimate (in year of expenditure dollars) was $439.4 million.

Decommissioning was completed and the plant's operating license was amended (for continued ISFSI operations) in January of 2007.

1998 TLG Estimate $293.9 million ($1997)
TLG Document No. C07-1267-004, Rev. 0
26 March 1998

2001 TLG Estimate ($2000)[12] TLG Document No. C07-1388-003, Rev. 0 01 March 2001	$400.6	million
BRP License Termination Plan, Rev. 0 ($2000)[13] 01 April 2003	$382.4	million
2004 TLG Estimate ($2003) TLG Document No. C07-1479-001, Rev. 0 22 March 2004	$430.8	million
BRP PSDAR, Rev. 4 31 March 2005	$439.4	million (YOE)
BRP License Termination Plan, Rev. 2 (YOE)[14] 27 September 2005	$439.4	million

Big Rock Point Notes:

12. $323.0 million Radiological Decommissioning, $50.9 million for Spent Fuel Management and $26.7 million for Site Restoration.

13. $291.0 million Radiological Decommissioning, $64.7 million for Spent Fuel Management and $26.7 million for Site Restoration.

14. $333.9 million of radiological decommissioning costs, $73.6 million of spent nuclear fuel storage costs, $30.3 million of site restoration and $1.6 million of post 9-11 incremental security costs. Consumers Energy has concluded that, based upon information currently available, that the estimate was adequate to complete the remaining decommissioning activities for the plant.

Schedule B

2023 Evergy Missouri Metro Funding Analysis

EVERGY METRO, INC. (f/k/a KANSAS CITY POWER & LIGHT COMPANY)

WOLF CREEK DECOMMISSIONING TRUST ANALYSIS

MISSOURI JURISDICTION - QUALIFIED TAXABLE TRUST

DECOMMISSIONING COST ASSUMPTIONS

2023 Decom Cost Est	$ 1,183,198,487
Cost Escalation Rate	3.33%
Metro Share	47.00%
Future Juris Allocation Factor	53.11%
Wtd Historical/Future Alloc Factor	54.77%

DECOMMISSIONING TRUST FUND EARNINGS ASSUMPTIONS

TRUST FUND MANAGEMENT FEE	
Missouri Avg Fund Balance	$ 260,104,746
Missouri Annual Fixed Trustee Fee	49,516
Fixed Trustee Fee %	0.0190%
FI Fee and Fixed Trustee Fee%	0.0194%
Equity Fee and Fixed Fee	0.0228%

DECOMMISSIONING TRUST FUND CASH FLOWS

NET AFTER-TAX MARKET VALUE		
June 30, 2023 Market Value	222,728,331	
2023 Remaining Deposits	640,632	
Market Value Incl Remaining Deposit		223,368,963
Unrealized Net Gain	89,525,566	
Effective Tax Rate	20.00%	
Tax on Unrealized Net Gain		17,905,113
Net After-Tax Market Value		205,463,849

