DECOMMISSIONING COST ANALYSIS

for the

WOLF CREEK GENERATING STATION

prepared for

Wolf Creek Nuclear Operating Corporation

prepared by

TLG Services, Inc.
Bridgewater, Connecticut

August 2008

APPROVALS

Project Manager	William A. Cloutier, Jr.	21 Aug 08 Date
Project Engineer	Thomas J. Garrett	8/21/08 Date
Technical Manager	Francis W. Seymore	8/21/08 Date
Quality Assurance Manager	Joseph J. Adler	8/21/08 Date

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REVISION LOG

No.	CRA No.	Date	Item Revised	Reason for Revision
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EXECUTIVE SUMMARY

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. The analysis relies upon site-specific, technical information from an evaluation prepared in 2005,[1] updated to reflect current assumptions pertaining to the disposition of the nuclear unit and relevant industry experience in undertaking such projects. The current estimates are designed to provide the Wolf Creek Nuclear Operating Corporation (WCNOC), the plant's operator, and the plant's owners, with sufficient information to assess their financial obligations, as they pertain to the eventual decommissioning of the nuclear unit.

The currently projected cost to decommission the station, assuming the DECON alternative, is estimated at $593.5 million, as reported in 2008 dollars. An estimate for the SAFSTOR alternative is also provided.

The estimates are based on numerous fundamental assumptions, including regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. The estimates incorporate a minimum cooling period of approximately 5½ years for the spent fuel that resides in the storage pool when operations cease. During this period, it is assumed the Department of Energy (DOE) will complete the transfer of the residual spent fuel inventory to a DOE repository. The estimates also include the dismantling of non-essential structures and limited restoration of the site.

Alternatives and Regulations

The ultimate objective of the decommissioning process is to reduce the inventory of contaminated and activated material so that the license can be terminated. The Nuclear Regulatory Commission (NRC or Commission) provided initial decommissioning requirements in its rule adopted on June 27, 1988.[2] In this rule, the NRC set forth financial criteria for decommissioning licensed nuclear power facilities. The regulations addressed planning needs, timing, funding methods, and environmental review requirements for decommissioning. The rule also defined three

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1 "Decommissioning Cost Analysis for the Wolf Creek Generating Station," Document No. W11-1536-002, Rev. 0, TLG Services, Inc., August 2005

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

decommissioning alternatives as being acceptable to the NRC: DECON, SAFSTOR, and ENTOMB.

> DECON is defined as "the alternative in which the equipment, structures, and portions of a facility and site containing radioactive contaminants are removed or decontaminated to a level that permits the property to be released for unrestricted use shortly after cessation of operations."[3]
>
> SAFSTOR is defined as "the alternative in which the nuclear facility is placed and maintained in a condition that allows the nuclear facility to be safely stored and subsequently decontaminated (deferred decontamination) to levels that permit release for unrestricted use."[4] Decommissioning is to be completed within 60 years, although longer time periods will be considered when necessary to protect public health and safety.
>
> ENTOMB is defined as "the alternative in which radioactive contaminants are encased in a structurally long-lived material, such as concrete; the entombed structure is appropriately maintained and continued surveillance is carried out until the radioactive material decays to a level permitting unrestricted release of the property."[5] As with the SAFSTOR alternative, decommissioning is currently required to be completed within 60 years.
>
> The 60-year restriction has limited the practicality for the ENTOMB alternative at commercial reactors that generate significant amounts of long-lived radioactive material. In 1997, the Commission directed its staff to re-evaluate this alternative and identify the technical requirements and regulatory actions that would be necessary for entombment to become a viable option. The resulting evaluation provided several recommendations, however, rulemaking has been deferred pending the completion of additional research studies, for example, on engineered barriers.

In 1996, the NRC published revisions to the 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.[6] The amendments allow for greater public participation

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3 Ibid. Page FR24022, Column 3
4 Ibid.
5 Ibid. Page FR24023, Column 2
6 U.S. Code of Federal Regulations, Title 10, Parts 2, 50, and 51, "Decommissioning of Nuclear Power

and better define the transition process from operations to decommissioning. Regulatory Guide 1.184, issued in July 2000, further described the methods and procedures acceptable to the NRC staff for implementing the requirements of the 1996 revised rule relating to the initial activities and major phases of the decommissioning process. The costs and schedules presented in this analysis follow the general guidance and processes described in the amended regulations. The format and content of the estimates is also consistent with the recommendations of Regulatory Guide 1.202, issued in February 2005.[7]

Methodology

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

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

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.

Contingency

Consistent with cost estimating practice, contingencies are applied to the decontamination and dismantling costs developed as "specific provision for

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Reactors," Nuclear Regulatory Commission, Federal Register Volume 61, (p 39278 et seq.), July 29, 1996

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

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

unforeseeable elements of cost within the defined project scope, particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur."[9] The cost elements in the estimates are based on ideal conditions; therefore, the types of unforeseeable events that are almost certain to occur in decommissioning, based on industry experience, are addressed through a percentage contingency applied on a line-item basis. This contingency factor is a nearly universal element in all large-scale construction and demolition projects. It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

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

Low-Level Radioactive Waste Disposal

The contaminated and activated material generated in the decontamination and dismantling of a commercial nuclear reactor is classified as low-level (radioactive) waste, although not all of the material is suitable for "shallow-land" disposal. With the passage of the "Low-Level Radioactive Waste Policy Act" in 1980,[10] and its Amendments of 1985,[11] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders.

Until recently, there were two facilities available to WCNOC for the disposal of low-level radioactive waste generated by Wolf Creek. As of July 1, 2008, however, the facility in Barnwell, South Carolina was closed to generators outside the Atlantic Compact (comprised of the states of Connecticut, New Jersey and South Carolina). This leaves the facility in Clive, Utah, operated by EnergySolutions, as the only available destination for low-level radioactive waste requiring controlled disposal.

For the purpose of this analysis, the EnergySolutions' facility is used as the basis for estimating the disposal cost for the majority of the radioactive waste (Class A [12]). EnergySolutions does not have a license to dispose of the more highly radioactive waste (Classes B and C), for example, generated in the dismantling of the reactor vessel. As a proxy, the disposal cost for this material is based upon the last published rate schedule for non-compact waste for the Barnwell facility.

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

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

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

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

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

For purposes of this study, GTCC is packaged in the same canisters used for spent fuel. The GTCC material is shipped directly to a DOE facility, as it is generated.

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

High-Level Radioactive Waste Management

Congress passed the "Nuclear Waste Policy Act"[13] (NWPA) in 1982, assigning the federal government's long-standing responsibility for disposal of the spent nuclear fuel created by the commercial nuclear generating plants to the DOE. The NWPA provided that DOE would enter into contracts with utilities in which DOE would promise to take the utilities' spent fuel and high-level radioactive waste and utilities would pay the cost of the disposition services for that material. NWPA, along with the individual contracts with the utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

Since the original legislation, the DOE has announced several delays in the program schedule. By January 1998, the DOE had failed to accept any spent fuel or high level waste, as required by the NWPA and utility contracts. Delays continue and, as a

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

result, generators have initiated legal action against the DOE in an attempt to obtain compensation for DOE's breach of contract.

Operation of DOE's yet-to-be constructed repository is contingent upon the review and approval of the facility's license application by the NRC and the successful resolution of pending litigation. The DOE submitted its license application to the NRC on June 3, 2008, seeking authorization to construct the repository at Yucca Mountain, Nevada. Assuming a timely review, and adequate funding, the DOE expects that receipt of fuel could begin by 2020.[14]

It is generally necessary that spent fuel be actively 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 Secretary of Energy, pursuant to 10 CFR Part 50.54(bb).[15] This funding requirement is fulfilled through inclusion of certain cost elements in the decommissioning estimates, for example, associated with the isolation and continued operation of the spent fuel pool.

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 5½ years the assemblies are packaged into multipurpose canisters for transfer to the DOE. It is assumed that this period provides the necessary cooling for the final core to meet the transportation system requirements for decay heat.

DOE's contracts with utilities generally order the acceptance of spent fuel from utilities based upon the oldest fuel receiving the highest priority. For estimating purposes, WCNOC has assumed that all spent fuel will be removed to the DOE high-level waste repository within 5½ years after shutdown. Interim storage of the fuel, until the DOE has completed the transfer, will be in the pool located in the Fuel Building. The pool will be isolated, allowing WCNOC to proceed with decommissioning (or safe-storage preparations) in the shortest time possible.

Site Restoration

Prompt dismantling of site structures (once the facilities are decontaminated) is clearly the most appropriate and cost-effective option. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The cost to dismantle site structures with a

14 "Testimony of Edward Sproat, Director, Office of Civilian Radioactive Waste Management, before a U.S. House of Representatives subcommittee on the status of Yucca Mountain, July 15, 2008

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

work force already mobilized on site is more efficient than if the process is deferred. Site facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public and the demolition work force. Consequently, this study assumes that site structures are removed to a nominal depth of three feet below the local grade level wherever possible. The site is then to be graded and stabilized.

Summary

The costs to decommission Wolf Creek assumes the removal of all contaminated and activated plant components and structural materials such that the owners 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. Regardless of the timing of the decommissioning activities, the estimates assume the eventual removal of all the contaminated and activated plant components and structural materials, such that the facility operator may then have unrestricted use of the site with no further requirement for an operating license.

The decommissioning scenarios are described in Section 2. The assumptions are presented in Section 3, along with schedules of annual expenditures. The major cost contributors are identified in Section 6, with detailed activity costs, waste volumes, and associated manpower requirements delineated in Appendices C 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 are assigned to one of three subcategories: NRC License Termination, Spent Fuel Management, and Site Restoration. The subcategory "NRC License Termination" is used to accumulate costs that are consistent with "decommissioning" as defined by the NRC in its financial assurance regulations (i.e., 10 CFR Part 50.75). The cost reported for this subcategory is generally sufficient to terminate the unit's operating license, recognizing that there may be some additional cost impact from spent fuel management.

The "Spent Fuel Management" subcategory contains costs associated with the transfer of the spent fuel to the DOE as well as the operation of the spent fuel pool until such time that the transfer is complete.

"Site Restoration" is used to capture costs associated with the dismantling and demolition of buildings and facilities demonstrated to be free from contamination. This includes structures never exposed to radioactive materials, as well as those facilities

that have been decontaminated to appropriate levels. Structures are removed to a depth of three feet and backfilled to conform to local grade.

It should be noted that the costs assigned to these subcategories are allocations. Delegation of cost elements is for the purposes of comparison (e.g., with NRC financial guidelines) or to permit specific financial treatment (e.g., Asset Retirement Obligations 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 2008 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 reactor or during the decommissioning period.

DECON COST SUMMARY
DECOMMISSIONING COST ELEMENTS
(thousands of 2008 dollars)

Cost Element	Cost
Decontamination	13,552
Removal	93,421
Packaging	14,601
Transportation	9,695
Waste Disposal	67,104
Off-site Waste Processing	20,925
Program Management [1]	267,882
Corporate Allocations	1,396
Spent Fuel Pool Isolation	10,819
Spent Fuel Management [2]	34,331
Insurance and Regulatory Fees	10,258
Energy	14,641
Characterization and Licensing Surveys	15,778
Property Taxes	12,458
Miscellaneous Equipment	6,682
Total [3]	593,542

Cost Element	
License Termination	510,086
Spent Fuel Management	34,331
Site Restoration	49,126
Total [3]	593,542

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

SAFSTOR COST SUMMARY
DECOMMISSIONING COST ELEMENTS
(thousands of 2008 dollars)

Cost Element	Costs
Decontamination	11,901
Removal	94,663
Packaging	12,435
Transportation	7,443
Waste Disposal	48,501
Off-site Waste Processing	21,191
Program Management [1]	445,063
Corporate Allocations	2,281
Spent Fuel Pool Isolation	10,819
Spent Fuel Management [2]	34,331
Insurance and Regulatory Fees	44,185
Energy	30,198
Characterization and Licensing Surveys	17,211
Property Taxes	22,696
Miscellaneous Equipment	19,876
Total [3]	822,794

Cost Element	
License Termination	699,414
Spent Fuel Management	74,520
Site Restoration	48,860
Total [3]	822,794

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

1. INTRODUCTION

This report presents estimates of the costs to decommission the Wolf Creek Generating Station, (Wolf Creek) following a scheduled cessation of plant operations. The analysis relies upon site-specific, technical information from an earlier evaluation prepared in 2005,[1]* updated to reflect current assumptions pertaining to the disposition of the nuclear unit and relevant industry experience in undertaking such projects. The supporting analysis was designed to provide the Wolf Creek Nuclear Operating Corporation (WCNOC), the plant's operator, and its owners: Kansas Gas and Electric Company, a wholly owned subsidiary of Westar Energy, Inc. (Westar), Kansas City Power & Light Company (KCPL), a wholly owned subsidiary of Great Plains Energy Incorporated, and Kansas Electric Power Cooperative, Inc. (KEPCo), with sufficient information to assess their financial obligations, as they pertain to the eventual decommissioning of the nuclear station. It is not a detailed engineering document, but a financial analysis prepared in advance of the detailed engineering that will be required to carry out the decommissioning.

1.1 OBJECTIVES OF STUDY

The objectives of this study were 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 issued for Wolf Creek in June of 1985. A license renewal application was filed for the nuclear unit in October 2006. The process is expected be completed by the end of 2008. As such, this analysis assumes a 60 year operating life, with the final shutdown date (license expiration) projected to be March of 2045. This date was used as input to scheduling the decommissioning activities.

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 man-made lake formed by impounding Wolf Creek. The station is an 1,170 MWe (nominal) pressurized water reactor with supporting facilities.

* References provided in Section 7 of the document

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 1,214 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 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's 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. The rule also placed limits on the time allowed to complete the decommissioning process. For SAFSTOR, the process is restricted in overall duration to 60 years, unless it can be shown that a longer duration is necessary to protect public health and safety. The guidelines for ENTOMB are similar, providing the NRC with both sufficient leverage and flexibility to ensure that these deferred options are only used in situations where it is reasonable and consistent with the definition of decommissioning. At the conclusion of a 60-year dormancy period (or longer for ENTOMB if the NRC approves such a case), the site would still require significant remediation to meet the unrestricted release limits for license termination.

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

In 1996, the NRC published revisions to the general requirements for decommissioning nuclear power plants.[6] When the decommissioning regulations were adopted in 1988, it was assumed that the majority of licensees would decommission at the end of the facility's operating licensed life. Since that time, several licensees permanently and prematurely ceased operations. Exemptions from certain operating requirements were required

once the reactor was defueled to facilitate the decommissioning. Each case was handled individually, without clearly defined generic requirements. The NRC amended the decommissioning regulations in 1996 to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process. The amendments allow for greater public participation and better define the transition process from operations to decommissioning.

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

1.3.1 Nuclear Waste Policy Act

Congress passed the "Nuclear Waste Policy Act"[7] (NWPA) in 1982, assigning the federal government's long-standing responsibility for disposal of the spent nuclear fuel created by the commercial nuclear generating plants to the DOE. The NWPA provided that DOE would enter into contracts with utilities in which DOE would promise to take the utilities' spent fuel and high-level radioactive waste and utilities would pay the cost of the disposition services for that material. NWPA, along with the individual contracts with the utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

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

Operation of DOE's yet-to-be constructed repository is contingent upon the review and approval of the facility's license application by the NRC and the successful resolution of pending litigation. The DOE submitted

its license application to the NRC on June 3, 2008, seeking authorization to construct the repository at Yucca Mountain, Nevada. Assuming a timely review, and adequate funding, the DOE expects that receipt of fuel could begin by 2020.[8]

It is generally necessary that spent fuel be actively 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 until title of the fuel is transferred to the Secretary of Energy, pursuant to 10 CFR Part 50.54(bb).[9] This funding requirement is fulfilled through inclusion of certain cost elements in the decommissioning estimate, for example, associated with the isolation and continued operation of the spent fuel pool.

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 5½ years the assemblies are packaged into multipurpose canisters (provided by the DOE) for transfer to the DOE. It is assumed that this period provides the necessary cooling for the final core to meet the transport system requirements for decay heat.

For estimating purposes, WCNOC has assumed that all spent fuel will be removed to a DOE high-level waste repository within 5½ years after shutdown. Interim storage of the fuel, until the DOE has completed the transfer, will be in the storage pool located in the Fuel Building. The pool will be isolated, allowing WCNOC to proceed with decommissioning (or safe-storage preparations) in the shortest time possible.

1.3.2 Low-Level Radioactive Waste Acts

The contaminated and activated material generated in the decontamination and dismantling of a commercial nuclear reactor is classified as low-level (radioactive) waste, although not all of the material is suitable for "shallow-land" disposal. With the passage of the "Low-Level Radioactive Waste Policy Act" in 1980,[10] and its Amendments of 1985,[11] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders.

Until recently, there were two facilities available to WCNOC for the disposal of low-level radioactive waste generated by Wolf Creek. As of

July 1, 2008, however, the facility in Barnwell, South Carolina was closed to generators outside the Atlantic Compact (comprised of the states of Connecticut, New Jersey and South Carolina). This leaves the facility in Clive, Utah, operated by EnergySolutions, as the only available destination for low-level radioactive waste requiring controlled disposal.

For the purpose of this analysis, the EnergySolutions' facility is used as the basis for estimating the disposal cost for the majority of the radioactive waste (Class A[12]). EnergySolutions does not have a license to dispose of the more highly radioactive waste (Class B and C), for example, generated in the dismantling of the reactor vessel. As a proxy, the disposal cost for this material is based upon the last published rate schedule for non-compact waste for the Barnwell facility.

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

For purposes of this study, GTCC is packaged in the same canisters used for spent fuel. The GTCC material is shipped directly to a DOE facility as it is generated.

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

compaction, incineration or metal melt. The estimates for Wolf Creek 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,"[13] 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).[14] An additional and separate limit of 4 millirem per year, as defined in 40 CFR §141.16, is applied to drinking water.[15]

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)[16] 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 the Wolf Creek nuclear unit for the approved decommissioning alternatives: DECON and SAFSTOR. Although the alternatives differ with respect to technique, process, cost, and schedule, they attain the same result: the ultimate release of the site for unrestricted use.

The following 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 the projected expenditures.

2.1 DECON

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

2.1.1 Period 1 - Preparations

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

Engineering and Planning

The PSDAR, required within two years of the notice to cease operations, provides a description of the licensee's planned decommissioning activities, a timetable, and the associated financial requirements of the intended decommissioning program. Upon receipt of the PSDAR, the NRC will make the document available to the public for comment in a local 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 fuel handling systems, such that decommissioning operations can commence on the balance of the plant. The pool will remain operational for approximately 5½ years following the cessation of operations before the inventory resident at shutdown can be transferred to the DOE.
- Specification of transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.
- Development of procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and non-metallic components generated in decommissioning), site security and emergency programs, and industrial safety.

2.1.2 Period 2 - Decommissioning Operations

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

- Construction of temporary facilities and/or modification of existing facilities to support dismantling activities. This may include a centralized processing area to facilitate equipment removal and component preparations for off-site disposal.
- Reconfiguration and modification of site structures and facilities as needed to support decommissioning operations. This may include the upgrading of roads (on- and off-site) to facilitate hauling and transport. Modifications may be required to the containment structure to facilitate access of large/heavy equipment. Modifications may also be required to the refueling area of the building to support the segmentation of the reactor vessel internals and component extraction.
- Design and fabrication of temporary and permanent shielding to support removal and transportation activities, construction of contamination control envelopes, and the procurement of specialty tooling.
- Procurement (lease or purchase) of shipping canisters, cask liners, and industrial packages 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 the 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 will be packaged in modified fuel storage canisters for geologic disposal.
- Segmentation of the reactor vessel. A shielded platform is installed for segmentation as cutting operations are performed in-air using remotely operated equipment within a contamination control envelope. The water level is maintained just below the cut to minimize the working area dose rates. Segments are transferred in-air to containers that are stored under water, for example, in an isolated area of the refueling canal.
- Removal of the activated portions of the concrete biological shield and accessible contaminated concrete surfaces. If dictated by the steam generator and pressurizer removal scenarios, those portions of the associated 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.
- Remediation and removal of the contaminated equipment and material from the Fuel Building 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)."[17] This document incorporates the statistical approaches to survey design and data interpretation used by the EPA. It also identifies state-of-the-art, commercially available instrumentation and procedures for conducting radiological surveys. Use of this guidance ensures that the surveys are conducted in a manner that provides a high degree of confidence that applicable NRC criteria are satisfied. Once the survey is complete, the results are provided to the NRC in a format that can be verified. The NRC then reviews and evaluates the information, performs an independent confirmation of radiological site conditions, and makes a determination on final termination of the license.

The NRC will terminate 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 facility is suitable for release.

2.1.3 Period 3 - Site Restoration

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

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

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

restored and the plant area graded as required to prevent ponding and inhibit the refloating of subsurface materials.

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.

2.2 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. Minimal cleaning/removal of loose contamination and/or fixation and sealing of remaining contamination is 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.

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

2.2.2 Period 2 - Dormancy

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

adequate lighting, heating, and ventilation, and periodic preventive maintenance on essential site services.

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

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

Consistent with the DECON scenario, the spent fuel storage pool is emptied within 5½ years of the cessation of operations. The pool is secured for storage and decommissioned along with the power block structures in Period 4.

After an optional 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 an LTP (described in Section 2.1.2), thereby initiating the third phase.

2.2.3 Periods 3 and 4 - Delayed Decommissioning

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

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

and this deferred scenario is the absence, in the latter, of any constraint on the availability of the fuel storage facilities for decommissioning.

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

The delay in decommissioning also yields lower working area radiation levels. As such, the 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 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 can begin. Dismantling, as a continuation of the decommissioning process, is clearly the most appropriate and cost-effective option, as described in Section 2.1.3. The basis for the dismantling cost in this scenario is consistent with that described for DECON, presuming the removal of structures and site facilities to a

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

3. COST ESTIMATE

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

3.1 BASIS OF ESTIMATE

The estimates were developed using the site-specific, technical information from the 2005 analysis. This information was reviewed for the current analysis and updated as deemed appropriate. The site-specific considerations and assumptions used in the previous evaluation were also revisited. Modifications were incorporated where new information was available or experience from ongoing decommissioning programs provided viable alternatives or improved processes.

3.2 METHODOLOGY

The methodology used to develop the estimates follows the basic approach originally presented in the AIF/NESP-036 study report, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates,"[18] and the DOE "Decommissioning Handbook."[19] These documents present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal ($/cubic yard), steel removal ($/ton), and cutting costs ($/inch) are developed using local labor rates. The activity-dependent costs are estimated with the item quantities (cubic yards and tons), developed from plant drawings and inventory documents. Removal rates and material costs for the conventional disposition of components and structures rely upon information available in the industry publication, "Building Construction Cost Data," published by R.S. Means.[20]

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.

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

Work Difficulty Factors

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

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

An activity duration critical path is used to determine the total decommissioning program schedule. The schedule is relied upon in calculating the carrying costs, which include program management, administration, field

engineering, equipment rental, and support services such as quality control and security. This systematic approach for assembling decommissioning estimates ensures a high degree of confidence in the reliability of the resulting 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 and site restoration.

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

3.3.1 Contingency

The activity- and period-dependent costs are combined to develop the total decommissioning cost. A contingency is then applied on a line-item basis, using one or more of the contingency types listed in the AIF/NESP-036 study. "Contingencies" are defined in the American Association of Cost Engineers "Project and Cost Engineers' Handbook"[21] 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 percentage contingency in each category. It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

Contingency funds are an integral part of the total cost to complete the decommissioning process. Exclusion of this component puts at risk a

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

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

- Reactor Segmentation 75%
- NSSS Component Removal 25%
- Reactor Waste Packaging 25%
- Reactor Waste Transport 25%
- Reactor Vessel Component Disposal 50%
- GTCC Disposal 15%

- Non-Radioactive Component Removal 15%
- Heavy Equipment and Tooling 15%
- Supplies 25%
- Engineering 15%
- Energy 15%

- Characterization and Termination Surveys 30%
- Construction 15%
- Taxes and Fees 10%
- Insurance 10%
- Staffing 15%

The contingency values are applied to the appropriate components of the estimates on a line item basis. A composite value is then reported at the end of each detailed estimate (as provided in Appendix C and D). For example, the composite contingency value reported for the DECON alternative in Appendix C is approximately 18.6%.

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, for example, the start and rate of acceptance of spent fuel by the DOE.
- Pricing changes for basic inputs such as labor, energy, materials, and disposal. Items subject to widespread price competition (such as materials) may not show significant variation; however, others such as waste disposal could exhibit large pricing uncertainties, particularly in markets where limited access to services is available.

It has been TLG's experience that the results of a risk analysis, when compared with the base case estimate for decommissioning, indicate

that the chances of the base decommissioning estimate's being too high is a low probability, and the chances that the estimate is too low is a higher probability. This is mostly due to the pricing uncertainty for low-level radioactive waste burial, and to a lesser extent due to schedule increases from changes in plant conditions and to pricing variations in the cost of labor (both craft and staff). This cost study, however, does not add any additional costs to the 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

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

3.4.1 Spent Fuel Management

The cost to dispose the spent fuel generated from plant operations is not reflected within the estimates to decommission 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, the disposal cost is financed by a 1 mill/kWhr surcharge paid into the DOE's waste fund during operations. However, the NRC requires licensees to establish a program to manage and provide funding for the management of all irradiated fuel at the reactor until title of the fuel is transferred to the Secretary of Energy. This funding requirement is fulfilled through inclusion of certain high-level waste cost elements within the estimates, as described below.

For estimating purposes, WCNOC has assumed that all spent fuel will be removed to the DOE high-level waste repository within 5½ years after shutdown. Interim storage of the fuel, until the DOE has completed the transfer, will be in the spent fuel pool located in the Fuel Building on the Wolf Creek site. This will allow WCNOC to proceed with decommissioning (or safe-storage) operations in the shortest time possible. A delay in the startup of the repository, or a decrease in the spent fuel acceptance rate, will correspondingly prolong the transfer process and result in the fuel remaining at the Wolf Creek site longer.

It is assumed that the 5½ years also provides the necessary cooling period for the final core to meet DOE's transport system requirements for decay heat. Once the pool is emptied, the spent fuel storage and handling facilities are available for decommissioning. Operation and maintenance costs for the spent fuel pool are included within the estimate as well as the costs to transfer the spent fuel to the DOE.

Canister Loading and Transfer

A cost of $220,000 is used for the labor to load/transport the spent fuel from the pool to a DOE transport vehicle (assuming the DOE casks are multi-purpose canister designs within a storage or transportation overpack).

Operations and Maintenance

An annual cost (excluding labor) of approximately $941,000 is used for operation and maintenance of the spent fuel pool. Pool operations are expected to continue approximately 5½ years after the cessation of operations.

GTCC

The dismantling of the reactor internals will 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 Commission for Class C radioactive waste (GTCC). The Low-Level Radioactive Waste Policy Amendments Act of 1985 assigned the federal government the responsibility for the disposal of this material. The Act also stated that the beneficiaries of the activities resulting in the generation of such radioactive waste bear all reasonable costs of disposing of such waste. However, to date, the federal government has not identified a cost for disposing of GTCC or a schedule for acceptance. As such, the GTCC radioactive waste has been packaged and disposed of as high-level waste, at a cost equivalent to that envisioned for the spent fuel.

For purposes of this study, GTCC is packaged in the same canisters used to transport spent fuel. It is not anticipated that the DOE would accept this waste prior to completing the transfer of spent fuel. Therefore, the GTCC waste is assumed to be stored in the spent fuel storage pool (for the DECON alternative) until all the fuel has been transferred to the DOE (for the DECON alternative). In the SAFSTOR scenario, the GTCC

material is generated after the fuel has been removed. As such, the GTCC is assumed to be disposed of as it is generated during reactor vessel segmentation operations.

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 currently being 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 unit ceases operation. Future viability of this option will depend upon the ultimate location of the disposal site, as well as the disposal site licensee's ability to accept highly radioactive packages and effectively isolate them from the environment. Consequently, the study assumes the reactor vessel will require segmentation, as a bounding condition. With lower levels of activation, the vessel shell can be packaged more efficiently than the curie-limited internal components. This will allow the use of more conventional waste packages rather than shielded casks for transport (although some shielded casks are still required).

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.

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

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

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

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

Transportation costs for material requiring controlled disposal are based upon the mileage to the EnergySolutions facility in Clive, Utah. Transportation costs for off-site waste processing are based upon the mileage to Memphis, Tennessee. Truck transport costs are estimated using published tariffs from Tri-State Motor Transit.[23]

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 and D, 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 majority of the material generated from the decontamination and dismantling activities is based upon the current cost for disposal at EnergySolutions facility in Clive, Utah. Disposal costs for the higher activity waste (Class B and C) were based upon the last published rate schedule for non-compact waste for the Barnwell facility (as a proxy).

3.4.7 Site Conditions Following Decommissioning

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

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

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, and the Eisenhower Learning Center.

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

3.5 ASSUMPTIONS

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

3.5.1 Estimating Basis

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

3.5.2 Labor Costs

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

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.

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

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.[24] 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 CR-0130[25] and CR-0672,[26] and benchmarked to the long-lived values from CR-3474.

The control elements are disposed of along with the spent fuel, i.e., there is no additional cost provided for their disposal.

Activation of the containment building structure is confined to the biological shield. More extensive activation (at very low levels) of the interior structures within containment has been detected at several reactors and the owners have elected to dispose of the affected material at a controlled facility rather than reuse the material as fill on site or send it to a landfill. The ultimate disposition of the material removed from the containment building will depend upon the site release criteria selected, as well as the designated end use for the site.

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, with the exception of 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 and the limits for coverage defined in the NRC's proposed rulemaking "Financial Protection Requirements for Permanently Shutdown Nuclear Power Reactors."[27] The NRC's financial protection requirements are based on various reactor (and spent fuel) configurations.

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 cost contributors by year of expenditures as well as cost contributor (e.g., labor, materials, and waste disposal).

The cost elements are also assigned to one of three subcategories: "License Termination," "Spent Fuel Management," and "Site Restoration." The subcategory "License Termination" is used to accumulate costs that are consistent with "decommissioning" as defined by the NRC in its financial assurance regulations (i.e., 10 CFR §50.75). 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 "Spent Fuel Management" subcategory contains costs associated with the five and one-half years of post-shutdown pool operations, and the management of the spent fuel until such time that the transfer of all fuel from this facility to an off-site location (e.g., geologic repository) is complete.

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

As discussed in Section 3.4.1, while designated for disposal at the geologic repository along with the spent fuel, GTCC waste is still classified as low-level radioactive waste and, as such, included as a "License Termination" expense.

Decommissioning costs are reported in 2008 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 timeline presented in Section 4.

TABLE 3.1
DECON ALTERNATIVE
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	40,033	3,913	2,019	32	5,655	51,651
2046	61,469	22,727	3,706	15,723	11,262	114,886
2047	53,014	23,852	2,365	31,410	19,439	130,081
2048	46,379	12,248	1,970	11,658	9,272	81,528
2049	44,597	9,365	1,867	6,781	6,750	69,360
2050	39,629	8,058	1,597	6,543	6,387	62,214
2051	27,650	3,090	679	2,210	3,150	36,780
2052	18,546	9,894	284	4	443	29,171
2053	10,652	6,919	155	0	145	17,872
	341,970	100,067	14,641	74,361	62,504	593,542

Note: Columns may not add due to rounding

TABLE 3.1a
DECON ALTERNATIVE
SCHEDULE OF LICENSE TERMINATION EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	38,715	1,297	2,019	32	3,934	45,997
2046	59,052	19,385	3,706	15,723	9,202	107,067
2047	50,470	20,515	2,365	31,410	17,518	122,278
2048	44,127	8,872	1,970	11,658	7,513	74,140
2049	42,423	5,991	1,867	6,781	5,037	62,099
2050	38,128	5,729	1,597	6,543	5,205	57,202
2051	27,650	3,090	679	2,210	3,150	36,780
2052	3,828	262	68	4	265	4,427
2053	79	0	0	0	17	96
	304,472	65,142	14,270	74,361	51,841	510,086

Note: Columns may not add due to rounding

TABLE 3.1b
DECON ALTERNATIVE
SCHEDULE OF SPENT FUEL MANAGEMENT EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	872	2,616	0	0	1,720	5,208
2046	1,108	3,324	0	0	1,996	6,428
2047	1,093	3,280	0	0	1,713	6,086
2048	1,114	3,341	0	0	1,718	6,173
2049	1,115	3,345	0	0	1,713	6,173
2050	770	2,309	0	0	1,183	4,262
2051	0	0	0	0	0	0
2052	0	0	0	0	0	0
2053	0	0	0	0	0	0
	6,072	18,216	0	0	10,043	34,331

Note: Columns may not add due to rounding

TABLE 3.1c
DECON ALTERNATIVE
SCHEDULE OF SITE RESTORATION EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	446	0	0	0	0	446
2046	1,310	17	0	0	64	1,391
2047	1,451	57	0	0	209	1,716
2048	1,139	34	0	0	41	1,214
2049	1,059	29	0	0	0	1,087
2050	731	20	0	0	0	751
2051	0	0	0	0	0	0
2052	14,718	9,632	215	0	178	24,744
2053	10,573	6,919	155	0	128	17,775
	31,426	16,709	370	0	620	49,126

Note: Columns may not add due to rounding

TABLE 3.2
SAFSTOR ALTERNATIVE
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	32,656	3,703	2,019	32	5,655	44,064
2046	38,229	13,527	1,878	1,072	6,921	61,627
2047	11,886	3,633	498	27	4,607	20,651
2048	11,919	3,643	499	27	4,620	20,708
2049	11,886	3,633	498	27	4,607	20,651
2050	9,130	2,597	421	26	3,450	15,624
2051	2,983	285	249	24	871	4,412
2052	2,991	286	250	24	873	4,424
2053	2,983	285	249	24	871	4,412
2054	2,983	285	249	24	871	4,412
2055	2,983	285	249	24	871	4,412
2056	2,991	286	250	24	873	4,424
2057	2,983	285	249	24	871	4,412
2058	2,983	285	249	24	871	4,412
2059	2,983	285	249	24	871	4,412
2060	2,991	286	250	24	873	4,424
2061	2,983	285	249	24	871	4,412
2062	2,983	285	249	24	871	4,412
2063	2,983	285	249	24	871	4,412
2064	2,991	286	250	24	873	4,424
2065	2,983	285	249	24	871	4,412
2066	2,983	285	249	24	871	4,412
2067	2,983	285	249	24	871	4,412
2068	2,991	286	250	24	873	4,424
2069	2,983	285	249	24	871	4,412
2070	2,983	285	249	24	871	4,412
2071	2,983	285	249	24	871	4,412
2072	2,991	286	250	24	873	4,424
2073	2,983	285	249	24	871	4,412
2074	2,983	285	249	24	871	4,412
2075	2,983	285	249	24	871	4,412
2076	2,991	286	250	24	873	4,424

TABLE 3.2 (continued)
SAFSTOR ALTERNATIVE
SCHEDULE OF TOTAL ANNUAL EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2077	2,983	285	249	24	871	4,412
2078	2,983	285	249	24	871	4,412
2079	2,983	285	249	24	871	4,412
2080	2,991	286	250	24	873	4,424
2081	2,983	285	249	24	871	4,412
2082	2,983	285	249	24	871	4,412
2083	2,983	285	249	24	871	4,412
2084	2,991	286	250	24	873	4,424
2085	2,983	285	249	24	871	4,412
2086	2,983	285	249	24	871	4,412
2087	2,983	285	249	24	871	4,412
2088	2,991	286	250	24	873	4,424
2089	2,983	285	249	24	871	4,412
2090	2,983	285	249	24	871	4,412
2091	2,983	285	249	24	871	4,412
2092	2,991	286	250	24	873	4,424
2093	2,983	285	249	24	871	4,412
2094	2,983	285	249	24	871	4,412
2095	2,983	285	249	24	871	4,412
2096	2,991	286	250	24	873	4,424
2097	2,983	285	249	24	871	4,412
2098	3,963	324	298	24	876	5,485
2099	41,989	3,825	2,489	35	1,097	49,435
2100	40,967	15,018	2,425	15,407	10,113	83,930
2101	41,873	17,496	2,191	21,741	13,288	96,589
2102	36,115	5,453	1,867	6,791	3,503	53,728
2103	36,115	5,453	1,867	6,791	3,503	53,728
2104	30,726	3,412	1,077	2,883	2,344	40,441
2105	18,957	9,359	297	6	475	29,093
2106	11,638	7,560	169	0	159	19,525
	518,348	112,055	30,198	56,023	106,170	822,794

TABLE 3.2a
SAFSTOR ALTERNATIVE
SCHEDULE OF LICENSE TERMINATION ANNUAL EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	31,733	933	2,019	32	3,934	38,651
2046	34,776	10,345	1,802	1,072	4,310	52,305
2047	2,983	313	249	27	892	4,463
2048	2,991	314	250	27	895	4,476
2049	2,983	313	249	27	892	4,463
2050	2,983	304	249	26	885	4,447
2051	2,983	285	249	24	871	4,412
2052	2,991	286	250	24	873	4,424
2053	2,983	285	249	24	871	4,412
2054	2,983	285	249	24	871	4,412
2055	2,983	285	249	24	871	4,412
2056	2,991	286	250	24	873	4,424
2057	2,983	285	249	24	871	4,412
2058	2,983	285	249	24	871	4,412
2059	2,983	285	249	24	871	4,412
2060	2,991	286	250	24	873	4,424
2061	2,983	285	249	24	871	4,412
2062	2,983	285	249	24	871	4,412
2063	2,983	285	249	24	871	4,412
2064	2,991	286	250	24	873	4,424
2065	2,983	285	249	24	871	4,412
2066	2,983	285	249	24	871	4,412
2067	2,983	285	249	24	871	4,412
2068	2,991	286	250	24	873	4,424
2069	2,983	285	249	24	871	4,412
2070	2,983	285	249	24	871	4,412
2071	2,983	285	249	24	871	4,412
2072	2,991	286	250	24	873	4,424
2073	2,983	285	249	24	871	4,412
2074	2,983	285	249	24	871	4,412
2075	2,983	285	249	24	871	4,412
2076	2,991	286	250	24	873	4,424

TABLE 3.2a (continued)
SAFSTOR ALTERNATIVE
SCHEDULE OF LICENSE TERMINATION ANNUAL EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2077	2,983	285	249	24	871	4,412
2078	2,983	285	249	24	871	4,412
2079	2,983	285	249	24	871	4,412
2080	2,991	286	250	24	873	4,424
2081	2,983	285	249	24	871	4,412
2082	2,983	285	249	24	871	4,412
2083	2,983	285	249	24	871	4,412
2084	2,991	286	250	24	873	4,424
2085	2,983	285	249	24	871	4,412
2086	2,983	285	249	24	871	4,412
2087	2,983	285	249	24	871	4,412
2088	2,991	286	250	24	873	4,424
2089	2,983	285	249	24	871	4,412
2090	2,983	285	249	24	871	4,412
2091	2,983	285	249	24	871	4,412
2092	2,991	286	250	24	873	4,424
2093	2,983	285	249	24	871	4,412
2094	2,983	285	249	24	871	4,412
2095	2,983	285	249	24	871	4,412
2096	2,991	286	250	24	873	4,424
2097	2,983	285	249	24	871	4,412
2098	3,937	324	298	24	876	5,460
2099	41,040	3,825	2,489	35	1,097	48,487
2100	39,634	14,982	2,425	15,407	10,103	82,551
2101	40,325	17,441	2,191	21,741	13,275	94,973
2102	35,161	5,427	1,867	6,791	3,503	52,749
2103	35,161	5,427	1,867	6,791	3,503	52,749
2104	30,323	3,401	1,077	2,883	2,344	40,027
2105	5,217	367	95	6	308	5,993
2106	87	0	0	0	19	105
	449,634	77,134	28,832	56,023	87,789	699,414

TABLE 3.2b
SAFSTOR ALTERNATIVE
SCHEDULE OF SPENT FUEL MANAGEMENT ANNUAL EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	923	2,770	0	0	1,720	5,414
2046	3,453	3,183	76	0	2,610	9,323
2047	8,903	3,321	249	0	3,715	16,188
2048	8,928	3,330	250	0	3,725	16,232
2049	8,903	3,321	249	0	3,715	16,188
2050	6,147	2,293	172	0	2,565	11,176
2051	0	0	0	0	0	0
2052	0	0	0	0	0	0
2053	0	0	0	0	0	0
2054	0	0	0	0	0	0
2055	0	0	0	0	0	0
2056	0	0	0	0	0	0
2057	0	0	0	0	0	0
2058	0	0	0	0	0	0
2059	0	0	0	0	0	0
2060	0	0	0	0	0	0
2061	0	0	0	0	0	0
2062	0	0	0	0	0	0
2063	0	0	0	0	0	0
2064	0	0	0	0	0	0
2065	0	0	0	0	0	0
2066	0	0	0	0	0	0
2067	0	0	0	0	0	0
2068	0	0	0	0	0	0
2069	0	0	0	0	0	0
2070	0	0	0	0	0	0
2071	0	0	0	0	0	0
2072	0	0	0	0	0	0
2073	0	0	0	0	0	0
2074	0	0	0	0	0	0
2075	0	0	0	0	0	0
2076	0	0	0	0	0	0

TABLE 3.2b (continued)
SAFSTOR ALTERNATIVE
SCHEDULE OF SPENT FUEL MANAGEMENT ANNUAL EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2077	0	0	0	0	0	0
2078	0	0	0	0	0	0
2079	0	0	0	0	0	0
2080	0	0	0	0	0	0
2081	0	0	0	0	0	0
2082	0	0	0	0	0	0
2083	0	0	0	0	0	0
2084	0	0	0	0	0	0
2085	0	0	0	0	0	0
2086	0	0	0	0	0	0
2087	0	0	0	0	0	0
2088	0	0	0	0	0	0
2089	0	0	0	0	0	0
2090	0	0	0	0	0	0
2091	0	0	0	0	0	0
2092	0	0	0	0	0	0
2093	0	0	0	0	0	0
2094	0	0	0	0	0	0
2095	0	0	0	0	0	0
2096	0	0	0	0	0	0
2097	0	0	0	0	0	0
2098	0	0	0	0	0	0
2099	0	0	0	0	0	0
2100	0	0	0	0	0	0
2101	0	0	0	0	0	0
2102	0	0	0	0	0	0
2103	0	0	0	0	0	0
2104	0	0	0	0	0	0
2105	0	0	0	0	0	0
2106	0	0	0	0	0	0
	37,258	18,216	996	0	18,051	74,520