Annual Accrual Escalation	0.00%
Contribution	$ 1,281,264.00

Year	2023 Wolf Creek Decom Cost	Escalated Wolf Creek Decom Cost	Metro Missouri Decom Cost
2023	$ -	$ -	$ -
2024	$ -	$ -	$ -
2025	$ -	$ -	$ -
2026	$ -	$ -	$ -
2027	$ -	$ -	$ -
2028	$ -	$ -	$ -
2029	$ -	$ -	$ -
2030	$ -	$ -	$ -
2031	$ -	$ -	$ -
2032	$ -	$ -	$ -
2033	$ -	$ -	$ -
2034	$ -	$ -	$ -
2035	$ -	$ -	$ -
2036	$ -	$ -	$ -
2037	$ -	$ -	$ -
2038	$ -	$ -	$ -
2039	$ -	$ -	$ -
2040	$ -	$ -	$ -
2041	$ -	$ -	$ -
2042	$ -	$ -	$ -
2043	$ -	$ -	$ -
2044	$ -	$ -	$ -
2045	$ 78,763,511	$ 169,901,015	$ 43,738,842
2046	$ 167,311,059	$ 354,888,815	$ 91,361,584
2047	$ 195,793,622	$ 423,233,086	$ 108,955,942
2048	$ 214,553,540	$ 479,511,830	$ 123,444,184
2049	$ 96,789,401	$ 231,828,359	$ 59,681,244
2050	$ 53,355,651	$ 136,164,288	$ 35,053,753
2051	$ 48,724,496	$ 123,675,376	$ 31,838,643
2052	$ 15,376,748	$ 40,568,648	$ 10,443,879
2053	$ 10,231,654	$ 28,096,300	$ 7,233,033
2054	$ 10,231,654	$ 29,065,743	$ 7,482,604
2055	$ 10,499,029	$ 30,774,014	$ 7,922,376
2056	$ 10,258,221	$ 31,188,834	$ 8,029,166
2057	$ 10,231,654	$ 32,182,439	$ 8,284,957
2058	$ 10,499,029	$ 34,067,532	$ 8,770,250
2059	$ 10,231,654	$ 34,446,433	$ 8,867,793
2060	$ 10,258,221	$ 35,731,434	$ 9,198,601
2061	$ 10,499,029	$ 37,718,853	$ 9,710,236
2062	$ 10,231,654	$ 38,148,914	$ 9,820,950
2063	$ 10,231,654	$ 39,470,689	$ 10,161,224
2064	$ 10,525,596	$ 41,874,153	$ 10,779,965
2065	$ 10,231,654	$ 42,255,132	$ 10,878,043
2066	$ 10,231,654	$ 43,721,156	$ 11,255,452
2067	$ 10,499,029	$ 46,256,784	$ 11,908,217
2068	$ 10,258,221	$ 46,932,150	$ 12,082,082
2069	$ 10,499,029	$ 49,518,496	$ 12,747,903
2070	$ 10,231,654	$ 50,119,310	$ 12,902,575
2071	$ 10,231,654	$ 51,862,029	$ 13,351,216
2072	$ 10,525,596	$ 54,994,044	$ 14,157,513
2073	$ 10,231,654	$ 55,533,808	$ 14,296,468
2074	$ 10,231,654	$ 57,467,317	$ 14,794,225
2075	$ 10,499,029	$ 60,771,481	$ 15,644,840
2076	$ 10,258,221	$ 61,702,555	$ 15,884,533
2077	$ 10,231,654	$ 63,686,741	$ 16,395,336
2078	$ 28,016,192	$ 148,253,931	$ 38,166,077
2079	$ 26,424,512	$ 132,382,567	$ 34,080,198
	$ 1,183,198,487	$ 3,337,994,257	$ 859,323,905
Metro %	47.0%	47.0%	
Metro Share	$ 556,103,289	$ 1,568,857,301	
		54.7739%	
MO Jurisdictional Share --->		$ 859,323,905	