TABLE 3.2c
SAFSTOR ALTERNATIVE
SCHEDULE OF SITE RESTORATION ANNUAL EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2045	0	0	0	0	0	0
2046	0	0	0	0	0	0
2047	0	0	0	0	0	0
2048	0	0	0	0	0	0
2049	0	0	0	0	0	0
2050	0	0	0	0	0	0
2051	0	0	0	0	0	0
2052	0	0	0	0	0	0
2053	0	0	0	0	0	0
2054	0	0	0	0	0	0
2055	0	0	0	0	0	0
2056	0	0	0	0	0	0
2057	0	0	0	0	0	0
2058	0	0	0	0	0	0
2059	0	0	0	0	0	0
2060	0	0	0	0	0	0
2061	0	0	0	0	0	0
2062	0	0	0	0	0	0
2063	0	0	0	0	0	0
2064	0	0	0	0	0	0
2065	0	0	0	0	0	0
2066	0	0	0	0	0	0
2067	0	0	0	0	0	0
2068	0	0	0	0	0	0
2069	0	0	0	0	0	0
2070	0	0	0	0	0	0
2071	0	0	0	0	0	0
2072	0	0	0	0	0	0
2073	0	0	0	0	0	0
2074	0	0	0	0	0	0
2075	0	0	0	0	0	0
2076	0	0	0	0	0	0

TABLE 3.2c (continued)
SAFSTOR ALTERNATIVE
SCHEDULE OF SITE RESTORATION ANNUAL EXPENDITURES
(thousands, 2008 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2077	0	0	0	0	0	0
2078	0	0	0	0	0	0
2079	0	0	0	0	0	0
2080	0	0	0	0	0	0
2081	0	0	0	0	0	0
2082	0	0	0	0	0	0
2083	0	0	0	0	0	0
2084	0	0	0	0	0	0
2085	0	0	0	0	0	0
2086	0	0	0	0	0	0
2087	0	0	0	0	0	0
2088	0	0	0	0	0	0
2089	0	0	0	0	0	0
2090	0	0	0	0	0	0
2091	0	0	0	0	0	0
2092	0	0	0	0	0	0
2093	0	0	0	0	0	0
2094	0	0	0	0	0	0
2095	0	0	0	0	0	0
2096	0	0	0	0	0	0
2097	0	0	0	0	0	0
2098	25	0	0	0	0	25
2099	948	0	0	0	0	948
2100	1,333	36	0	0	10	1,379
2101	1,548	54	0	0	13	1,616
2102	954	26	0	0	0	980
2103	954	26	0	0	0	980
2104	402	11	0	0	0	413
2105	13,740	8,992	201	0	167	23,100
2106	11,551	7,560	169	0	140	19,420
	31,455	16,705	370	0	330	48,860

4. SCHEDULE ESTIMATE

The schedules for the decommissioning scenarios considered in this study 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 plan 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 assumes that fuel is removed from the spent fuel pool within 5½ 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 2003" computer software.[28]

4.1 SCHEDULE ESTIMATE ASSUMPTIONS

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

- The Fuel Building is isolated until such time that all spent fuel has been transferred from the spent fuel pool to the DOE. 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. There are eleven paid holidays per year.
- Reactor and internals removal activities are performed by using separate crews for different activities working on different shifts, with a corresponding backshift charge for the second shift.
- Multiple crews work parallel activities to the maximum extent possible, consistent with optimum efficiency, adequate access for cutting, removal and laydown space, and with the stringent safety measures necessary during demolition of heavy components and structures.

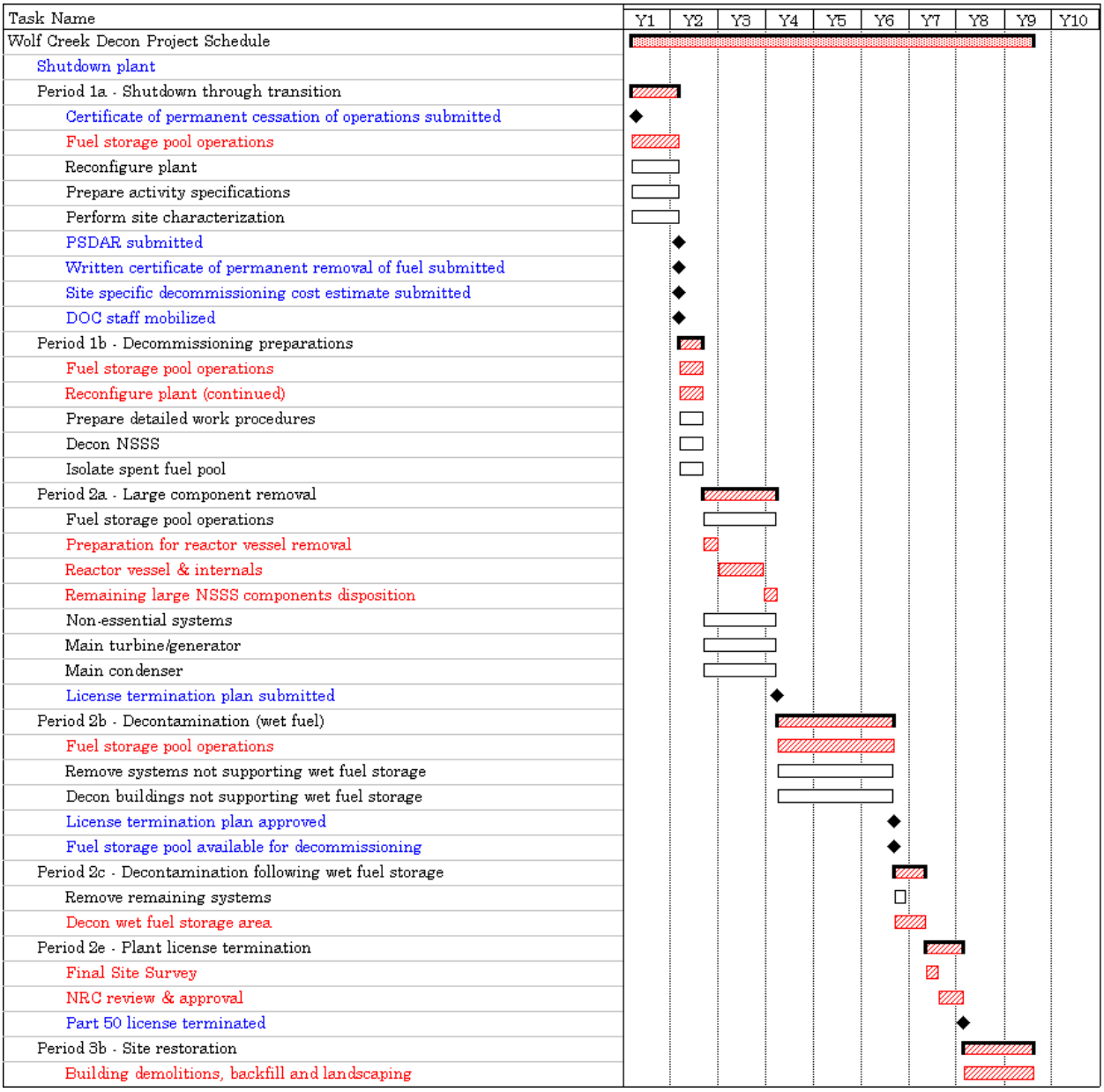
- For plant systems removal, the systems with the longest removal durations in areas on the critical path are considered to determine the duration of the activity.

4.2 PROJECT SCHEDULE

The period-dependent costs presented in the detailed cost tables are based upon the durations developed in the 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 a 2045 shutdown date. The fuel pool is emptied approximately 5½ years after shutdown. Deferred decommissioning in the SAFSTOR scenarios is assumed to commence so that the operating license is terminated within a 60-year period from the cessation of plant operations.

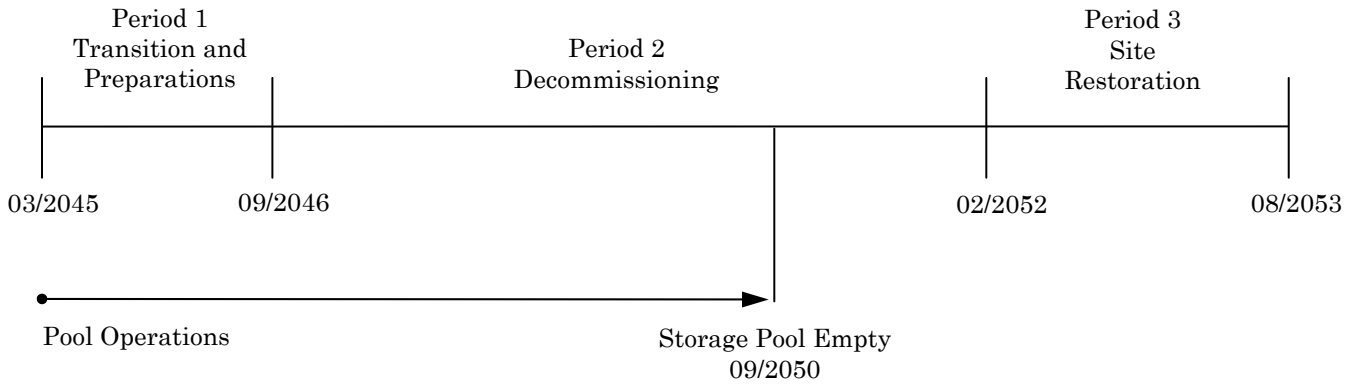
FIGURE 4.1
ACTIVITY SCHEDULE



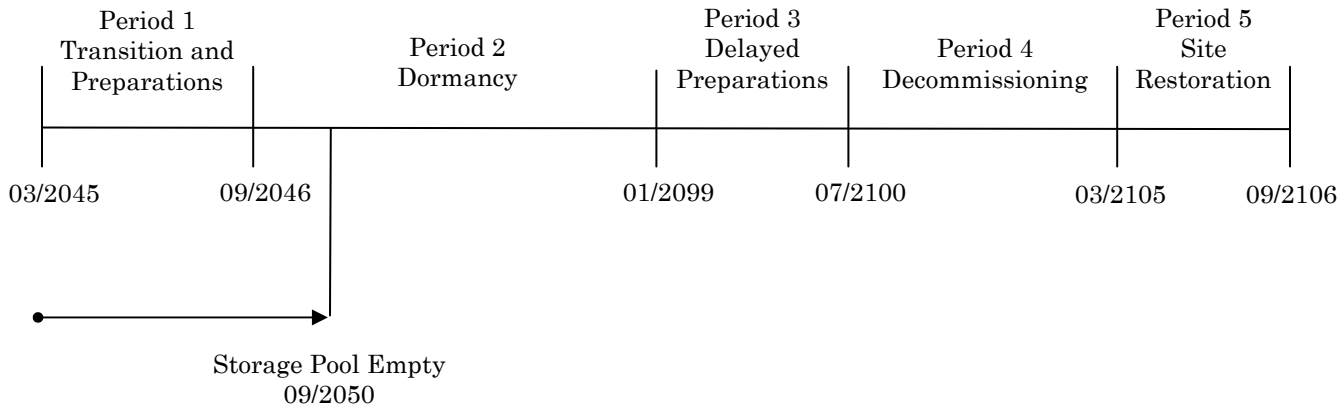
Red text indicates critical path activities
Blue text indicates milestones

FIGURE 4.2
DECOMMISSIONING TIMELINES
(not to scale)

DECON Alternative



SAFSTOR Alternative



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,[29] 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 volumes of radioactive waste generated during the various decommissioning activities at the site are shown on a line-item basis in Appendices C and D, and summarized in Tables 5.1 and 5.2. The quantified waste volume summaries shown in these tables are consistent with Part 61 classifications. The volumes are calculated based on the exterior dimensions for containerized material and on the displaced volume of components serving as their own waste containers.

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

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

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

The waste material produced in the decontamination and dismantling of the nuclear units 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.

For purposes of constructing the estimates, the cost for disposal at the EnergySolutions facility was used as a proxy for future disposal facilities. 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 EnergySolutions 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 the last published rate schedule for non-compact waste for the Barnwell facility (as a proxy). Additional surcharges were included for activity, dose rate, and/or handling added as appropriate for the particular package.

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)	EnergySolutions	A	115,803	9,659,680
	Barnwell	B	4,668	570,124
	Barnwell	C	459	48,448
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	500	104,146
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	243,009	9,824,333
Totals [2]			364,440	20,206,731

[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)	EnergySolutions	A	126,705	9,104,508
	Barnwell	B	3,330	350,113
	Barnwell	C	470	47,758
Greater than Class C (geologic repository)	Spent Fuel Equivalent	GTCC	500	104,146
Processed/Conditioned (off-site recycling center)	Recycling Vendors	A	244,979	9,952,212
Totals [2]			375,984	19,558,737

[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 2005. While not an engineering study, the estimates provide the operator and the plant owners 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 station's spent fuel pool for a minimum of 5½ years following the cessation of operations for continued cooling of the assemblies. Once sufficiently cooled, the assemblies will be transferred to a DOE facility (e.g., geologic repository).

The cost projected to promptly decommission (DECON) Wolf Creek is estimated to be $593.5 million. The majority of this cost (approximately 85.9%) is associated with the physical decontamination and dismantling of the nuclear unit so that the operating license can be terminated. Another 5.8% is associated with the management, interim storage, and eventual transfer of the spent fuel. The remaining 8.3% 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 $822.8 million. The majority of this cost (approximately 85.0%) is associated with placing the unit in storage, ongoing caretaking of the unit during dormancy, and the eventual physical decontamination and dismantling of the nuclear unit so that the operating license can be terminated. Another 9.1% is associated with the management, interim storage, and eventual transfer of the spent fuel. The remaining 5.9% 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 is the largest single contributor to the overall cost. The magnitude of the expense is a function of both the size of the organization required to manage the decommissioning, as well as the duration of the program. It is assumed, for purposes of this analysis, that 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 (for the DECON alternative).

As described in this report, the spent fuel pool will remain operational for a minimum of 5½ years following the cessation of operations. The pool will be isolated and an independent spent fuel island created. This will allow decommissioning operations to proceed in and around the pool area. Over the 5½-year period, the spent fuel will be packaged into transportable canisters for loading into a DOE-provided transport cask.

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 licensed facility (e.g., EnergySolutions' or equivalent). 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 unit.

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

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

TABLE 6.1
DECON ALTERNATIVE
DECOMMISSIONING COST ELEMENTS
(thousands of 2008 dollars)

Cost Element	Total	Percentage
Decontamination	13,552	2.3
Removal	93,421	15.7
Packaging	14,601	2.5
Transportation	9,695	1.6
Waste Disposal	67,104	11.3
Off-site Waste Processing	20,925	3.5
Program Management [1]	267,882	45.1
Corporate Allocations	1,396	0.2
Spent Fuel Pool Isolation	10,819	1.8
Spent Fuel Management [2]	34,331	5.8
Insurance and Regulatory Fees	10,258	1.7
Energy	14,641	2.5
Characterization and Licensing Surveys	15,778	2.7
Property Taxes	12,458	2.1
Miscellaneous Equipment	6,682	1.1
Total [3]	593,542	100

Cost Element	Total	Percentage
License Termination	510,086	85.9
Spent Fuel Management	34,331	5.8
Site Restoration	49,126	8.3
Total [3]	593,542	100

[1] Includes engineering and security costs
[2] Excludes program management costs (staffing) but includes costs for spent fuel loading/packaging costs/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 2008 dollars)

Cost Element	Total	Percentage
Decontamination	11,901	1.4
Removal	94,663	11.5
Packaging	12,435	1.5
Transportation	7,443	0.9
Waste Disposal	48,501	5.9
Off-site Waste Processing	21,191	2.6
Program Management [1]	445,063	54.1
Corporate Allocations	2,281	0.3
Spent Fuel Pool Isolation	10,819	1.3
Spent Fuel Management [2]	34,331	4.2
Insurance and Regulatory Fees	44,185	5.4
Energy	30,198	3.7
Characterization and Licensing Surveys	17,211	2.1
Property Taxes	22,696	2.8
Miscellaneous Equipment	19,876	2.4
Total [3]	822,794	100

Cost Element	Total	Percentage
License Termination	699,414	85.00
Spent Fuel Management	74,520	9.06
Site Restoration	48,860	5.94
Total [3]	822,794	100

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

7. REFERENCES

1. ""Decommissioning Cost Analysis for the Wolf Creek Generating Station," Document No. W11-1536-002, Rev. 0, TLG Services, Inc., August 2005

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

3. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," October 2003

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

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

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

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

8. Testimony of Edward Sproat, Director, Office of Civilian Radioactive Waste Management, before a U.S. House of Representatives subcommittee on the status of Yucca Mountain, July 15, 2008

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

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

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

7. REFERENCES
(continued)

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

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

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

15. U.S. Code of Federal Regulations, Title 40, Part 141.16, "Maximum contaminant levels for beta particle and photon radioactivity from man-made radionuclides in community water systems"

16. "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

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

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

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

20. "Building Construction Cost Data 2008," Robert Snow Means Company, Inc., Kingston, Massachusetts

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

22. U.S. Department of Transportation, Title 49 of the Code of Federal Regulations, "Transportation," Parts 173 through 178, 2007

7. REFERENCES
(continued)

23. Tri-State Motor Transit Company, published tariffs, Interstate Commerce Commission (ICC), Docket No. MC-427719 Rules Tariff, March 2004, Radioactive Materials Tariff, February 2006

24. 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

25. 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

26. 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

27. "Financial Protection Requirements for Permanently Shutdown Nuclear Power Reactors," 10 CFR Parts 50 and 140, Federal Register Notice, Vol. 62, No. 210, October 30, 1997

28. "Microsoft Project Professional 2003," Microsoft Corporation, Redmond, WA.

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

APPENDIX A

UNIT COST FACTOR DEVELOPMENT

APPENDIX A
UNIT COST FACTOR DEVELOPMENT

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

1. SCOPE

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

2. CALCULATIONS

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

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

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

* alpha designators indicate activities that can be performed in parallel

APPENDIX A
(continued)

3. LABOR REQUIRED

Crew	Number	Duration (hours)	Rate ($/hr)	Cost
Laborers	3.00	11.217	$16.77	$564.33
Craftsmen	2.00	11.217	$31.22	$700.39
Foreman	1.00	11.217	$34.57	$387.77
General Foreman	0.25	11.217	$38.70	$108.52
Fire Watch	0.05	11.217	$16.77	$9.41
Health Physics Technician	1.00	11.217	$51.44	$577.00
Total Labor Cost				$2,347.42

4. EQUIPMENT & CONSUMABLES COSTS

Equipment Costs	none
Consumables/Materials Costs	
-Blotting paper 50 @ $0.52 sq ft {1}	$26.00
-Plastic sheets/bags 50 @ $0.16/sq ft {2}	$8.00
-Gas torch consumables 1 @ $9.34/hr x 1 hr {3}	$9.34
Subtotal cost of equipment and materials	$43.34
Overhead & profit on equipment and materials @ 15.30 %	$6.63
Total costs, equipment & material	$49.97

TOTAL COST:

Removal of contaminated **heat exchanger <3000 pounds:**	**$2,397.39**
Total labor cost:	$2,347.42
Total equipment/material costs:	$49.97
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. McMaster-Carr, Item 7193T88, Spill Control
  2. R.S. Means (2008) Division 01 56, Section 13.60-0200, page 20
  3. R.S. Means (2008) Division 01 54 33, Section 40-6360, Reference-10

- 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	0.21
Removal of clean pipe 0.25 to 2 inches diameter, $/linear foot	2.16
Removal of clean pipe >2 to 4 inches diameter, $/linear foot	3.26
Removal of clean pipe >4 to 8 inches diameter, $/linear foot	6.80
Removal of clean pipe >8 to 14 inches diameter, $/linear foot	12.63
Removal of clean pipe >14 to 20 inches diameter, $/linear foot	16.47
Removal of clean pipe >20 to 36 inches diameter, $/linear foot	24.21
Removal of clean pipe >36 inches diameter, $/linear foot	28.75
Removal of clean valve >2 to 4 inches	45.13
Removal of clean valve >4 to 8 inches	68.02
Removal of clean valve >8 to 14 inches	126.29
Removal of clean valve >14 to 20 inches	164.66
Removal of clean valve >20 to 36 inches	242.14
Removal of clean valve >36 inches	287.48
Removal of clean pipe hanger for small bore piping	15.11
Removal of clean pipe hanger for large bore piping	50.05
Removal of clean pump, <300 pound	115.64
Removal of clean pump, 300-1000 pound	330.34
Removal of clean pump, 1000-10,000 pound	1,283.38
Removal of clean pump, >10,000 pound	2,485.11
Removal of clean pump motor, 300-1000 pound	137.83
Removal of clean pump motor, 1000-10,000 pound	532.96
Removal of clean pump motor, >10,000 pound	1,199.16
Removal of clean heat exchanger <3000 pound	694.65
Removal of clean heat exchanger >3000 pound	1,752.89

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of clean feedwater heater/deaerator	4,902.42
Removal of clean moisture separator/reheater	10,027.96
Removal of clean tank, <300 gallons	148.63
Removal of clean tank, 300-3000 gallon	466.91
Removal of clean tank, >3000 gallons, $/square foot surface area	4.07
Removal of clean electrical equipment, <300 pound	62.29
Removal of clean electrical equipment, 300-1000 pound	224.40
Removal of clean electrical equipment, 1000-10,000 pound	448.78
Removal of clean electrical equipment, >10,000 pound	1,093.76
Removal of clean electrical transformer < 30 tons	759.61
Removal of clean electrical transformer > 30 tons	2,187.50
Removal of clean standby diesel generator, <100 kW	775.87
Removal of clean standby diesel generator, 100 kW to 1 MW	1,731.78
Removal of clean standby diesel generator, >1 MW	3,585.13
Removal of clean electrical cable tray, $/linear foot	5.88
Removal of clean electrical conduit, $/linear foot	2.57
Removal of clean mechanical equipment, <300 pound	62.29
Removal of clean mechanical equipment, 300-1000 pound	224.40
Removal of clean mechanical equipment, 1000-10,000 pound	448.78
Removal of clean mechanical equipment, >10,000 pound	1,093.76
Removal of clean HVAC equipment, <300 pound	62.29
Removal of clean HVAC equipment, 300-1000 pound	224.40
Removal of clean HVAC equipment, 1000-10,000 pound	448.78
Removal of clean HVAC equipment, >10,000 pound	1,093.76
Removal of clean HVAC ductwork, $/pound	0.23

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated instrument and sampling tubing, $/linear foot	0.92
Removal of contaminated pipe 0.25 to 2 inches diameter, $/linear foot	12.49
Removal of contaminated pipe >2 to 4 inches diameter, $/linear foot	20.69
Removal of contaminated pipe >4 to 8 inches diameter, $/linear foot	34.83
Removal of contaminated pipe >8 to 14 inches diameter, $/linear foot	65.11
Removal of contaminated pipe >14 to 20 inches diameter, $/linear foot	77.76
Removal of contaminated pipe >20 to 36 inches diameter, $/linear foot	106.70
Removal of contaminated pipe >36 inches diameter, $/linear foot	125.66
Removal of contaminated valve >2 to 4 inches	267.26
Removal of contaminated valve >4 to 8 inches	314.93
Removal of contaminated valve >8 to 14 inches	611.89
Removal of contaminated valve >14 to 20 inches	774.78
Removal of contaminated valve >20 to 36 inches	1,027.82
Removal of contaminated valve >36 inches	1,217.43
Removal of contaminated pipe hanger for small bore piping	65.48
Removal of contaminated pipe hanger for large bore piping	194.62
Removal of contaminated pump, <300 pound	563.17
Removal of contaminated pump, 300-1000 pound	1,281.14
Removal of contaminated pump, 1000-10,000 pound	3,836.73
Removal of contaminated pump, >10,000 pound	9,341.57
Removal of contaminated pump motor, 300-1000 pound	558.71
Removal of contaminated pump motor, 1000-10,000 pound	1,578.48
Removal of contaminated pump motor, >10,000 pound	3,544.04
Removal of contaminated heat exchanger <3000 pound	2,397.39
Removal of contaminated heat exchanger >3000 pound	6,989.07

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated tank, <300 gallons	939.63
Removal of contaminated tank, >300 gallons, $/square foot	17.75
Removal of contaminated electrical equipment, <300 pound	428.85
Removal of contaminated electrical equipment, 300-1000 pound	1,024.34
Removal of contaminated electrical equipment, 1000-10,000 pound	1,972.57
Removal of contaminated electrical equipment, >10,000 pound	3,861.72
Removal of contaminated electrical cable tray, $/linear foot	20.68
Removal of contaminated electrical conduit, $/linear foot	9.82
Removal of contaminated mechanical equipment, <300 pound	477.26
Removal of contaminated mechanical equipment, 300-1000 pound	1,131.84
Removal of contaminated mechanical equipment, 1000-10,000 pound	2,176.01
Removal of contaminated mechanical equipment, >10,000 pound	3,861.72
Removal of contaminated HVAC equipment, <300 pound	477.26
Removal of contaminated HVAC equipment, 300-1000 pound	1,131.84
Removal of contaminated HVAC equipment, 1000-10,000 pound	2,176.01
Removal of contaminated HVAC equipment, >10,000 pound	3,861.72
Removal of contaminated HVAC ductwork, $/pound	1.42
Removal/plasma arc cut of contaminated thin metal components, $/linear in.	2.16
Additional decontamination of surface by washing, $/square foot	4.51
Additional decontamination of surfaces by hydrolasing, $/square foot	21.49
Decontamination rig hook up and flush, $/ 250 foot length	4,036.66
Chemical flush of components/systems, $/gallon	14.63
Removal of clean standard reinforced concrete, $/cubic yard	87.26
Removal of grade slab concrete, $/cubic yard	108.25
Removal of clean concrete floors, $/cubic yard	240.08

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of sections of clean concrete floors, $/cubic yard	673.55
Removal of clean heavily rein concrete w/#9 rebar, $/cubic yard	168.32
Removal of contaminated heavily rein concrete w/#9 rebar, $/cubic yard	1,357.62
Removal of clean heavily rein concrete w/#18 rebar, $/cubic yard	212.87
Removal of contaminated heavily rein concrete w/#18 rebar, $/cubic yard	1,795.48
Removal heavily rein concrete w/#18 rebar & steel embedments, $/cubic yard	304.44
Removal of below-grade suspended floors, $/cubic yard	240.08
Removal of clean monolithic concrete structures, $/cubic yard	558.23
Removal of contaminated monolithic concrete structures, $/cubic yard	1,352.66
Removal of clean foundation concrete, $/cubic yard	440.96
Removal of contaminated foundation concrete, $/cubic yard	1,260.78
Explosive demolition of bulk concrete, $/cubic yard	20.33
Removal of clean hollow masonry block wall, $/cubic yard	57.53
Removal of contaminated hollow masonry block wall, $/cubic yard	229.83
Removal of clean solid masonry block wall, $/cubic yard	57.53
Removal of contaminated solid masonry block wall, $/cubic yard	229.83
Backfill of below-grade voids, $/cubic yard	23.55
Removal of subterranean tunnels/voids, $/linear foot	67.45
Placement of concrete for below-grade voids, $/cubic yard	127.18
Excavation of clean material, $/cubic yard	2.28
Excavation of contaminated material, $/cubic yard	30.23
Removal of clean concrete rubble, $/cubic yard	18.42
Removal of contaminated concrete rubble, $/cubic yard	18.66
Removal of building by volume, $/cubic foot	0.21
Removal of clean building metal siding, $/square foot	0.57

APPENDIX B

UNIT COST FACTOR LISTING
(Power Block Structures Only)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated building metal siding, $/square foot	2.63
Removal of standard asphalt roofing, $/square foot	1.00
Removal of transite panels, $/square foot	1.30
Scarifying contaminated concrete surfaces (drill & spall), $/square foot	10.27
Scabbling contaminated concrete floors, $/square foot	5.28
Scabbling contaminated concrete walls, $/square foot	13.10
Scabbling contaminated ceilings, $/square foot	44.12
Scabbling structural steel, $/square foot	4.61
Removal of clean overhead crane/monorail < 10 ton capacity	329.33
Removal of contaminated overhead crane/monorail < 10 ton capacity	1,115.23
Removal of clean overhead crane/monorail >10-50 ton capacity	790.39
Removal of contaminated overhead crane/monorail >10-50 ton capacity	2,676.11
Removal of polar crane > 50 ton capacity	3,370.32
Removal of gantry crane > 50 ton capacity	13,671.93
Removal of structural steel, $/pound	0.13
Removal of clean steel floor grating, $/square foot	2.59
Removal of contaminated steel floor grating, $/square foot	8.46
Removal of clean free standing steel liner, $/square foot	6.10
Removal of contaminated free standing steel liner, $/square foot	20.65
Removal of clean concrete-anchored steel liner, $/square foot	3.05
Removal of contaminated concrete-anchored steel liner, $/square foot	24.08
Placement of scaffolding in clean areas, $/square foot	13.16
Placement of scaffolding in contaminated areas, $/square foot	19.67
Landscaping without topsoil, $/acre	985.11
Cost of CPC B-88 LSA box & preparation for use	1,613.47

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	1,413.60
Cost of CPC B-12V 12 gauge LSA box & preparation for use	1,382.84
Cost of CPC B-144 LSA box & preparation for use	8,797.74
Cost of LSA drum & preparation for use	107.42
Cost of cask liner for CNSI 14 195 cask	102.48
Cost of cask liner for CNSI 8 120A cask (resins)	6,450.15
Cost of cask liner for CNSI 8 120A cask (filters)	497.35
Decontamination of surfaces with vacuuming, $/square foot	0.38

APPENDIX C

DETAILED COST ANALYSIS

DECON

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(thousands of 2008 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	-	-	-	-	-	-	138	21	158	158	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	212	32	243	243	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	487	73	560	560	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	106	16	122	122	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	106	16	122	122	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	138	21	158	158	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	793	119	912	912	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	328	49	377	377	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Perform Site-Specific Cost Study	-	-	-	-	-	-	529	79	608	608	-	-	-	-	-	-	-	-	-	5,000
1a.1.15	Prepare/submit License Termination Plan	-	-	-	-	-	-	433	65	498	498	-	-	-	-	-	-	-	-	-	4,096
1a.1.16	Receive NRC approval of termination plan									a											
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	520	78	599	539	-	60	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	441	66	507	456	-	51	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	53	8	61	61	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	751	113	864	864	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	688	103	791	791	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Biological shield	-	-	-	-	-	-	53	8	61	61	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Steam generators	-	-	-	-	-	-	330	50	380	380	-	-	-	-	-	-	-	-	-	3,120
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	169	25	195	97	-	97	-	-	-	-	-	-	-	1,600
1a.1.17.9	Main Turbine	-	-	-	-	-	-	42	6	49	-	-	49	-	-	-	-	-	-	-	400
1a.1.17.10	Main Condensers	-	-	-	-	-	-	42	6	49	-	-	49	-	-	-	-	-	-	-	400
1a.1.17.11	Plant structures & buildings	-	-	-	-	-	-	330	50	380	190	-	190	-	-	-	-	-	-	-	3,120
1a.1.17.12	Waste management	-	-	-	-	-	-	487	73	560	560	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.13	Facility & site closeout	-	-	-	-	-	-	95	14	109	55	-	55	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	4,001	600	4,602	4,052	-	550	-	-	-	-	-	-	-	37,827
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	254	38	292	292	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	2,700	405	3,105	3,105	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	148	22	170	170	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,100	315	2,415	2,415	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	130	20	150	150	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	12,602	1,890	14,492	13,942	-	550	-	-	-	-	-	-	-	73,753
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	3,740	561	4,301	-	4,301	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	3,740	561	4,301	-	4,301	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	1,292	129	1,421	1,421	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	1,897	190	2,086	2,086	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	432	-	-	-	-	-	108	540	540	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	428	-	-	-	-	-	64	492	492	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	15	6	-	31	-	10	62	62	-	-	-	675	-	-	-	13,531	21	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	2,164	325	2,489	2,489	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	706	71	776	776	-	-	-	-	-	-	-	-	-	-

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(thousands of 2008 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 Period-Dependent Costs (continued)																					
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	945	95	1,040	-	1,040	-	-	-	-	-	-	-	-	-
1a.4.9	INPO Fees	-	-	-	-	-	-	238	36	274	274	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	940	141	1,082	-	1,082	-	-	-	-	-	-	-	-	-
1a.4.11	Corporate Allocations	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	-
1a.4.12	Security Staff Cost	-	-	-	-	-	-	6,278	942	7,219	7,219	-	-	-	-	-	-	-	-	-	157,471
1a.4.13	Utility Staff Cost	-	-	-	-	-	-	23,592	3,539	27,131	27,131	-	-	-	-	-	-	-	-	-	423,400
1a.4	Subtotal Period 1a Period-Dependent Costs	-	859	15	6	-	31	38,302	5,686	44,899	42,777	2,122	-	-	675	-	-	-	13,531	21	580,871
1a.0	TOTAL PERIOD 1a COST	-	859	15	6	-	31	54,644	8,137	63,692	56,719	6,423	550	-	675	-	-	-	13,531	21	654,624
PERIOD 1b - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	501	75	576	518	-	58	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	106	16	122	122	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	264	40	304	304	-	-	-	-	-	-	-	-	-	2,500
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	143	21	164	41	-	123	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD cooling assembly	-	-	-	-	-	-	106	16	122	122	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	CRD housings & ICI tubes	-	-	-	-	-	-	106	16	122	122	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Incore instrumentation	-	-	-	-	-	-	106	16	122	122	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	384	58	442	442	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	127	19	146	73	-	73	-	-	-	-	-	-	-	1,200
1b.1.1.10	Missile shields	-	-	-	-	-	-	48	7	55	55	-	-	-	-	-	-	-	-	-	450
1b.1.1.11	Biological shield	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.12	Steam generators	-	-	-	-	-	-	487	73	560	560	-	-	-	-	-	-	-	-	-	4,600
1b.1.1.13	Reinforced concrete	-	-	-	-	-	-	106	16	122	61	-	61	-	-	-	-	-	-	-	1,000
1b.1.1.14	Main Turbine	-	-	-	-	-	-	165	25	190	-	-	190	-	-	-	-	-	-	-	1,560
1b.1.1.15	Main Condensers	-	-	-	-	-	-	165	25	190	-	-	190	-	-	-	-	-	-	-	1,560
1b.1.1.16	Auxiliary building	-	-	-	-	-	-	289	43	332	299	-	33	-	-	-	-	-	-	-	2,730
1b.1.1.17	Reactor building	-	-	-	-	-	-	289	43	332	299	-	33	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	3,516	527	4,044	3,283	-	761	-	-	-	-	-	-	-	33,243
1b.1.2	Decon primary loop	514	-	-	-	-	-	-	257	771	771	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	514	-	-	-	-	-	3,516	784	4,815	4,054	-	761	-	-	-	-	-	-	1,067	33,243
Period 1b Additional Costs																					
1b.2.1	Spent Fuel Pool Isolation	-	-	-	-	-	-	9,407	1,411	10,819	10,819	-	-	-	-	-	-	-	-	-	-
1b.2.2	Site Characterization	-	-	-	-	-	-	3,057	917	3,974	3,974	-	-	-	-	-	-	-	-	19,100	7,852
1b.2.3	Misc/Hazardous Waste	-	-	43	14	68	-	-	17	142	142	-	-	2,067	-	-	-	-	133,598	619	-
1b.2	Subtotal Period 1b Additional Costs	-	-	43	14	68	-	12,465	2,345	14,935	14,935	-	-	2,067	-	-	-	-	133,598	19,719	7,852
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	830	-	-	-	-	-	-	125	955	955	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,083	162	1,245	1,245	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process liquid waste	51	-	99	508	-	4,780	-	1,306	6,744	6,744	-	-	-	324	1,512	-	-	187,252	358	-
1b.3.4	Small tool allowance	-	2	-	-	-	-	-	0	2	2	-	-	-	-	-	-	-	-	-	-
1b.3.5	Pipe cutting equipment	-	1,000	-	-	-	-	-	150	1,150	1,150	-	-	-	-	-	-	-	-	-	-
1b.3.6	Decon rig	1,400	-	-	-	-	-	-	210	1,610	1,610	-	-	-	-	-	-	-	-	-	-
1b.3.7	Spent Fuel Capital and Transfer	-	-	-	-	-	-	1,980	297	2,277	-	2,277	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	2,281	1,002	99	508	-	4,780	3,063	2,251	13,983	11,706	2,277	-	-	324	1,512	-	-	187,252	358	-

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(thousands of 2008 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 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	26	-	-	-	-	-	-	6	32	32	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	651	65	716	716	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	956	96	1,052	1,052	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	247	-	-	-	-	-	62	309	309	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	216	-	-	-	-	-	32	248	248	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	9	3	-	19	-	6	37	37	-	-	-	399	-	-	-	7,988	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	2,182	327	2,510	2,510	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	356	36	391	391	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	477	48	524	-	524	-	-	-	-	-	-	-	-	-
1b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	474	71	545	-	545	-	-	-	-	-	-	-	-	-
1b.4.11	Corporate Allocations	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	-
1b.4.12	Security Staff Cost	-	-	-	-	-	-	3,165	475	3,639	3,639	-	-	-	-	-	-	-	-	-	79,383
1b.4.13	DOC Staff Cost	-	-	-	-	-	-	4,609	691	5,301	5,301	-	-	-	-	-	-	-	-	-	64,137
1b.4.14	Utility Staff Cost	-	-	-	-	-	-	11,955	1,793	13,748	13,748	-	-	-	-	-	-	-	-	-	214,491
1b.4	Subtotal Period 1b Period-Dependent Costs	26	463	9	3	-	19	24,951	3,727	29,198	28,128	1,069	-	-	399	-	-	-	7,988	12	358,011
1b.0	TOTAL PERIOD 1b COST	2,821	1,465	151	525	68	4,799	43,995	9,107	62,931	58,824	3,346	761	2,067	722	1,512	-	-	328,838	21,156	399,106
PERIOD 1 TOTALS		2,821	2,324	166	531	68	4,830	98,639	17,244	126,622	115,543	9,769	1,310	2,067	1,397	1,512	-	-	342,370	21,176	1,053,731
PERIOD 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Reactor Coolant Piping	113	116	18	25	-	351	-	179	803	803	-	-	-	1,157	-	-	-	139,959	6,838	-
2a.1.1.2	Pressurizer Relief Tank	19	16	5	7	-	91	-	38	176	176	-	-	-	328	-	-	-	36,395	1,068	-
2a.1.1.3	Reactor Coolant Pumps & Motors	58	52	34	152	142	914	-	318	1,670	1,670	-	-	198	3,386	-	-	-	897,754	3,772	-
2a.1.1.4	Pressurizer	28	31	568	383	-	1,048	-	398	2,457	2,457	-	-	-	3,882	-	-	-	240,508	2,502	1,875
2a.1.1.5	Steam Generators	241	4,446	3,187	2,485	2,770	6,241	-	3,899	23,269	23,269	-	-	40,845	23,116	-	-	-	3,573,347	23,233	5,750
2a.1.1.6	CRDMs/ICIs/Service Structure Removal	96	67	207	46	-	273	-	160	848	848	-	-	-	4,534	-	-	-	108,572	4,446	-
2a.1.1.7	Reactor Vessel Internals	75	2,497	4,373	803	-	7,106	222	6,791	21,866	21,866	-	-	-	1,377	903	459	-	326,029	27,883	1,247
2a.1.1.8	Vessel & Internals GTCC Disposal	-	-	-	-	-	11,886	-	1,783	13,669	13,669	-	-	-	-	-	-	500	104,146	-	-
2a.1.1.9	Reactor Vessel	57	5,249	1,468	615	-	7,443	222	8,241	23,294	23,294	-	-	-	6,511	2,254	-	-	948,723	27,883	1,247
2a.1.1	Totals	687	12,473	9,861	4,515	2,912	35,353	443	21,807	88,052	88,052	-	-	41,043	44,291	3,156	459	500	6,375,433	97,626	10,120
Removal of Major Equipment																					
2a.1.2	Main Turbine/Generator	-	289	302	43	745	576	-	365	2,320	2,320	-	-	4,844	2,698	-	-	-	653,808	9,734	-
2a.1.3	Main Condensers	-	785	158	67	627	511	-	444	2,593	2,593	-	-	7,701	2,270	-	-	-	550,231	27,762	-
Cascading Costs from Clean Building Demolition																					
2a.1.4.1	Reactor	-	639	-	-	-	-	-	96	734	734	-	-	-	-	-	-	-	-	10,579	-
2a.1.4.2	Auxiliary	-	315	-	-	-	-	-	47	363	363	-	-	-	-	-	-	-	-	5,551	-
2a.1.4.3	Hot Machine Shop	-	1	-	-	-	-	-	0	1	1	-	-	-	-	-	-	-	-	16	-
2a.1.4.4	Radwaste	-	66	-	-	-	-	-	10	76	76	-	-	-	-	-	-	-	-	1,108	-
2a.1.4.5	Fuel Building	-	160	-	-	-	-	-	24	184	184	-	-	-	-	-	-	-	-	2,395	-
2a.1.4	Totals	-	1,181	-	-	-	-	-	177	1,358	1,358	-	-	-	-	-	-	-	-	19,649	-
Disposal of Plant Systems																					
2a.1.5.1	AB - Main Steam	-	131	-	-	-	-	-	20	151	-	-	151	-	-	-	-	-	-	5,833	-
2a.1.5.2	AB - Main Steam RCA	-	48	4	8	158	-	-	37	255	255	-	-	2,156	-	-	-	-	87,550	1,495	-
2a.1.5.3	AC - Main Turbine	-	131	-	-	-	-	-	20	150	-	-	150	-	-	-	-	-	-	5,641	-
2a.1.5.4	AD - Condensate	-	147	-	-	-	-	-	22	169	-	-	169	-	-	-	-	-	-	6,144	-
2a.1.5.5	AE - Feedwater	-	100	-	-	-	-	-	15	115	-	-	115	-	-	-	-	-	-	4,271	-
2a.1.5.6	AF - Feedwater Hter Extrction, Drn & Vnt	-	121	-	-	-	-	-	18	140	-	-	140	-	-	-	-	-	-	5,352	-
2a.1.5.7	AK - Condensate Demineralizer	-	45	-	-	-	-	-	7	52	-	-	52	-	-	-	-	-	-	1,944	-