	US T-Bills	Fixed Income	Inter-national	Small Stocks	Lrg Corp Stocks	Weighted After-Tax Earnings
Pre-tax Returns	3.99%	4.91%	8.96%	8.79%	8.52%	
Effective Tax Rate	20.0%	20.0%	20.0%	20.0%	20.0%	
Earnings After Fees & Taxes	3.18%	3.91%	7.15%	7.01%	6.80%	
Year	Investment Mix					V
2023	0.0%	35.0%	15.0%	18.0%	32.0%	5.88%
2024	0.0%	35.0%	15.0%	18.0%	32.0%	5.88%
2025	0.0%	35.0%	15.0%	18.0%	32.0%	5.88%
2026	0.0%	35.0%	15.0%	18.0%	32.0%	5.88%
2027	0.0%	70.0%	7.0%	9.0%	14.0%	4.82%
2028	0.0%	73.3%	6.0%	7.7%	13.0%	4.72%
2029	0.0%	76.7%	5.0%	6.3%	12.0%	4.62%
2030	0.0%	80.0%	4.0%	5.0%	11.0%	4.51%
2031	0.0%	80.5%	4.0%	4.9%	10.6%	4.50%
2032	0.0%	81.0%	4.0%	4.8%	10.2%	4.49%
2033	0.0%	81.5%	4.0%	4.7%	9.8%	4.47%
2034	0.0%	82.0%	4.0%	4.6%	9.4%	4.46%
2035	0.0%	82.5%	4.0%	4.5%	9.0%	4.44%
2036	0.0%	83.0%	4.0%	4.4%	8.6%	4.43%
2037	0.0%	83.5%	4.0%	4.3%	8.2%	4.41%
2038	0.0%	84.0%	4.0%	4.2%	7.8%	4.40%
2039	0.0%	84.5%	4.0%	4.1%	7.4%	4.38%
2040	0.0%	85.0%	4.0%	4.0%	7.0%	4.37%
2041	0.3%	85.0%	3.9%	3.7%	7.0%	4.36%
2042	0.7%	85.0%	3.9%	3.5%	7.0%	4.34%
2043	1.0%	85.0%	3.8%	3.2%	7.0%	4.33%
2044	1.3%	85.0%	3.7%	2.9%	7.0%	4.32%
2045	1.7%	85.0%	3.7%	2.7%	7.0%	4.30%
2046	2.0%	85.0%	3.6%	2.4%	7.0%	4.29%
2047	2.3%	85.0%	3.5%	2.1%	7.0%	4.28%
2048	2.7%	85.0%	3.5%	1.9%	7.0%	4.26%
2049	3.0%	85.0%	3.4%	1.6%	7.0%	4.25%
2050	3.3%	85.0%	3.3%	1.3%	7.0%	4.24%
2051	3.7%	85.0%	3.3%	1.1%	7.0%	4.23%
2052	4.0%	85.0%	3.2%	0.8%	7.0%	4.21%
2053	4.3%	85.0%	3.1%	0.5%	7.0%	4.20%
2054	4.7%	85.0%	3.1%	0.3%	7.0%	4.19%
2055	5.0%	85.0%	3.0%	0.0%	7.0%	4.17%
2056	6.0%	84.7%	2.8%	0.0%	6.5%	4.15%
2057	7.0%	84.3%	2.6%	0.0%	6.1%	4.12%
2058	8.0%	84.0%	2.4%	0.0%	5.6%	4.09%
2059	9.0%	83.7%	2.2%	0.0%	5.1%	4.07%
2060	10.0%	83.3%	2.0%	0.0%	4.7%	4.04%
2061	11.0%	83.0%	1.8%	0.0%	4.2%	4.01%
2062	12.0%	82.7%	1.6%	0.0%	3.7%	3.98%
2063	13.0%	82.3%	1.4%	0.0%	3.3%	3.96%
2064	14.0%	82.0%	1.2%	0.0%	2.8%	3.93%
2065	15.0%	81.7%	1.0%	0.0%	2.3%	3.90%
2066	16.0%	81.3%	0.8%	0.0%	1.9%	3.87%
2067	17.0%	81.0%	0.6%	0.0%	1.4%	3.85%
2068	18.0%	80.7%	0.4%	0.0%	0.9%	3.82%
2069	19.0%	80.3%	0.2%	0.0%	0.5%	3.79%
2070	20.0%	80.0%	0.0%	0.0%	0.0%	3.77%
2071	28.9%	71.1%	0.0%	0.0%	0.0%	3.70%
2072	37.8%	62.2%	0.0%	0.0%	0.0%	3.63%
2073	46.7%	53.3%	0.0%	0.0%	0.0%	3.57%
2074	55.6%	44.4%	0.0%	0.0%	0.0%	3.50%
2075	64.4%	35.6%	0.0%	0.0%	0.0%	3.44%
2076	73.3%	26.7%	0.0%	0.0%	0.0%	3.37%
2077	82.2%	17.8%	0.0%	0.0%	0.0%	3.31%
2078	91.1%	8.9%	0.0%	0.0%	0.0%	3.24%
2079	100.0%	0.0%	0.0%	0.0%	0.0%	3.18%
2023	0%	35%	15%	18%	32%	
2027	0%	70%	7%	9%	14%	100%
	0%	-3%	1%	1%	1%	
2030	0%	80%	4%	5%	11%	100%
	0%	0%	0%	0%	0%	