Table C
Wolf Creek Generating Station
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Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Disposal of Plant Systems (continued)																					
2a.1.5.8	AL - Auxiliary Feedwater	-	20	-	-	-	-	-	3	23	-	-	23	-	-	-	-	-	-	852	-
2a.1.5.9	AQ - Condensate & Feedwater Chem Additn	-	11	-	-	-	-	-	2	13	-	-	13	-	-	-	-	-	-	468	-
2a.1.5.10	AX - Acid Feed	-	17	-	-	-	-	-	3	20	-	-	20	-	-	-	-	-	-	754	-
2a.1.5.11	Auxiliary Bldg Non-System Specific	-	71	4	5	35	45	-	35	195	195	-	-	474	199	-	-	-	37,110	2,280	-
2a.1.5.12	Auxiliary Bldg Non-System Specific RCA	-	432	13	28	561	-	-	198	1,232	1,232	-	-	7,629	-	-	-	-	309,812	13,468	-
2a.1.5.13	BL - Reactor Makeup Water	-	172	16	17	142	135	-	102	584	584	-	-	1,928	700	-	-	-	132,091	5,428	-
2a.1.5.14	BM - Steam Generator Blowdown	-	346	9	19	379	-	-	147	901	901	-	-	5,160	-	-	-	-	209,560	11,023	-
2a.1.5.15	CA - Steam Seal	-	10	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	455	-
2a.1.5.16	CB - Main Turbine Lube Oil	-	31	-	-	-	-	-	5	35	-	-	35	-	-	-	-	-	-	1,207	-
2a.1.5.17	CC - Generator Hydrogen & CO2	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	198	-
2a.1.5.18	CD - Generator Seal Oil	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	287	-
2a.1.5.19	CE - Stator Cooling Water	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	241	-
2a.1.5.20	CF - Lube Oil Strg, Xfer & Purification	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	812	-
2a.1.5.21	CG - Condenser Air Removal	-	16	-	-	-	-	-	2	18	-	-	18	-	-	-	-	-	-	657	-
2a.1.5.22	CH - Main Turbine Control Oil	-	32	-	-	-	-	-	5	36	-	-	36	-	-	-	-	-	-	1,219	-
2a.1.5.23	CL - Chlorination	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	569	-
2a.1.5.24	CO - Carbon Dioxide	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	121	-
2a.1.5.25	CW - Circulating Water	-	179	-	-	-	-	-	27	206	-	-	206	-	-	-	-	-	-	7,858	-
2a.1.5.26	CZ - Caustic Acid	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	111	-
2a.1.5.27	DA - Circulating Water System	-	181	-	-	-	-	-	27	208	-	-	208	-	-	-	-	-	-	7,953	-
2a.1.5.28	DM - Equipment Drains	-	30	-	-	-	-	-	4	34	-	-	34	-	-	-	-	-	-	1,223	-
2a.1.5.29	DM - Equipment Drains RCA	-	92	27	56	1,135	-	-	204	1,515	1,515	-	-	15,445	-	-	-	-	627,223	2,835	-
2a.1.5.30	EG - Component Cooling Water RCA	-	431	25	52	1,041	-	-	274	1,823	1,823	-	-	14,161	-	-	-	-	575,071	13,276	-
2a.1.5.31	EJ - Residual Heat Removal	-	227	33	37	200	383	-	191	1,072	1,072	-	-	2,727	1,713	-	-	-	263,397	7,439	-
2a.1.5.32	EM - High Pressure Coolant Injection	-	174	11	12	93	103	-	86	479	479	-	-	1,260	458	-	-	-	92,199	5,465	-
2a.1.5.33	EN - Containment Spray	-	130	5	11	222	-	-	68	436	436	-	-	3,026	-	-	-	-	122,874	4,004	-
2a.1.5.34	FB - Auxiliary Steam	-	48	-	-	-	-	-	7	55	-	-	55	-	-	-	-	-	-	2,106	-
2a.1.5.35	FB - Auxiliary Steam RCA	-	50	1	3	60	-	-	22	137	137	-	-	816	-	-	-	-	33,148	1,492	-
2a.1.5.36	FC - Auxiliary Turbines	-	31	-	-	-	-	-	5	36	-	-	36	-	-	-	-	-	-	1,301	-
2a.1.5.37	FE - Auxiliary Steam Chemical Addition	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	105	-
2a.1.5.38	GE - Turbine Bldg HVAC	-	70	-	-	-	-	-	10	80	-	-	80	-	-	-	-	-	-	3,081	-
2a.1.5.39	GF - Miscellaneous Building HVAC	-	21	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	945	-
2a.1.5.40	GS - Containment Hydrogen Control	-	46	3	4	48	16	-	24	142	142	-	-	658	73	-	-	-	33,309	1,464	-
2a.1.5.41	HF - Secondary Liquid Waste	464	583	57	59	455	509	-	588	2,714	2,714	-	-	6,186	2,522	-	-	-	453,942	30,613	-
2a.1.5.42	HY - Hydrogen	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	223	-
2a.1.5.43	KH - Service Gas	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	644	-
2a.1.5.44	LE - Oily Waste	-	58	-	-	-	-	-	9	67	-	-	67	-	-	-	-	-	-	2,575	-
2a.1.5.45	LE - Oily Waste RCA	-	115	3	6	126	-	-	49	299	299	-	-	1,718	-	-	-	-	69,785	3,398	-
2a.1.5.46	NT - Nitrogen	-	3	-	-	-	-	-	0	4	-	-	4	-	-	-	-	-	-	149	-
2a.1.5.47	OX - Oxygen	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	171	-
2a.1.5.48	SW - Screen Wash	-	16	-	-	-	-	-	2	19	-	-	19	-	-	-	-	-	-	635	-
2a.1.5.49	Turbine Bldg Non-System Specific	-	381	-	-	-	-	-	57	438	-	-	438	-	-	-	-	-	-	15,405	-
2a.1.5.50	VH - Circ Water & Makeup Water Scrnhs	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	245	-
2a.1.5.51	VV - Misc Bldg HVAC	-	3	-	-	-	-	-	0	4	-	-	4	-	-	-	-	-	-	123	-
2a.1.5.52	WG - Gland Water & Motor Cooling Water	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	593	-
2a.1.5.53	WL - Cooling Lake Makeup & Blowdown	-	18	-	-	-	-	-	3	20	-	-	20	-	-	-	-	-	-	745	-
2a.1.5	Totals	464	4,870	212	315	4,656	1,191	-	2,319	14,028	11,784	-	2,244	63,344	5,666	-	-	-	3,047,070	186,894	-
2a.1.6	Scaffolding in support of decommissioning	-	899	20	6	98	10	-	245	1,278	1,278	-	-	1,206	68	-	-	-	60,659	36,034	-
2a.1	Subtotal Period 2a Activity Costs	1,151	20,497	10,555	4,947	9,039	37,641	443	25,356	109,629	107,385	-	2,244	118,138	54,993	3,156	459	500	10,687,200	377,698	10,120
Period 2a Collateral Costs																					
2a.3.1	Process liquid waste	202	-	88	440	-	531	-	309	1,570	1,570	-	-	-	1,634	-	-	-	111,087	319	-
2a.3.2	Small tool allowance	-	206	-	-	-	-	-	31	237	213	-	24	-	-	-	-	-	-	-	-
2a.3.3	Spent Fuel Capital and Transfer	-	-	-	-	-	-	5,720	858	6,578	-	6,578	-	-	-	-	-	-	-	-	-

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(thousands of 2008 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
2a.3.4	Survey and Release of Scrap Metal	-	-	-	-	-	-	846	127	973	973	-	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	202	206	88	440	-	531	6,566	1,325	9,358	2,756	6,578	24	-	1,634	-	-	-	111,087	319	-
Period 2a Period-Dependent Costs																					
2a.4.1	Decon supplies	76	-	-	-	-	-	-	19	95	95	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	703	70	773	773	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	2,853	285	3,138	2,824	-	314	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	2,176	-	-	-	-	-	544	2,720	2,720	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	3,092	-	-	-	-	-	464	3,556	3,556	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	137	50	-	284	-	92	563	563	-	-	-	6,106	-	-	-	122,360	186	-
2a.4.7	Plant energy budget	-	-	-	-	-	-	3,093	464	3,557	3,557	-	-	-	-	-	-	-	-	-	-
2a.4.8	NRC Fees	-	-	-	-	-	-	990	99	1,089	1,089	-	-	-	-	-	-	-	-	-	-
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	863	86	950	-	950	-	-	-	-	-	-	-	-	-
2a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	1,415	212	1,627	-	1,627	-	-	-	-	-	-	-	-	-
2a.4.11	Radwaste Processing Equipment/Services	-	-	-	-	-	-	282	42	324	324	-	-	-	-	-	-	-	-	-	-
2a.4.12	Corporate Allocations	-	-	-	-	-	-	262	39	301	301	-	-	-	-	-	-	-	-	-	-
2a.4.13	Security Staff Cost	-	-	-	-	-	-	8,014	1,202	9,216	9,216	-	-	-	-	-	-	-	-	-	198,424
2a.4.14	DOC Staff Cost	-	-	-	-	-	-	16,604	2,491	19,095	19,095	-	-	-	-	-	-	-	-	-	238,423
2a.4.15	Utility Staff Cost	-	-	-	-	-	-	25,795	3,869	29,664	29,664	-	-	-	-	-	-	-	-	-	443,906
2a.4	Subtotal Period 2a Period-Dependent Costs	76	5,268	137	50	-	284	60,873	9,980	76,668	73,778	2,576	314	-	6,106	-	-	-	122,360	186	880,753
2a.0	TOTAL PERIOD 2a COST	1,430	25,971	10,780	5,437	9,039	38,456	67,882	36,660	195,655	183,919	9,154	2,582	118,138	62,733	3,156	459	500	10,920,650	378,203	890,873
PERIOD 2b - Site Decontamination																					
Period 2b Direct Decommissioning Activities																					
Disposal of Plant Systems																					
2b.1.1.1	AN - Demineralized Wtr Storage & xfer	-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	1,548	-
2b.1.1.2	AN - Demineralized Wtr Strg & xfer RCA	-	11	0	0	9	-	-	4	25	25	-	-	120	-	-	-	-	4,855	320	-
2b.1.1.3	AP - Condensate Storage & Transfer	-	43	-	-	-	-	-	6	49	-	-	49	-	-	-	-	-	-	1,660	-
2b.1.1.4	BB - Reactor Coolant	-	173	25	25	128	265	-	135	752	752	-	-	1,746	1,388	-	-	-	176,612	5,746	-
2b.1.1.5	BG - Chemical & Volume Control	558	537	71	73	360	783	-	681	3,063	3,063	-	-	4,899	3,559	-	-	-	510,728	25,897	-
2b.1.1.6	BN - Borated Refueling Water Storage	-	209	16	26	405	85	-	140	881	881	-	-	5,512	416	-	-	-	257,593	6,818	-
2b.1.1.7	Control Bldg Non-System Specific	-	110	4	8	157	-	-	53	332	332	-	-	2,139	-	-	-	-	86,849	3,413	-
2b.1.1.8	Control Bldg Non-System Specific Cln	-	877	-	-	-	-	-	132	1,009	-	-	1,009	-	-	-	-	-	-	29,076	-
2b.1.1.9	DO - Diesel Oil	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	48	-
2b.1.1.10	EA - Service Water	-	60	-	-	-	-	-	9	69	-	-	69	-	-	-	-	-	-	2,592	-
2b.1.1.11	EB - Closed Cooling Water	-	29	-	-	-	-	-	4	33	-	-	33	-	-	-	-	-	-	1,267	-
2b.1.1.12	EF - Essential Service Water	-	67	-	-	-	-	-	10	77	-	-	77	-	-	-	-	-	-	2,951	-
2b.1.1.13	EF - Essential Service Water RCA	-	54	3	5	105	-	-	30	196	196	-	-	1,427	-	-	-	-	57,959	1,677	-
2b.1.1.14	EP - Accumulator Safety Injection	-	97	7	9	115	45	-	55	328	328	-	-	1,568	208	-	-	-	81,536	3,030	-
2b.1.1.15	FA - Auxiliary Steam Generator	-	11	-	-	-	-	-	2	13	-	-	13	-	-	-	-	-	-	521	-
2b.1.1.16	FO - Fuel Oil	-	11	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	486	-
2b.1.1.17	FP - Fire Protection	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	3,826	-
2b.1.1.18	FP - Fire Protection RCA	-	122	8	16	330	-	-	83	559	559	-	-	4,492	-	-	-	-	182,411	3,540	-
2b.1.1.19	GA - Plant Heating	-	43	-	-	-	-	-	6	49	-	-	49	-	-	-	-	-	-	1,912	-
2b.1.1.20	GA - Plant Heating RCA	-	68	1	3	55	-	-	26	153	153	-	-	746	-	-	-	-	30,275	1,992	-
2b.1.1.21	GB - Central Chilled Water	-	40	-	-	-	-	-	6	46	-	-	46	-	-	-	-	-	-	1,803	-
2b.1.1.22	GB - Central Chilled Water RCA	-	16	0	1	14	-	-	6	37	37	-	-	187	-	-	-	-	7,591	463	-
2b.1.1.23	GD - Esstl Srvc Wtr Pumphs Bldg HVAC	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	271	-
2b.1.1.24	GH - Radwaste Building HVAC	-	128	5	10	178	16	-	65	401	401	-	-	2,425	69	-	-	-	104,668	3,444	-
2b.1.1.25	GK - Control Building HVAC	-	83	-	-	-	-	-	12	95	-	-	95	-	-	-	-	-	-	3,900	-
2b.1.1.26	GL - Auxiliary Building HVAC	-	320	11	21	372	36	-	149	910	910	-	-	5,064	161	-	-	-	220,066	8,473	-
2b.1.1.27	GM - Diesel Generator Building HVAC	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	692	-
2b.1.1.28	GN - Containment Cooling	-	334	20	34	541	102	-	197	1,228	1,228	-	-	7,354	454	-	-	-	339,357	9,333	-
2b.1.1.29	GP - Containmnt Integratd Leak Rate Test	-	24	1	2	43	-	-	13	83	83	-	-	580	-	-	-	-	23,570	737	-

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
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Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Disposal of Plant Systems (continued)																					
2b.1.1.30	GR - Containment Atmospheric Control	-	12	2	4	80	7	-	18	123	123	-	-	1,086	29	-	-	-	46,679	391	-
2b.1.1.31	GT - Contaiment Purge HVAC	-	80	5	9	143	27	-	50	314	314	-	-	1,948	120	-	-	-	89,887	2,239	-
2b.1.1.32	HA - Gaseous Radwaste	-	214	16	18	204	106	-	115	673	673	-	-	2,782	486	-	-	-	155,095	6,499	-
2b.1.1.33	HB - Liquid Radwaste	501	516	53	51	408	436	-	563	2,527	2,527	-	-	5,544	2,203	-	-	-	398,693	29,726	-
2b.1.1.34	HC - Solid Radwaste	-	279	32	34	204	330	-	191	1,070	1,070	-	-	2,781	1,514	-	-	-	244,386	8,765	-
2b.1.1.35	HD - Decontamination	-	64	4	6	72	27	-	35	208	208	-	-	983	125	-	-	-	50,772	1,982	-
2b.1.1.36	HE - Boron Recycle	253	292	25	25	191	224	-	290	1,301	1,301	-	-	2,600	1,111	-	-	-	194,922	15,830	-
2b.1.1.37	JE - Emergency Fuel Oil	-	32	-	-	-	-	-	5	37	-	-	37	-	-	-	-	-	-	1,260	-
2b.1.1.38	KA - Compressed Air and Instrument	-	139	-	-	-	-	-	21	160	-	-	160	-	-	-	-	-	-	6,089	-
2b.1.1.39	KB - Breathing Air	-	24	-	-	-	-	-	4	28	-	-	28	-	-	-	-	-	-	1,075	-
2b.1.1.40	KC - Fire Protection	-	171	-	-	-	-	-	26	196	-	-	196	-	-	-	-	-	-	7,516	-
2b.1.1.41	KC - Fire Protection RCA	-	212	10	22	437	-	-	123	804	804	-	-	5,944	-	-	-	-	241,384	6,276	-
2b.1.1.42	KD - Domestic Water	-	38	-	-	-	-	-	6	44	-	-	44	-	-	-	-	-	-	1,708	-
2b.1.1.43	KE - Fuel Hndlg & Strg Reactor Vssl Serv	-	12	3	4	49	25	-	17	110	110	-	-	661	111	-	-	-	36,859	374	-
2b.1.1.44	KJ - Standby Diesel Engine	-	168	-	-	-	-	-	25	194	-	-	194	-	-	-	-	-	-	6,749	-
2b.1.1.45	LA - Sanitary Drains	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	290	-
2b.1.1.46	LA - Sanitary Drains RCA	-	16	0	1	20	-	-	7	45	45	-	-	272	-	-	-	-	11,053	421	-
2b.1.1.47	LB - Roof Drains	-	29	-	-	-	-	-	4	34	-	-	34	-	-	-	-	-	-	1,276	-
2b.1.1.48	LB - Roof Drains RCA	-	88	4	8	157	-	-	47	304	304	-	-	2,139	-	-	-	-	86,858	2,627	-
2b.1.1.49	LC - Yard Drains	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	96	-
2b.1.1.50	LD - Chemical & Detergent Waste	45	67	4	4	37	33	-	54	243	243	-	-	504	150	-	-	-	33,812	3,234	-
2b.1.1.51	LF - Floor & Equipment Drains	-	858	72	78	275	910	-	502	2,695	2,695	-	-	3,739	4,073	-	-	-	514,287	27,094	-
2b.1.1.52	RM - Process Sampling & Analysis	-	85	6	5	49	38	-	39	221	221	-	-	661	169	-	-	-	42,010	2,724	-
2b.1.1.53	Radwaste Bldg Non-System Specific	-	115	6	8	52	79	-	58	318	318	-	-	705	351	-	-	-	60,095	3,649	-
2b.1.1.54	Radwaste Bldg Non-System Specific RCA	-	710	22	46	932	-	-	327	2,037	2,037	-	-	12,684	-	-	-	-	515,103	21,915	-
2b.1.1.55	Reactor Bldg Non-System Specific	-	57	2	3	20	30	-	25	137	137	-	-	269	131	-	-	-	22,692	1,758	-
2b.1.1.56	Reactor Bldg Non-System Specific RCA	-	350	8	17	350	-	-	143	869	869	-	-	4,768	-	-	-	-	193,612	10,423	-
2b.1.1.57	SJ - Nuclear Sampling	-	46	4	4	31	29	-	25	139	139	-	-	423	130	-	-	-	28,862	1,538	-
2b.1.1.58	ST - Sewage Treatment	-	55	-	-	-	-	-	8	63	-	-	63	-	-	-	-	-	-	2,316	-
2b.1.1.59	SZ - Service Air	-	43	-	-	-	-	-	6	49	-	-	49	-	-	-	-	-	-	1,892	-
2b.1.1.60	VA - I&C Shop HVAC	-	3	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	141	-
2b.1.1.61	VB - I&C Shop Computer Room HVAC	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	95	-
2b.1.1.62	VC - Health Physics Computer Room HVAC	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	202	-
2b.1.1.63	VJ - Shop Bldg Machine Shop Area Vent	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	51	-
2b.1.1.64	VL - Shop Building HVAC	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	92	-
2b.1.1.65	VS - Admin Bldg HVAC	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	238	-
2b.1.1.66	VT - Tech Support Building HVAC	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	79	-
2b.1.1.67	VW - Waste Water Treatment Ventilation	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	48	-
2b.1.1.68	WD - Domestic Water	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	870	-
2b.1.1.69	WM - Makeup Demineralizer	-	91	-	-	-	-	-	14	105	-	-	105	-	-	-	-	-	-	3,929	-
2b.1.1.70	WS - Plant Services Water	-	76	-	-	-	-	-	11	87	-	-	87	-	-	-	-	-	-	3,297	-
2b.1.1.71	WS - Plant Services Water RCA	-	24	3	7	135	-	-	28	197	197	-	-	1,838	-	-	-	-	74,625	778	-
2b.1.1.72	WT - Waste Water Treatment	-	18	-	-	-	-	-	3	21	-	-	21	-	-	-	-	-	-	769	-
2b.1.1.73	WZ - Radioactive Liquid Waste	-	30	3	3	9	41	-	20	106	106	-	-	120	182	-	-	-	21,219	877	-
2b.1.1.74	Yard Non-System Specific	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	603	-
2b.1.1	Totals	1,357	8,686	460	591	6,668	3,673	-	4,667	26,100	23,386	-	2,714	90,709	17,141	-	-	-	5,146,975	317,239	-
2b.1.2	Scaffolding in support of decommissioning	-	1,124	25	8	123	13	-	306	1,598	1,598	-	-	1,508	85	-	-	-	75,824	45,043	-
Decontamination of Site Buildings																					
2b.1.3.1	Reactor	765	728	128	155	438	1,020	-	921	4,155	4,155	-	-	5,955	7,661	-	-	-	965,504	44,521	-
2b.1.3.2	Auxiliary	398	277	56	71	151	182	-	352	1,487	1,487	-	-	2,058	3,318	-	-	-	411,803	19,512	-
2b.1.3.3	Communication Corridor - Contaminated	9	5	1	1	1	4	-	7	29	29	-	-	17	72	-	-	-	7,852	397	-
2b.1.3.4	Hot Machine Shop	11	10	1	2	-	5	-	10	38	38	-	-	-	89	-	-	-	8,892	599	-
2b.1.3.5	Radwaste	212	136	29	37	62	96	-	181	753	753	-	-	844	1,754	-	-	-	208,503	10,044	-
2b.1.3.6	Radwaste Drum Storage	24	14	3	4	5	11	-	20	80	80	-	-	66	196	-	-	-	22,234	1,097	-