Year	Trust Fund Contribution	Trust Fund Expenditure	Earnings After Fees & Taxes	Trust Fund Balance
2023		$ -	$ -	$ 205,463,849
2024	$ 1,281,264	$ -	$ 12,108,697	$ 218,853,810
2025	$ 1,281,264	$ -	$ 12,895,973	$ 233,031,047
2026	$ 1,281,264	$ -	$ 13,729,537	$ 248,041,848
2027	$ 1,281,264	$ -	$ 11,984,071	$ 261,307,183
2028	$ 1,281,264	$ -	$ 12,355,207	$ 274,943,654
2029	$ 1,281,264	$ -	$ 12,716,264	$ 288,941,182
2030	$ 1,281,264	$ -	$ 13,065,644	$ 303,288,090
2031	$ 1,281,264	$ -	$ 13,668,841	$ 318,238,195
2032	$ 1,281,264	$ -	$ 14,294,890	$ 333,814,349
2033	$ 1,281,264	$ -	$ 14,944,548	$ 350,040,161
2034	$ 1,281,264	$ -	$ 15,618,593	$ 366,940,018
2035	$ 1,281,264	$ -	$ 16,317,821	$ 384,539,103
2036	$ 1,281,264	$ -	$ 17,043,051	$ 402,863,418
2037	$ 1,281,264	$ -	$ 17,795,125	$ 421,939,807
2038	$ 1,281,264	$ -	$ 18,574,902	$ 441,795,973
2039	$ 1,281,264	$ -	$ 19,383,267	$ 462,460,504
2040	$ 1,281,264	$ -	$ 20,221,127	$ 483,962,896
2041	$ 1,281,264	$ -	$ 21,097,940	$ 506,342,100
2042	$ 1,281,264	$ -	$ 22,007,287	$ 529,630,651
2043	$ 1,281,264	$ -	$ 22,950,236	$ 553,862,151
2044	$ 1,281,264	$ -	$ 23,927,888	$ 579,071,303
2045	$ 320,316	$ (43,738,842)	$ 24,219,989	$ 559,872,766
2046	$ -	$ (91,361,584)	$ 22,552,338	$ 491,063,520
2047	$ -	$ (108,955,942)	$ 19,258,864	$ 401,366,442
2048	$ -	$ (123,444,184)	$ 15,143,647	$ 293,065,905
2049	$ -	$ (59,681,244)	$ 11,509,639	$ 244,894,300
2050	$ -	$ (35,053,753)	$ 9,824,201	$ 219,664,748
2051	$ -	$ (31,838,643)	$ 8,779,033	$ 196,605,138
2052	$ -	$ (10,443,879)	$ 8,118,725	$ 194,279,984
2053	$ -	$ (7,233,033)	$ 8,046,812	$ 195,093,763
2054	$ -	$ (7,482,604)	$ 8,052,293	$ 195,663,452
2055	$ -	$ (7,922,376)	$ 8,044,422	$ 195,785,498
2056	$ -	$ (8,029,166)	$ 7,995,218	$ 195,751,550
2057	$ -	$ (8,284,957)	$ 7,937,241	$ 195,403,834
2058	$ -	$ (8,770,250)	$ 7,862,970	$ 194,496,554
2059	$ -	$ (8,867,793)	$ 7,772,150	$ 193,400,911
2060	$ -	$ (9,198,601)	$ 7,670,707	$ 191,873,017
2061	$ -	$ (9,710,236)	$ 7,549,873	$ 189,712,654
2062	$ -	$ (9,820,950)	$ 7,410,771	$ 187,302,475
2063	$ -	$ (10,161,224)	$ 7,259,582	$ 184,400,834
2064	$ -	$ (10,779,965)	$ 7,086,367	$ 180,707,236
2065	$ -	$ (10,878,043)	$ 6,891,580	$ 176,720,773
2066	$ -	$ (11,255,452)	$ 6,683,424	$ 172,148,744
2067	$ -	$ (11,908,217)	$ 6,451,022	$ 166,691,549
2068	$ -	$ (12,082,082)	$ 6,194,298	$ 160,803,766
2069	$ -	$ (12,747,903)	$ 5,917,263	$ 153,973,126
2070	$ -	$ (12,902,575)	$ 5,615,294	$ 146,685,845
2071	$ -	$ (13,351,216)	$ 5,241,886	$ 138,576,515
2072	$ -	$ (14,157,513)	$ 4,843,481	$ 129,262,482
2073	$ -	$ (14,296,468)	$ 4,422,018	$ 119,388,033
2074	$ -	$ (14,794,225)	$ 3,988,462	$ 108,582,269
2075	$ -	$ (15,644,840)	$ 3,531,501	$ 96,468,930
2076	$ -	$ (15,884,533)	$ 3,052,722	$ 83,637,119
2077	$ -	$ (16,395,336)	$ 2,562,786	$ 69,804,568
2078	$ -	$ (38,166,077)	$ 1,798,990	$ 33,437,480
2079	$ -	$ (34,080,198)	$ 656,172	$ 13,455
			Surplus/(Deficit)	0.00%

SCHEDULE C
IS CONFIDENTIAL IN ITS ENTIRETY

IT CONTAINS INFORMATION
NOT AVAILBLE TO THE PUBLIC.

ORIGINAL FILED UNDER SEAL