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
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Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes 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
Decontamination of Site Buildings (continued)																					
2b.1.3.7	Radwaste Storage Building	61	31	8	10	-	28	-	47	185	185	-	-	-	515	-	-	-	51,480	2,646	-
2b.1.3	Totals	1,479	1,200	226	280	657	1,345	-	1,539	6,727	6,727	-	-	8,941	13,605	-	-	-	1,676,269	78,816	-
2b.1	Subtotal Period 2b Activity Costs	2,836	11,009	711	879	7,448	5,030	-	6,512	34,425	31,711	-	2,714	101,157	30,830	-	-	-	6,899,068	441,098	-
Period 2b Collateral Costs																					
2b.3.1	Process liquid waste	294	-	184	929	-	1,326	-	636	3,369	3,369	-	-	-	3,416	-	-	-	277,477	666	-
2b.3.2	Small tool allowance	-	217	-	-	-	-	-	33	249	249	-	-	-	-	-	-	-	-	-	-
2b.3.3	Spent Fuel Capital and Transfer	-	-	-	-	-	-	9,680	1,452	11,132	-	11,132	-	-	-	-	-	-	-	-	-
2b.3.4	Survey and Release of Scrap Metal	-	-	-	-	-	-	967	145	1,112	1,112	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	294	217	184	929	-	1,326	10,647	2,266	15,862	4,730	11,132	-	-	3,416	-	-	-	277,477	666	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	1,164	-	-	-	-	-	-	291	1,455	1,455	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	1,166	117	1,283	1,283	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	4,734	473	5,207	5,207	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	2,853	-	-	-	-	-	713	3,567	3,567	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	5,095	-	-	-	-	-	764	5,859	5,859	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	160	58	-	331	-	108	658	658	-	-	-	7,128	-	-	-	142,832	217	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	4,052	608	4,659	4,659	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,643	164	1,807	1,807	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	1,433	143	1,576	-	1,576	-	-	-	-	-	-	-	-	-
2b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	2,347	352	2,699	-	2,699	-	-	-	-	-	-	-	-	-
2b.4.11	Radwaste Processing Equipment/Services	-	-	-	-	-	-	468	70	538	538	-	-	-	-	-	-	-	-	-	-
2b.4.12	Corporate Allocations	-	-	-	-	-	-	416	62	479	479	-	-	-	-	-	-	-	-	-	-
2b.4.13	Security Staff Cost	-	-	-	-	-	-	13,298	1,995	15,293	15,293	-	-	-	-	-	-	-	-	-	329,261
2b.4.14	DOC Staff Cost	-	-	-	-	-	-	26,505	3,976	30,480	30,480	-	-	-	-	-	-	-	-	-	380,017
2b.4.15	Utility Staff Cost	-	-	-	-	-	-	41,103	6,165	47,268	47,268	-	-	-	-	-	-	-	-	-	705,374
2b.4	Subtotal Period 2b Period-Dependent Costs	1,164	7,948	160	58	-	331	97,164	16,002	122,827	118,552	4,275	-	-	7,128	-	-	-	142,832	217	1,414,653
2b.0	TOTAL PERIOD 2b COST	4,293	19,174	1,055	1,867	7,448	6,688	107,811	24,779	173,114	154,993	15,407	2,714	101,157	41,374	-	-	-	7,319,376	441,982	1,414,653
PERIOD 2c - Decontamination Following Wet Fuel Storage																					
Period 2c Direct Decommissioning Activities																					
2c.1.1	Remove spent fuel racks	448	43	203	71	-	994	-	514	2,272	2,272	-	-	-	4,412	-	-	-	395,882	1,722	-
Disposal of Plant Systems																					
2c.1.2.1	EC - Fuel Pool Cooling & Cleanup	-	233	17	22	191	173	-	135	771	771	-	-	2,600	769	-	-	-	174,505	7,383	-
2c.1.2.2	Fuel Bldg Non-System Specific	-	30	2	2	13	19	-	15	80	80	-	-	170	85	-	-	-	14,545	953	-
2c.1.2.3	Fuel Bldg Non-System Specific RCA	-	192	6	12	235	-	-	86	530	530	-	-	3,200	-	-	-	-	129,974	5,858	-
2c.1.2.4	Fuel Building Fire Protection	-	94	5	11	216	-	-	58	384	384	-	-	2,941	-	-	-	-	119,444	2,771	-
2c.1.2.5	GG - Fuel Building HVAC	-	176	8	15	274	25	-	94	593	593	-	-	3,729	109	-	-	-	161,237	4,670	-
2c.1.2	Totals	-	725	38	61	929	217	-	388	2,358	2,358	-	-	12,641	963	-	-	-	599,704	21,636	-
Decontamination of Site Buildings																					
2c.1.3.1	Fuel Building	499	540	20	26	199	55	-	434	1,772	1,772	-	-	2,705	902	-	-	-	199,149	31,581	-
2c.1.3	Totals	499	540	20	26	199	55	-	434	1,772	1,772	-	-	2,705	902	-	-	-	199,149	31,581	-
2c.1.4	Scaffolding in support of decommissioning	-	225	5	2	25	3	-	61	320	320	-	-	302	17	-	-	-	15,165	9,009	-
2c.1	Subtotal Period 2c Activity Costs	946	1,533	265	159	1,153	1,268	-	1,397	6,721	6,721	-	-	15,647	6,295	-	-	-	1,209,900	63,947	-
Period 2c Additional Costs																					
2c.2.1	Final Survey Program Management	-	-	-	-	-	-	1,174	352	1,526	1,526	-	-	-	-	-	-	-	-	-	12,480
2c.2	Subtotal Period 2c Additional Costs	-	-	-	-	-	-	1,174	352	1,526	1,526	-	-	-	-	-	-	-	-	-	12,480

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(thousands of 2008 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 2c Collateral Costs																					
2c.3.1	Process liquid waste	139	-	51	255	-	274	-	181	901	901	-	-	-	955	-	-	-	57,296	186	-
2c.3.2	Small tool allowance	-	41	-	-	-	-	-	6	47	47	-	-	-	-	-	-	-	-	-	-
2c.3.3	Decommissioning Equipment Disposition	-	-	100	36	489	84	-	110	818	818	-	-	6,000	373	-	-	-	303,507	88	-
2c.3.4	Survey and Release of Scrap Metal	-	-	-	-	-	-	184	28	212	212	-	-	-	-	-	-	-	-	-	-
2c.3	Subtotal Period 2c Collateral Costs	139	41	152	291	489	358	184	325	1,979	1,979	-	-	6,000	1,328	-	-	-	360,802	274	-
Period 2c Period-Dependent Costs																					
2c.4.1	Decon supplies	165	-	-	-	-	-	-	41	206	206	-	-	-	-	-	-	-	-	-	-
2c.4.2	Insurance	-	-	-	-	-	-	271	27	298	298	-	-	-	-	-	-	-	-	-	-
2c.4.3	Property taxes	-	-	-	-	-	-	287	29	315	315	-	-	-	-	-	-	-	-	-	-
2c.4.4	Health physics supplies	-	521	-	-	-	-	-	130	651	651	-	-	-	-	-	-	-	-	-	-
2c.4.5	Heavy equipment rental	-	1,376	-	-	-	-	-	206	1,582	1,582	-	-	-	-	-	-	-	-	-	-
2c.4.6	Disposal of DAW generated	-	-	51	19	-	106	-	34	210	210	-	-	-	2,277	-	-	-	45,639	69	-
2c.4.7	Plant energy budget	-	-	-	-	-	-	584	88	671	671	-	-	-	-	-	-	-	-	-	-
2c.4.8	NRC Fees	-	-	-	-	-	-	444	44	488	488	-	-	-	-	-	-	-	-	-	-
2c.4.9	Radwaste Processing Equipment/Services	-	-	-	-	-	-	253	38	291	291	-	-	-	-	-	-	-	-	-	-
2c.4.10	Corporate Allocations	-	-	-	-	-	-	78	12	90	90	-	-	-	-	-	-	-	-	-	-
2c.4.11	Security Staff Cost	-	-	-	-	-	-	1,070	160	1,230	1,230	-	-	-	-	-	-	-	-	-	21,086
2c.4.12	DOC Staff Cost	-	-	-	-	-	-	4,946	742	5,688	5,688	-	-	-	-	-	-	-	-	-	70,286
2c.4.13	Utility Staff Cost	-	-	-	-	-	-	8,039	1,206	9,245	9,245	-	-	-	-	-	-	-	-	-	132,840
2c.4	Subtotal Period 2c Period-Dependent Costs	165	1,896	51	19	-	106	15,970	2,758	20,965	20,965	-	-	-	2,277	-	-	-	45,639	69	224,211
2c.0	TOTAL PERIOD 2c COST	1,250	3,470	468	469	1,641	1,731	17,329	4,831	31,191	31,191	-	-	21,647	9,901	-	-	-	1,616,341	64,290	236,691
PERIOD 2e - License Termination																					
Period 2e Direct Decommissioning Activities																					
2e.1.1	ORISE confirmatory survey	-	-	-	-	-	-	151	45	197	197	-	-	-	-	-	-	-	-	-	-
2e.1.2	Terminate license									a											
2e.1	Subtotal Period 2e Activity Costs	-	-	-	-	-	-	151	45	197	197	-	-	-	-	-	-	-	-	-	-
Period 2e Additional Costs																					
2e.2.1	Final Site Survey	-	-	-	-	-	-	5,987	1,796	7,783	7,783	-	-	-	-	-	-	-	-	151,236	6,240
2e.2	Subtotal Period 2e Additional Costs	-	-	-	-	-	-	5,987	1,796	7,783	7,783	-	-	-	-	-	-	-	-	151,236	6,240
Period 2e Collateral Costs																					
2e.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,083	162	1,245	1,245	-	-	-	-	-	-	-	-	-	-
2e.3	Subtotal Period 2e Collateral Costs	-	-	-	-	-	-	1,083	162	1,245	1,245	-	-	-	-	-	-	-	-	-	-
Period 2e Period-Dependent Costs																					
2e.4.1	Insurance	-	-	-	-	-	-	310	31	341	341	-	-	-	-	-	-	-	-	-	-
2e.4.2	Property taxes	-	-	-	-	-	-	328	33	361	361	-	-	-	-	-	-	-	-	-	-
2e.4.3	Health physics supplies	-	875	-	-	-	-	-	219	1,094	1,094	-	-	-	-	-	-	-	-	-	-
2e.4.4	Disposal of DAW generated	-	-	9	3	-	19	-	6	37	37	-	-	-	399	-	-	-	7,996	12	-
2e.4.5	Plant energy budget	-	-	-	-	-	-	334	50	385	385	-	-	-	-	-	-	-	-	-	-
2e.4.6	NRC Fees	-	-	-	-	-	-	545	55	600	600	-	-	-	-	-	-	-	-	-	-
2e.4.7	Corporate Allocations	-	-	-	-	-	-	45	7	52	52	-	-	-	-	-	-	-	-	-	-
2e.4.8	Security Staff Cost	-	-	-	-	-	-	1,223	183	1,407	1,407	-	-	-	-	-	-	-	-	-	19,337
2e.4.9	DOC Staff Cost	-	-	-	-	-	-	4,301	645	4,946	4,946	-	-	-	-	-	-	-	-	-	58,817
2e.4.10	Utility Staff Cost	-	-	-	-	-	-	5,010	751	5,761	5,761	-	-	-	-	-	-	-	-	-	76,543
2e.4	Subtotal Period 2e Period-Dependent Costs	-	875	9	3	-	19	12,097	1,980	14,983	14,983	-	-	-	399	-	-	-	7,996	12	154,697
2e.0	TOTAL PERIOD 2e COST	-	875	9	3	-	19	19,319	3,984	24,209	24,209	-	-	-	399	-	-	-	7,996	151,248	160,937
PERIOD 2 TOTALS		6,973	49,490	12,311	7,776	18,128	46,894	212,341	70,256	424,169	394,312	24,562	5,296	240,942	114,406	3,156	459	500	19,864,360	1,035,723	2,703,154

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(thousands of 2008 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor	-	3,624	-	-	-	-	-	544	4,168	-	-	4,168	-	-	-	-	-	-	60,067	-
3b.1.1.2	Access Vaults	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	250	-
3b.1.1.3	Administration	-	164	-	-	-	-	-	25	189	-	-	189	-	-	-	-	-	-	4,467	-
3b.1.1.4	Auxiliary	-	2,837	-	-	-	-	-	426	3,263	-	-	3,263	-	-	-	-	-	-	49,968	-
3b.1.1.5	Auxiliary Boiler	-	23	-	-	-	-	-	3	26	-	-	26	-	-	-	-	-	-	619	-
3b.1.1.6	Chemical Addition Structure	-	31	-	-	-	-	-	5	36	-	-	36	-	-	-	-	-	-	735	-
3b.1.1.7	Circ Water Pump Enclosure	-	4	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	164	-
3b.1.1.8	Circ Water Travel Screen Enclosure	-	4	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	160	-
3b.1.1.9	Circulating Water Discharge Structure	-	118	-	-	-	-	-	18	136	-	-	136	-	-	-	-	-	-	2,373	-
3b.1.1.10	Circulating Water Intake & Screenhouse	-	115	-	-	-	-	-	17	132	-	-	132	-	-	-	-	-	-	2,059	-
3b.1.1.11	Communication Corridor - Clean	-	895	-	-	-	-	-	134	1,030	-	-	1,030	-	-	-	-	-	-	17,215	-
3b.1.1.12	Communication Corridor - Contaminated	-	40	-	-	-	-	-	6	46	-	-	46	-	-	-	-	-	-	674	-
3b.1.1.13	Covered Walkways	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	242	-
3b.1.1.14	Diesel Generator	-	348	-	-	-	-	-	52	401	-	-	401	-	-	-	-	-	-	5,492	-
3b.1.1.15	E.S.W.S. Pumphouse	-	192	-	-	-	-	-	29	220	-	-	220	-	-	-	-	-	-	3,019	-
3b.1.1.16	ESWS Valve House	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	243	-
3b.1.1.17	GOB - Administration Building	-	217	-	-	-	-	-	33	250	-	-	250	-	-	-	-	-	-	5,819	-
3b.1.1.18	Hot Machine Shop	-	14	-	-	-	-	-	2	16	-	-	16	-	-	-	-	-	-	417	-
3b.1.1.19	M.M.O. Building	-	205	-	-	-	-	-	31	236	-	-	236	-	-	-	-	-	-	3,483	-
3b.1.1.20	Material Center West	-	82	-	-	-	-	-	12	94	-	-	94	-	-	-	-	-	-	2,512	-
3b.1.1.21	Misc Structures and Additions	-	60	-	-	-	-	-	9	68	-	-	68	-	-	-	-	-	-	1,523	-
3b.1.1.22	Miscellaneous Site Foundations	-	292	-	-	-	-	-	44	335	-	-	335	-	-	-	-	-	-	7,073	-
3b.1.1.23	Miscellaneous Site Structures	-	1,174	-	-	-	-	-	176	1,350	-	-	1,350	-	-	-	-	-	-	20,147	-
3b.1.1.24	New Covered Walkway	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	160	-
3b.1.1.25	Oil Separator and Waste Tank	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	48	-
3b.1.1.26	Radwaste	-	1,278	-	-	-	-	-	192	1,470	-	-	1,470	-	-	-	-	-	-	21,798	-
3b.1.1.27	Radwaste Drum Storage	-	176	-	-	-	-	-	26	202	-	-	202	-	-	-	-	-	-	3,840	-
3b.1.1.28	Radwaste Storage Building	-	81	-	-	-	-	-	12	93	-	-	93	-	-	-	-	-	-	2,323	-
3b.1.1.29	Security Additions - Main Gate North	-	72	-	-	-	-	-	11	83	-	-	83	-	-	-	-	-	-	1,720	-
3b.1.1.30	Security/Guardhouse	-	36	-	-	-	-	-	5	42	-	-	42	-	-	-	-	-	-	845	-
3b.1.1.31	Site Diesel Generator	-	3	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	61	-
3b.1.1.32	Support Complex	-	23	-	-	-	-	-	4	27	-	-	27	-	-	-	-	-	-	697	-
3b.1.1.33	Turbine Building	-	2,310	-	-	-	-	-	347	2,657	-	-	2,657	-	-	-	-	-	-	55,694	-
3b.1.1.34	Turbine Pedestal	-	776	-	-	-	-	-	116	893	-	-	893	-	-	-	-	-	-	10,928	-
3b.1.1.35	Waste Water Treatment	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	407	-
3b.1.1.36	Water Treatment Building North (Z110)	-	44	-	-	-	-	-	7	50	-	-	50	-	-	-	-	-	-	911	-
3b.1.1.37	Fuel Building	-	1,468	-	-	-	-	-	220	1,688	-	-	1,688	-	-	-	-	-	-	22,580	-
3b.1.1	Totals	-	16,759	-	-	-	-	-	2,514	19,273	-	-	19,273	-	-	-	-	-	-	310,729	-
Site Closeout Activities																					
3b.1.2	Remove Rubble	-	653	-	-	-	-	-	98	751	-	-	751	-	-	-	-	-	-	4,860	-
3b.1.3	Grade & landscape site	-	95	-	-	-	-	-	14	109	-	-	109	-	-	-	-	-	-	512	-
3b.1.4	Final report to NRC	-	-	-	-	-	-	165	25	190	190	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	17,507	-	-	-	-	165	2,651	20,323	190	-	20,133	-	-	-	-	-	-	316,102	1,560
Period 3b Additional Costs																					
3b.2.1	Circulating Water Intake Cofferdam	-	239	-	-	-	-	-	36	275	-	-	275	-	-	-	-	-	-	2,540	-
3b.2.2	E.S.W.S. Pumphouse Cofferdam	-	319	-	-	-	-	-	48	367	-	-	367	-	-	-	-	-	-	3,386	-
3b.2.3	Concrete Crushing	-	750	-	-	-	-	8	114	871	-	-	871	-	-	-	-	-	-	4,308	-
3b.2	Subtotal Period 3b Additional Costs	-	1,309	-	-	-	-	8	197	1,514	-	-	1,514	-	-	-	-	-	-	10,234	-

Table C
Wolf Creek Generating Station
DECON Decommissioning Cost Estimate
(thousands of 2008 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	155	-	-	-	-	-	23	179	-	-	179	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	155	-	-	-	-	-	23	179	-	-	179	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	271	27	298	-	-	298	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	4,069	-	-	-	-	-	610	4,679	-	-	4,679	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	322	48	370	-	-	370	-	-	-	-	-	-	-	-
3b.4.5	Corporate Allocations	-	-	-	-	-	-	36	5	41	41	-	-	-	-	-	-	-	-	-	-
3b.4.6	Security Staff Cost	-	-	-	-	-	-	1,749	262	2,011	-	-	2,011	-	-	-	-	-	-	-	37,234
3b.4.7	DOC Staff Cost	-	-	-	-	-	-	7,838	1,176	9,014	-	-	9,014	-	-	-	-	-	-	-	105,497
3b.4.8	Utility Staff Cost	-	-	-	-	-	-	3,758	564	4,322	-	-	4,322	-	-	-	-	-	-	-	60,506
3b.4	Subtotal Period 3b Period-Dependent Costs	-	4,069	-	-	-	-	13,973	2,693	20,735	41	-	20,694	-	-	-	-	-	-	-	203,237
3b.0	TOTAL PERIOD 3b COST	-	23,040	-	-	-	-	14,146	5,564	42,751	231	-	42,520	-	-	-	-	-	-	326,336	204,797
PERIOD 3 TOTALS		-	23,040	-	-	-	-	14,146	5,564	42,751	231	-	42,520	-	-	-	-	-	-	326,336	204,797
TOTAL COST TO DECOMMISSION		9,794	74,854	12,477	8,307	18,196	51,725	325,126	93,064	593,542	510,086	34,331	49,126	243,009	115,803	4,668	459	500	20,206,730	1,383,235	3,961,681

TOTAL COST TO DECOMMISSION WITH 18.6% CONTINGENCY:	**$593,542**	**thousands of 2008 dollars**
TOTAL NRC LICENSE TERMINATION COST IS 85.94% OR:	**$510,086**	**thousands of 2008 dollars**
SPENT FUEL MANAGEMENT COST IS 5.78% OR:	**$34,331**	**thousands of 2008 dollars**
NON-NUCLEAR DEMOLITION COST IS 8.28% OR:	**$49,126**	**thousands of 2008 dollars**
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	**120,930**	**cubic feet**
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	**500**	**cubic feet**
TOTAL SCRAP METAL REMOVED:	**67,249**	**tons**
TOTAL CRAFT LABOR REQUIREMENTS:	**1,364,135**	**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 2008 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
PERIOD 1a - Shutdown through Transition																					
Period 1a Direct Decommissioning Activities																					
1a.1.1	SAFSTOR site characterization survey	-	-	-	-	-	-	398	119	517	517	-	-	-	-	-	-	-	-	-	-
1a.1.2	Prepare preliminary decommissioning cost	-	-	-	-	-	-	138	21	158	158	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	212	32	243	243	-	-	-	-	-	-	-	-	-	2,000
1a.1.8	Review plant dwgs & specs.	-	-	-	-	-	-	138	21	158	158	-	-	-	-	-	-	-	-	-	1,300
1a.1.9	Perform detailed rad survey									a											
1a.1.10	Estimate by-product inventory	-	-	-	-	-	-	106	16	122	122	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	End product description	-	-	-	-	-	-	106	16	122	122	-	-	-	-	-	-	-	-	-	1,000
1a.1.12	Detailed by-product inventory	-	-	-	-	-	-	159	24	182	182	-	-	-	-	-	-	-	-	-	1,500
1a.1.13	Define major work sequence	-	-	-	-	-	-	106	16	122	122	-	-	-	-	-	-	-	-	-	1,000
1a.1.14	Perform SER and EA	-	-	-	-	-	-	328	49	377	377	-	-	-	-	-	-	-	-	-	3,100
1a.1.15	Perform Site-Specific Cost Study	-	-	-	-	-	-	529	79	608	608	-	-	-	-	-	-	-	-	-	5,000
Activity Specifications																					
1a.1.16.1	Prepare plant and facilities for SAFSTOR	-	-	-	-	-	-	520	78	599	599	-	-	-	-	-	-	-	-	-	4,920
1a.1.16.2	Plant systems	-	-	-	-	-	-	441	66	507	507	-	-	-	-	-	-	-	-	-	4,167
1a.1.16.3	Plant structures and buildings	-	-	-	-	-	-	330	50	380	380	-	-	-	-	-	-	-	-	-	3,120
1a.1.16.4	Waste management	-	-	-	-	-	-	212	32	243	243	-	-	-	-	-	-	-	-	-	2,000
1a.1.16.5	Facility and site dormancy	-	-	-	-	-	-	212	32	243	243	-	-	-	-	-	-	-	-	-	2,000
1a.1.16	Total	-	-	-	-	-	-	1,714	257	1,971	1,971	-	-	-	-	-	-	-	-	-	16,207
Detailed Work Procedures																					
1a.1.17.1	Plant systems	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	1,183
1a.1.17.2	Facility closeout & dormancy	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	1,200
1a.1.17	Total	-	-	-	-	-	-	252	38	290	290	-	-	-	-	-	-	-	-	-	2,383
1a.1.18	Procure vacuum drying system	-	-	-	-	-	-	11	2	12	12	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	4,194	689	4,883	4,883	-	-	-	-	-	-	-	-	-	35,890
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	3,960	594	4,554	-	4,554	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	3,960	594	4,554	-	4,554	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	1,292	129	1,421	1,421	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	1,897	190	2,086	2,086	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	432	-	-	-	-	-	108	540	540	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	428	-	-	-	-	-	64	492	492	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	15	6	-	31	-	10	62	62	-	-	-	675	-	-	-	13,531	21	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	2,164	325	2,489	2,489	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	706	71	776	776	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	945	95	1,040	-	1,040	-	-	-	-	-	-	-	-	-
1a.4.9	INPO Fees	-	-	-	-	-	-	238	36	274	274	-	-	-	-	-	-	-	-	-	-
1a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	940	141	1,082	-	1,082	-	-	-	-	-	-	-	-	-
1a.4.11	Corporate Allocations	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	-
1a.4.12	Security Staff Cost	-	-	-	-	-	-	6,278	942	7,219	7,219	-	-	-	-	-	-	-	-	-	157,471

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2008 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 Period-Dependent Costs (continued)																					
1a.4.13	Utility Staff Cost	-	-	-	-	-	-	23,592	3,539	27,131	27,131	-	-	-	-	-	-	-	-	-	423,400
1a.4	Subtotal Period 1a Period-Dependent Costs	-	859	15	6	-	31	38,302	5,686	44,899	42,777	2,122	-	-	675	-	-	-	13,531	21	580,871
1a.0	TOTAL PERIOD 1a COST	-	859	15	6	-	31	46,456	6,968	54,336	47,660	6,676	-	-	675	-	-	-	13,531	21	616,761
PERIOD 1b - SAFSTOR Limited DECON Activities																					
Period 1b Direct Decommissioning Activities																					
Decontamination of Site Buildings																					
1b.1.1.1	Reactor	754	-	-	-	-	-	-	377	1,131	1,131	-	-	-	-	-	-	-	-	24,102	-
1b.1.1.2	Auxiliary	374	-	-	-	-	-	-	187	561	561	-	-	-	-	-	-	-	-	12,527	-
1b.1.1.3	Communication Corridor - Contaminated	8	-	-	-	-	-	-	4	12	12	-	-	-	-	-	-	-	-	276	-
1b.1.1.4	Fuel Building	492	-	-	-	-	-	-	246	738	738	-	-	-	-	-	-	-	-	14,371	-
1b.1.1.5	Hot Machine Shop	10	-	-	-	-	-	-	5	15	15	-	-	-	-	-	-	-	-	344	-
1b.1.1.6	Radwaste	199	-	-	-	-	-	-	100	299	299	-	-	-	-	-	-	-	-	6,671	-
1b.1.1.7	Radwaste Drum Storage	22	-	-	-	-	-	-	11	34	34	-	-	-	-	-	-	-	-	750	-
1b.1.1.8	Radwaste Storage Building	51	-	-	-	-	-	-	25	76	76	-	-	-	-	-	-	-	-	1,650	-
1b.1.1	Totals	1,911	-	-	-	-	-	-	956	2,867	2,867	-	-	-	-	-	-	-	-	60,692	-
1b.1	Subtotal Period 1b Activity Costs	1,911	-	-	-	-	-	-	956	2,867	2,867	-	-	-	-	-	-	-	-	60,692	-
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	830	-	-	-	-	-	-	125	955	955	-	-	-	-	-	-	-	-	-	-
1b.3.2	Process liquid waste	178	-	65	325	-	348	-	232	1,149	1,149	-	-	-	1,215	-	-	-	72,881	237	-
1b.3.3	Small tool allowance	-	31	-	-	-	-	-	5	36	36	-	-	-	-	-	-	-	-	-	-
1b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	880	132	1,012	-	1,012	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	1,009	31	65	325	-	348	880	493	3,152	2,140	1,012	-	-	1,215	-	-	-	72,881	237	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	1,079	-	-	-	-	-	-	270	1,349	1,349	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	326	33	358	358	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	478	48	526	526	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	352	-	-	-	-	-	88	441	441	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	108	-	-	-	-	-	16	124	124	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	19	7	-	39	-	13	77	77	-	-	-	833	-	-	-	16,695	25	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	546	82	627	627	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	178	18	196	196	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	238	24	262	-	262	-	-	-	-	-	-	-	-	-
1b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	237	36	273	-	273	-	-	-	-	-	-	-	-	-
1b.4.11	Corporate Allocations	-	-	-	-	-	-	63	9	72	72	-	-	-	-	-	-	-	-	-	-
1b.4.12	Security Staff Cost	-	-	-	-	-	-	1,582	237	1,820	1,820	-	-	-	-	-	-	-	-	-	39,691
1b.4.13	Utility Staff Cost	-	-	-	-	-	-	5,946	892	6,838	6,838	-	-	-	-	-	-	-	-	-	106,720
1b.4	Subtotal Period 1b Period-Dependent Costs	1,079	460	19	7	-	39	9,594	1,765	12,963	12,428	535	-	-	833	-	-	-	16,695	25	146,411
1b.0	TOTAL PERIOD 1b COST	3,999	492	84	332	-	387	10,474	3,213	18,981	17,434	1,547	-	-	2,048	-	-	-	89,577	60,954	146,411
PERIOD 1c - Preparations for SAFSTOR Dormancy																					
Period 1c Direct Decommissioning Activities																					
1c.1.1	Prepare support equipment for storage	-	346	-	-	-	-	-	52	398	398	-	-	-	-	-	-	-	-	3,000	-
1c.1.2	Install containment pressure equal. lines	-	22	-	-	-	-	-	3	25	25	-	-	-	-	-	-	-	-	700	-
1c.1.3	Interim survey prior to dormancy	-	-	-	-	-	-	733	220	953	953	-	-	-	-	-	-	-	-	13,410	-
1c.1.4	Secure building accesses									a											
1c.1.5	Prepare & submit interim report	-	-	-	-	-	-	62	9	71	71	-	-	-	-	-	-	-	-	-	583

Table D
Wolf Creek Generating Station
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Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				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			
1c.1	Subtotal Period 1c Activity Costs	-	368	-	-	-	-	795	284	1,447	1,447	-	-	-	-	-	-	-	-	17,110	583
Period 1c Additional Costs																					
1c.2.1	Spent Fuel Pool Isolation	-	-	-	-	-	-	9,407	1,411	10,819	10,819	-	-	-	-	-	-	-	-	-	-
1c.2.2	Misc/Hazardous Waste	-	-	43	14	68	-	-	17	142	142	-	-	2,067	-	-	-	-	133,598	619	-
1c.2	Subtotal Period 1c Additional Costs	-	-	43	14	68	-	9,407	1,428	10,960	10,960	-	-	2,067	-	-	-	-	133,598	619	-
Period 1c Collateral Costs																					
1c.3.1	Process liquid waste	198	-	73	361	-	388	-	258	1,278	1,278	-	-	-	1,352	-	-	-	81,092	264	-
1c.3.2	Small tool allowance	-	2	-	-	-	-	-	0	2	2	-	-	-	-	-	-	-	-	-	-
1c.3.3	Spent Fuel Capital and Transfer	-	-	-	-	-	-	880	132	1,012	-	1,012	-	-	-	-	-	-	-	-	-
1c.3	Subtotal Period 1c Collateral Costs	198	2	73	361	-	388	880	390	2,292	1,280	1,012	-	-	1,352	-	-	-	81,092	264	-
Period 1c Period-Dependent Costs																					
1c.4.1	Insurance	-	-	-	-	-	-	326	33	358	358	-	-	-	-	-	-	-	-	-	-
1c.4.2	Property taxes	-	-	-	-	-	-	478	48	526	526	-	-	-	-	-	-	-	-	-	-
1c.4.3	Health physics supplies	-	181	-	-	-	-	-	45	226	226	-	-	-	-	-	-	-	-	-	-
1c.4.4	Heavy equipment rental	-	108	-	-	-	-	-	16	124	124	-	-	-	-	-	-	-	-	-	-
1c.4.5	Disposal of DAW generated	-	-	4	1	-	8	-	3	16	16	-	-	-	170	-	-	-	3,411	5	-
1c.4.6	Plant energy budget	-	-	-	-	-	-	546	82	627	627	-	-	-	-	-	-	-	-	-	-
1c.4.7	NRC Fees	-	-	-	-	-	-	178	18	196	196	-	-	-	-	-	-	-	-	-	-
1c.4.8	Emergency Planning Fees	-	-	-	-	-	-	238	24	262	-	262	-	-	-	-	-	-	-	-	-
1c.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	237	36	273	-	273	-	-	-	-	-	-	-	-	-
1c.4.10	Corporate Allocations	-	-	-	-	-	-	63	9	72	72	-	-	-	-	-	-	-	-	-	-
1c.4.11	Security Staff Cost	-	-	-	-	-	-	1,582	237	1,820	1,820	-	-	-	-	-	-	-	-	-	39,691
1c.4.12	Utility Staff Cost	-	-	-	-	-	-	5,946	892	6,838	6,838	-	-	-	-	-	-	-	-	-	106,720
1c.4	Subtotal Period 1c Period-Dependent Costs	-	289	4	1	-	8	9,594	1,442	11,338	10,803	535	-	-	170	-	-	-	3,411	5	146,411
1c.0	TOTAL PERIOD 1c COST	198	659	119	377	68	396	20,676	3,544	26,038	24,491	1,547	-	2,067	1,522	-	-	-	218,101	17,998	146,995
PERIOD 1 TOTALS		4,198	2,009	219	714	68	814	77,607	13,726	99,355	89,586	9,769	-	2,067	4,245	-	-	-	321,209	78,973	910,168
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	-	-	-	-	-	-	311	47	358	358	-	-	-	-	-	-	-	-	-	-
2a.1.5	Maintenance supplies	-	-	-	-	-	-	503	126	629	629	-	-	-	-	-	-	-	-	-	-
2a.1	Subtotal Period 2a Activity Costs	-	-	-	-	-	-	814	172	986	986	-	-	-	-	-	-	-	-	-	-
Period 2a Collateral Costs																					
2a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	15,400	2,310	17,710	-	17,710	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	-	-	-	-	-	-	15,400	2,310	17,710	-	17,710	-	-	-	-	-	-	-	-	-
Period 2a Period-Dependent Costs																					
2a.4.1	Insurance	-	-	-	-	-	-	1,869	187	2,056	1,768	289	-	-	-	-	-	-	-	-	-
2a.4.2	Property taxes	-	-	-	-	-	-	7,587	759	8,345	801	7,545	-	-	-	-	-	-	-	-	-
2a.4.3	Health physics supplies	-	401	-	-	-	-	-	100	501	501	-	-	-	-	-	-	-	-	-	-
2a.4.4	Disposal of DAW generated	-	-	41	15	-	85	-	28	169	169	-	-	-	1,828	-	-	-	36,637	56	-
2a.4.5	Plant energy budget	-	-	-	-	-	-	1,732	260	1,991	996	996	-	-	-	-	-	-	-	-	-
2a.4.6	NRC Fees	-	-	-	-	-	-	806	81	887	887	-	-	-	-	-	-	-	-	-	-
2a.4.7	Emergency Planning Fees	-	-	-	-	-	-	2,296	230	2,526	-	2,526	-	-	-	-	-	-	-	-	-
2a.4.8	Spent Fuel Pool O&M	-	-	-	-	-	-	3,762	564	4,326	-	4,326	-	-	-	-	-	-	-	-	-
2a.4.9	Corporate Allocations	-	-	-	-	-	-	194	29	224	50	174	-	-	-	-	-	-	-	-	-
2a.4.10	Security Staff Cost	-	-	-	-	-	-	18,211	2,732	20,942	7,302	13,640	-	-	-	-	-	-	-	-	444,257

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2008 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 Period-Dependent Costs (continued)																					
2a.4.11	Utility Staff Cost	-	-	-	-	-	-	19,079	2,862	21,941	4,396	17,546	-	-	-	-	-	-	-	-	329,543
2a.4	Subtotal Period 2a Period-Dependent Costs	-	401	41	15	-	85	55,536	7,830	63,908	16,867	47,041	-	-	1,828	-	-	-	36,637	56	773,800
2a.0	TOTAL PERIOD 2a COST	-	401	41	15	-	85	71,750	10,313	82,604	17,853	64,751	-	-	1,828	-	-	-	36,637	56	773,800
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	-	-	-	-	-	-	3,758	564	4,322	4,322	-	-	-	-	-	-	-	-	-	-
2c.1.5	Maintenance supplies	-	-	-	-	-	-	6,074	1,518	7,592	7,592	-	-	-	-	-	-	-	-	-	-
2c.1	Subtotal Period 2c Activity Costs	-	-	-	-	-	-	9,832	2,082	11,914	11,914	-	-	-	-	-	-	-	-	-	-
Period 2c Period-Dependent Costs																					
2c.4.1	Insurance	-	-	-	-	-	-	19,412	1,941	21,353	21,353	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	8,792	879	9,671	9,671	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	3,817	-	-	-	-	-	954	4,772	4,772	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	452	165	-	935	-	304	1,855	1,855	-	-	-	20,103	-	-	-	402,847	613	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	10,459	1,569	12,027	12,027	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	8,817	882	9,699	9,699	-	-	-	-	-	-	-	-	-	-
2c.4.7	Corporate Allocations	-	-	-	-	-	-	520	78	598	598	-	-	-	-	-	-	-	-	-	-
2c.4.8	Security Staff Cost	-	-	-	-	-	-	76,702	11,505	88,207	88,207	-	-	-	-	-	-	-	-	-	1,511,743
2c.4.9	Utility Staff Cost	-	-	-	-	-	-	46,174	6,926	53,100	53,100	-	-	-	-	-	-	-	-	-	881,850
2c.4	Subtotal Period 2c Period-Dependent Costs	-	3,817	452	165	-	935	170,875	25,038	201,281	201,281	-	-	-	20,103	-	-	-	402,847	613	2,393,593
2c.0	TOTAL PERIOD 2c COST	-	3,817	452	165	-	935	180,707	27,120	213,196	213,196	-	-	-	20,103	-	-	-	402,847	613	2,393,593
PERIOD 2 TOTALS		-	4,218	493	180	-	1,020	252,457	37,433	295,800	231,049	64,751	-	-	21,931	-	-	-	439,484	669	3,167,393
PERIOD 3a - Reactivate Site Following SAFSTOR Dormancy																					
Period 3a Direct Decommissioning Activities																					
3a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	138	21	158	158	-	-	-	-	-	-	-	-	-	1,300
3a.1.2	Review plant dwgs & specs.	-	-	-	-	-	-	487	73	560	560	-	-	-	-	-	-	-	-	-	4,600
3a.1.3	Perform detailed rad survey									a											
3a.1.4	End product description	-	-	-	-	-	-	106	16	122	122	-	-	-	-	-	-	-	-	-	1,000
3a.1.5	Detailed by-product inventory	-	-	-	-	-	-	138	21	158	158	-	-	-	-	-	-	-	-	-	1,300
3a.1.6	Define major work sequence	-	-	-	-	-	-	793	119	912	912	-	-	-	-	-	-	-	-	-	7,500
3a.1.7	Perform SER and EA	-	-	-	-	-	-	328	49	377	377	-	-	-	-	-	-	-	-	-	3,100
3a.1.8	Perform Site-Specific Cost Study	-	-	-	-	-	-	529	79	608	608	-	-	-	-	-	-	-	-	-	5,000
3a.1.9	Prepare/submit License Termination Plan	-	-	-	-	-	-	433	65	498	498	-	-	-	-	-	-	-	-	-	4,096
3a.1.10	Receive NRC approval of termination plan									a											
Activity Specifications																					
3a.1.11.1	Re-activate plant & temporary facilities	-	-	-	-	-	-	780	117	897	807	-	90	-	-	-	-	-	-	-	7,370
3a.1.11.2	Plant systems	-	-	-	-	-	-	441	66	507	456	-	51	-	-	-	-	-	-	-	4,167
3a.1.11.3	Reactor internals	-	-	-	-	-	-	751	113	864	864	-	-	-	-	-	-	-	-	-	7,100
3a.1.11.4	Reactor vessel	-	-	-	-	-	-	688	103	791	791	-	-	-	-	-	-	-	-	-	6,500
3a.1.11.5	Biological shield	-	-	-	-	-	-	53	8	61	61	-	-	-	-	-	-	-	-	-	500
3a.1.11.6	Steam generators	-	-	-	-	-	-	330	50	380	380	-	-	-	-	-	-	-	-	-	3,120
3a.1.11.7	Reinforced concrete	-	-	-	-	-	-	169	25	195	97	-	97	-	-	-	-	-	-	-	1,600
3a.1.11.8	Main Turbine	-	-	-	-	-	-	42	6	49	-	-	49	-	-	-	-	-	-	-	400

Table D
Wolf Creek Generating Station
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(thousands of 2008 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.1.11.9	Main Condensers	-	-	-	-	-	-	42	6	49	-	-	49	-	-	-	-	-	-	-	400
3a.1.11.10	Plant structures & buildings	-	-	-	-	-	-	330	50	380	190	-	190	-	-	-	-	-	-	-	3,120
3a.1.11.11	Waste management	-	-	-	-	-	-	487	73	560	560	-	-	-	-	-	-	-	-	-	4,600
3a.1.11.12	Facility & site closeout	-	-	-	-	-	-	95	14	109	55	-	55	-	-	-	-	-	-	-	900
3a.1.11	Total	-	-	-	-	-	-	4,208	631	4,839	4,259	-	579	-	-	-	-	-	-	-	39,777
Planning & Site Preparations																					
3a.1.12	Prepare dismantling sequence	-	-	-	-	-	-	254	38	292	292	-	-	-	-	-	-	-	-	-	2,400
3a.1.13	Plant prep. & temp. svces	-	-	-	-	-	-	2,700	405	3,105	3,105	-	-	-	-	-	-	-	-	-	-
3a.1.14	Design water clean-up system	-	-	-	-	-	-	148	22	170	170	-	-	-	-	-	-	-	-	-	1,400
3a.1.15	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,100	315	2,415	2,415	-	-	-	-	-	-	-	-	-	-
3a.1.16	Procure casks/liners & containers	-	-	-	-	-	-	130	20	150	150	-	-	-	-	-	-	-	-	-	1,230
3a.1	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	12,490	1,874	14,364	13,785	-	579	-	-	-	-	-	-	-	72,703
Period 3a Period-Dependent Costs																					
3a.4.1	Insurance	-	-	-	-	-	-	203	20	223	223	-	-	-	-	-	-	-	-	-	-
3a.4.2	Property taxes	-	-	-	-	-	-	92	9	101	101	-	-	-	-	-	-	-	-	-	-
3a.4.3	Health physics supplies	-	190	-	-	-	-	-	48	238	238	-	-	-	-	-	-	-	-	-	-
3a.4.4	Heavy equipment rental	-	216	-	-	-	-	-	32	248	248	-	-	-	-	-	-	-	-	-	-
3a.4.5	Disposal of DAW generated	-	-	6	2	-	13	-	4	27	27	-	-	-	287	-	-	-	5,756	9	-
3a.4.6	Plant energy budget	-	-	-	-	-	-	1,091	164	1,255	1,255	-	-	-	-	-	-	-	-	-	-
3a.4.7	NRC Fees	-	-	-	-	-	-	126	13	138	138	-	-	-	-	-	-	-	-	-	-
3a.4.8	Corporate Allocations	-	-	-	-	-	-	77	12	88	88	-	-	-	-	-	-	-	-	-	-
3a.4.9	Security Staff Cost	-	-	-	-	-	-	1,435	215	1,651	1,651	-	-	-	-	-	-	-	-	-	32,857
3a.4.10	Utility Staff Cost	-	-	-	-	-	-	7,452	1,118	8,570	8,570	-	-	-	-	-	-	-	-	-	130,377
3a.4	Subtotal Period 3a Period-Dependent Costs	-	406	6	2	-	13	10,475	1,635	12,538	12,538	-	-	-	287	-	-	-	5,756	9	163,234
3a.0	TOTAL PERIOD 3a COST	-	406	6	2	-	13	22,966	3,508	26,902	26,322	-	579	-	287	-	-	-	5,756	9	235,937
PERIOD 3b - Decommissioning Preparations																					
Period 3b Direct Decommissioning Activities																					
Detailed Work Procedures																					
3b.1.1.1	Plant systems	-	-	-	-	-	-	501	75	576	518	-	58	-	-	-	-	-	-	-	4,733
3b.1.1.2	Reactor internals	-	-	-	-	-	-	264	40	304	304	-	-	-	-	-	-	-	-	-	2,500
3b.1.1.3	Remaining buildings	-	-	-	-	-	-	143	21	164	41	-	123	-	-	-	-	-	-	-	1,350
3b.1.1.4	CRD cooling assembly	-	-	-	-	-	-	106	16	122	122	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.5	CRD housings & ICI tubes	-	-	-	-	-	-	106	16	122	122	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.6	Incore instrumentation	-	-	-	-	-	-	106	16	122	122	-	-	-	-	-	-	-	-	-	1,000
3b.1.1.7	Reactor vessel	-	-	-	-	-	-	384	58	442	442	-	-	-	-	-	-	-	-	-	3,630
3b.1.1.8	Facility closeout	-	-	-	-	-	-	127	19	146	73	-	73	-	-	-	-	-	-	-	1,200
3b.1.1.9	Missile shields	-	-	-	-	-	-	48	7	55	55	-	-	-	-	-	-	-	-	-	450
3b.1.1.10	Biological shield	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	1,200
3b.1.1.11	Steam generators	-	-	-	-	-	-	487	73	560	560	-	-	-	-	-	-	-	-	-	4,600
3b.1.1.12	Reinforced concrete	-	-	-	-	-	-	106	16	122	61	-	61	-	-	-	-	-	-	-	1,000
3b.1.1.13	Main Turbine	-	-	-	-	-	-	165	25	190	-	-	190	-	-	-	-	-	-	-	1,560
3b.1.1.14	Main Condensers	-	-	-	-	-	-	165	25	190	-	-	190	-	-	-	-	-	-	-	1,560
3b.1.1.15	Auxiliary building	-	-	-	-	-	-	289	43	332	299	-	33	-	-	-	-	-	-	-	2,730
3b.1.1.16	Reactor building	-	-	-	-	-	-	289	43	332	299	-	33	-	-	-	-	-	-	-	2,730
3b.1.1	Total	-	-	-	-	-	-	3,411	512	3,922	3,162	-	761	-	-	-	-	-	-	-	32,243
3b.1	Subtotal Period 3b Activity Costs	-	-	-	-	-	-	3,411	512	3,922	3,162	-	761	-	-	-	-	-	-	-	32,243

Table D
Wolf Creek Generating Station
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Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	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 3b Additional Costs																					
3b.2.1	Site Characterization	-	-	-	-	-	-	3,057	917	3,974	3,974	-	-	-	-	-	-	-	-	19,100	7,852
3b.2	Subtotal Period 3b Additional Costs	-	-	-	-	-	-	3,057	917	3,974	3,974	-	-	-	-	-	-	-	-	19,100	7,852
Period 3b Collateral Costs																					
3b.3.1	Decon equipment	830	-	-	-	-	-	-	125	955	955	-	-	-	-	-	-	-	-	-	-
3b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,083	162	1,245	1,245	-	-	-	-	-	-	-	-	-	-
3b.3.3	Pipe cutting equipment	-	1,000	-	-	-	-	-	150	1,150	1,150	-	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	830	1,000	-	-	-	-	1,083	437	3,350	3,350	-	-	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Decon supplies	51	-	-	-	-	-	-	13	63	63	-	-	-	-	-	-	-	-	-	-
3b.4.2	Insurance	-	-	-	-	-	-	402	40	442	442	-	-	-	-	-	-	-	-	-	-
3b.4.3	Property taxes	-	-	-	-	-	-	182	18	200	200	-	-	-	-	-	-	-	-	-	-
3b.4.4	Health physics supplies	-	416	-	-	-	-	-	104	520	520	-	-	-	-	-	-	-	-	-	-
3b.4.5	Heavy equipment rental	-	428	-	-	-	-	-	64	492	492	-	-	-	-	-	-	-	-	-	-
3b.4.6	Disposal of DAW generated	-	-	14	5	-	30	-	10	59	59	-	-	-	645	-	-	-	12,916	20	-
3b.4.7	Plant energy budget	-	-	-	-	-	-	2,164	325	2,489	2,489	-	-	-	-	-	-	-	-	-	-
3b.4.8	NRC Fees	-	-	-	-	-	-	249	25	274	274	-	-	-	-	-	-	-	-	-	-
3b.4.9	Corporate Allocations	-	-	-	-	-	-	153	23	175	175	-	-	-	-	-	-	-	-	-	-
3b.4.10	Security Staff Cost	-	-	-	-	-	-	2,847	427	3,274	3,274	-	-	-	-	-	-	-	-	-	65,179
3b.4.11	DOC Staff Cost	-	-	-	-	-	-	8,295	1,244	9,539	9,539	-	-	-	-	-	-	-	-	-	116,800
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	14,783	2,217	17,001	17,001	-	-	-	-	-	-	-	-	-	258,629
3b.4	Subtotal Period 3b Period-Dependent Costs	51	843	14	5	-	30	29,075	4,510	34,529	34,529	-	-	-	645	-	-	-	12,916	20	440,607
3b.0	TOTAL PERIOD 3b COST	881	1,843	14	5	-	30	36,626	6,376	45,776	45,015	-	761	-	645	-	-	-	12,916	19,120	480,702
PERIOD 3 TOTALS		881	2,249	21	8	-	43	59,592	9,884	72,678	71,338	-	1,340	-	932	-	-	-	18,672	19,128	716,639
PERIOD 4a - Large Component Removal																					
Period 4a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
4a.1.1.1	Reactor Coolant Piping	21	104	18	14	116	176	-	102	550	550	-	-	579	579	-	-	-	134,210	3,867	-
4a.1.1.2	Pressurizer Relief Tank	4	14	5	4	33	46	-	23	128	128	-	-	164	164	-	-	-	36,395	581	-
4a.1.1.3	Reactor Coolant Pumps & Motors	12	52	34	152	142	914	-	295	1,602	1,602	-	-	198	3,386	-	-	-	897,754	3,464	-
4a.1.1.4	Pressurizer	5	31	475	378	-	1,048	-	377	2,315	2,315	-	-	-	3,882	-	-	-	240,508	1,866	1,500
4a.1.1.5	Steam Generators	45	4,446	2,382	2,432	2,770	6,060	-	3,668	21,804	21,804	-	-	40,845	22,448	-	-	-	3,353,623	20,508	4,500
4a.1.1.6	CRDMs/ICIs/Service Structure Removal	18	64	201	32	82	141	-	97	635	635	-	-	1,227	3,012	-	-	-	101,470	2,260	-
4a.1.1.7	Reactor Vessel Internals	39	2,111	3,838	472	-	3,458	162	4,434	14,514	14,514	-	-	-	2,211	376	470	-	325,254	19,517	913
4a.1.1.8	Vessel & Internals GTCC Disposal	-	-	-	-	-	11,886	-	1,783	13,669	13,669	-	-	-	-	-	-	500	104,146	-	-
4a.1.1.9	Reactor Vessel	-	4,863	935	255	-	3,475	162	5,706	15,396	15,396	-	-	-	6,481	2,955	-	-	954,563	19,517	913
4a.1.1	Totals	144	11,685	7,890	3,739	3,143	27,203	324	16,484	70,613	70,613	-	-	43,013	42,163	3,330	470	500	6,147,923	71,581	7,825
Removal of Major Equipment																					
4a.1.2	Main Turbine/Generator	-	248	302	43	745	576	-	354	2,268	2,268	-	-	4,844	2,698	-	-	-	653,808	8,325	-
4a.1.3	Main Condensers	-	686	158	67	627	511	-	419	2,470	2,470	-	-	7,701	2,270	-	-	-	550,231	24,132	-
Cascading Costs from Clean Building Demolition																					
4a.1.4.1	Reactor	-	639	-	-	-	-	-	96	734	734	-	-	-	-	-	-	-	-	10,579	-
4a.1.4.2	Auxiliary	-	315	-	-	-	-	-	47	363	363	-	-	-	-	-	-	-	-	5,551	-
4a.1.4.3	Fuel Building	-	160	-	-	-	-	-	24	184	184	-	-	-	-	-	-	-	-	2,395	-
4a.1.4.4	Hot Machine Shop	-	1	-	-	-	-	-	0	1	1	-	-	-	-	-	-	-	-	16	-
4a.1.4.5	Radwaste	-	66	-	-	-	-	-	10	76	76	-	-	-	-	-	-	-	-	1,108	-
4a.1.4	Totals	-	1,181	-	-	-	-	-	177	1,358	1,358	-	-	-	-	-	-	-	-	19,649	-

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(thousands of 2008 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																					
4a.1.5.1	AB - Main Steam	-	131	-	-	-	-	-	20	151	-	-	151	-	-	-	-	-	-	5,833	-
4a.1.5.2	AB - Main Steam RCA	-	48	4	8	158	-	-	37	255	255	-	-	2,156	-	-	-	-	87,550	1,495	-
4a.1.5.3	AC - Main Turbine	-	131	-	-	-	-	-	20	150	-	-	150	-	-	-	-	-	-	5,641	-
4a.1.5.4	AD - Condensate	-	147	-	-	-	-	-	22	169	-	-	169	-	-	-	-	-	-	6,144	-
4a.1.5.5	AE - Feedwater	-	100	-	-	-	-	-	15	115	-	-	115	-	-	-	-	-	-	4,271	-
4a.1.5.6	AF - Feedwater Hter Extrction, Drn & Vnt	-	121	-	-	-	-	-	18	140	-	-	140	-	-	-	-	-	-	5,352	-
4a.1.5.7	AK - Condensate Demineralizer	-	45	-	-	-	-	-	7	52	-	-	52	-	-	-	-	-	-	1,944	-
4a.1.5.8	AL - Auxiliary Feedwater	-	20	-	-	-	-	-	3	23	-	-	23	-	-	-	-	-	-	852	-
4a.1.5.9	AQ - Condensate & Feedwater Chem Additn	-	11	-	-	-	-	-	2	13	-	-	13	-	-	-	-	-	-	468	-
4a.1.5.10	AX - Acid Feed	-	17	-	-	-	-	-	3	20	-	-	20	-	-	-	-	-	-	754	-
4a.1.5.11	Auxiliary Bldg Non-System Specific	-	62	4	5	35	45	-	33	184	184	-	-	474	199	-	-	-	37,110	1,974	-
4a.1.5.12	Auxiliary Bldg Non-System Specific RCA	-	432	13	28	561	-	-	198	1,232	1,232	-	-	7,629	-	-	-	-	309,812	13,468	-
4a.1.5.13	BL - Reactor Makeup Water	-	151	16	17	142	135	-	97	558	558	-	-	1,928	700	-	-	-	132,091	4,666	-
4a.1.5.14	BM - Steam Generator Blowdown	-	304	9	19	379	-	-	137	848	848	-	-	5,160	-	-	-	-	209,560	9,483	-
4a.1.5.15	CA - Steam Seal	-	10	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	455	-
4a.1.5.16	CB - Main Turbine Lube Oil	-	31	-	-	-	-	-	5	35	-	-	35	-	-	-	-	-	-	1,207	-
4a.1.5.17	CC - Generator Hydrogen & CO2	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	198	-
4a.1.5.18	CD - Generator Seal Oil	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	287	-
4a.1.5.19	CE - Stator Cooling Water	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	241	-
4a.1.5.20	CF - Lube Oil Strg, Xfer & Purification	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	812	-
4a.1.5.21	CG - Condenser Air Removal	-	16	-	-	-	-	-	2	18	-	-	18	-	-	-	-	-	-	657	-
4a.1.5.22	CH - Main Turbine Control Oil	-	32	-	-	-	-	-	5	36	-	-	36	-	-	-	-	-	-	1,219	-
4a.1.5.23	CL - Chlorination	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	569	-
4a.1.5.24	CO - Carbon Dioxide	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	121	-
4a.1.5.25	CW - Circulating Water	-	179	-	-	-	-	-	27	206	-	-	206	-	-	-	-	-	-	7,858	-
4a.1.5.26	CZ - Caustic Acid	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	111	-
4a.1.5.27	DA - Circulating Water System	-	181	-	-	-	-	-	27	208	-	-	208	-	-	-	-	-	-	7,953	-
4a.1.5.28	DM - Equipment Drains	-	30	-	-	-	-	-	4	34	-	-	34	-	-	-	-	-	-	1,223	-
4a.1.5.29	DM - Equipment Drains RCA	-	92	27	56	1,135	-	-	204	1,515	1,515	-	-	15,445	-	-	-	-	627,223	2,835	-
4a.1.5.30	EG - Component Cooling Water RCA	-	431	25	52	1,041	-	-	274	1,823	1,823	-	-	14,161	-	-	-	-	575,071	13,276	-
4a.1.5.31	EJ - Residual Heat Removal	-	200	33	37	200	383	-	185	1,038	1,038	-	-	2,727	1,713	-	-	-	263,397	6,440	-
4a.1.5.32	EM - High Pressure Coolant Injection	-	153	11	12	93	103	-	81	453	453	-	-	1,260	458	-	-	-	92,199	4,676	-
4a.1.5.33	EN - Containment Spray	-	130	5	11	222	-	-	68	436	436	-	-	3,026	-	-	-	-	122,874	4,004	-
4a.1.5.34	FB - Auxiliary Steam	-	48	-	-	-	-	-	7	55	-	-	55	-	-	-	-	-	-	2,106	-
4a.1.5.35	FB - Auxiliary Steam RCA	-	50	1	3	60	-	-	22	137	137	-	-	816	-	-	-	-	33,148	1,492	-
4a.1.5.36	FC - Auxiliary Turbines	-	31	-	-	-	-	-	5	36	-	-	36	-	-	-	-	-	-	1,301	-
4a.1.5.37	FE - Auxiliary Steam Chemical Addition	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	105	-
4a.1.5.38	GE - Turbine Bldg HVAC	-	70	-	-	-	-	-	10	80	-	-	80	-	-	-	-	-	-	3,081	-
4a.1.5.39	GF - Miscellaneous Building HVAC	-	21	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	945	-
4a.1.5.40	GS - Containment Hydrogen Control	-	41	3	4	48	16	-	22	135	135	-	-	658	73	-	-	-	33,309	1,268	-
4a.1.5.41	HF - Secondary Liquid Waste	-	514	57	59	455	509	-	338	1,932	1,932	-	-	6,186	2,522	-	-	-	453,942	16,203	-
4a.1.5.42	HY - Hydrogen	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	223	-
4a.1.5.43	KH - Service Gas	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	644	-
4a.1.5.44	LE - Oily Waste	-	58	-	-	-	-	-	9	67	-	-	67	-	-	-	-	-	-	2,575	-
4a.1.5.45	LE - Oily Waste RCA	-	115	3	6	126	-	-	49	299	299	-	-	1,718	-	-	-	-	69,785	3,398	-
4a.1.5.46	NT - Nitrogen	-	3	-	-	-	-	-	0	4	-	-	4	-	-	-	-	-	-	149	-
4a.1.5.47	OX - Oxygen	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	171	-
4a.1.5.48	SW - Screen Wash	-	16	-	-	-	-	-	2	19	-	-	19	-	-	-	-	-	-	635	-
4a.1.5.49	Turbine Bldg Non-System Specific	-	381	-	-	-	-	-	57	438	-	-	438	-	-	-	-	-	-	15,405	-
4a.1.5.50	VH - Circ Water & Makeup Water Scrnhs	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	245	-
4a.1.5.51	VV - Misc Bldg HVAC	-	3	-	-	-	-	-	0	4	-	-	4	-	-	-	-	-	-	123	-
4a.1.5.52	WG - Gland Water & Motor Cooling Water	-	13	-	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	593	-
4a.1.5.53	WL - Cooling Lake Makeup & Blowdown	-	18	-	-	-	-	-	3	20	-	-	20	-	-	-	-	-	-	745	-
4a.1.5	Totals	-	4,674	212	315	4,656	1,191	-	2,038	13,088	10,843	-	2,244	63,344	5,666	-	-	-	3,047,070	167,892	-
4a.1.6	Scaffolding in support of decommissioning	-	794	20	6	98	10	-	219	1,147	1,147	-	-	1,206	68	-	-	-	60,659	32,150	-

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2008 dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
4a.1	Subtotal Period 4a Activity Costs	144	19,268	8,583	4,171	9,270	29,491	324	19,692	90,944	88,700	-	2,244	120,108	52,864	3,330	470	500	10,459,690	323,728	7,825
Period 4a Collateral Costs																					
4a.3.1	Process liquid waste	31	-	13	67	-	71	-	45	228	228	-	-	-	249	-	-	-	14,957	49	-
4a.3.2	Small tool allowance	-	167	-	-	-	-	-	25	192	173	-	19	-	-	-	-	-	-	-	-
4a.3.3	Survey and Release of Scrap Metal	-	-	-	-	-	-	814	122	936	936	-	-	-	-	-	-	-	-	-	-
4a.3	Subtotal Period 4a Collateral Costs	31	167	13	67	-	71	814	192	1,357	1,337	-	19	-	249	-	-	-	14,957	49	-
Period 4a Period-Dependent Costs																					
4a.4.1	Decon supplies	59	-	-	-	-	-	-	15	74	74	-	-	-	-	-	-	-	-	-	-
4a.4.2	Insurance	-	-	-	-	-	-	470	47	517	517	-	-	-	-	-	-	-	-	-	-
4a.4.3	Property taxes	-	-	-	-	-	-	213	21	234	211	-	23	-	-	-	-	-	-	-	-
4a.4.4	Health physics supplies	-	1,792	-	-	-	-	-	448	2,241	2,241	-	-	-	-	-	-	-	-	-	-
4a.4.5	Heavy equipment rental	-	2,405	-	-	-	-	-	361	2,766	2,766	-	-	-	-	-	-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	107	39	-	221	-	72	439	439	-	-	-	4,757	-	-	-	95,337	145	-
4a.4.7	Plant energy budget	-	-	-	-	-	-	2,405	361	2,766	2,766	-	-	-	-	-	-	-	-	-	-
4a.4.8	NRC Fees	-	-	-	-	-	-	770	77	847	847	-	-	-	-	-	-	-	-	-	-
4a.4.9	Radwaste Processing Equipment/Services	-	-	-	-	-	-	219	33	252	252	-	-	-	-	-	-	-	-	-	-
4a.4.10	Corporate Allocations	-	-	-	-	-	-	180	27	207	207	-	-	-	-	-	-	-	-	-	-
4a.4.11	Security Staff Cost	-	-	-	-	-	-	3,331	500	3,830	3,830	-	-	-	-	-	-	-	-	-	76,250
4a.4.12	DOC Staff Cost	-	-	-	-	-	-	11,460	1,719	13,179	13,179	-	-	-	-	-	-	-	-	-	168,360
4a.4.13	Utility Staff Cost	-	-	-	-	-	-	17,477	2,622	20,098	20,098	-	-	-	-	-	-	-	-	-	305,000
4a.4	Subtotal Period 4a Period-Dependent Costs	59	4,198	107	39	-	221	36,525	6,302	47,451	47,428	-	23	-	4,757	-	-	-	95,337	145	549,610
4a.0	TOTAL PERIOD 4a COST	235	23,633	8,703	4,276	9,270	29,784	37,664	26,186	139,751	137,464	-	2,287	120,108	57,871	3,330	470	500	10,569,990	323,922	557,435
PERIOD 4b - Site Decontamination																					
Period 4b Direct Decommissioning Activities																					
4b.1.1	Remove spent fuel racks	398	43	203	71	-	994	-	489	2,198	2,198	-	-	-	4,412	-	-	-	395,882	1,722	-
Disposal of Plant Systems																					
4b.1.2.1	AN - Demineralized Wtr Storage & xfer	-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	1,548	-
4b.1.2.2	AN - Demineralized Wtr Strg & xfer RCA	-	11	0	0	9	-	-	4	25	25	-	-	120	-	-	-	-	4,855	320	-
4b.1.2.3	AP - Condensate Storage & Transfer	-	43	-	-	-	-	-	6	49	-	-	49	-	-	-	-	-	-	1,660	-
4b.1.2.4	BB - Reactor Coolant	-	150	25	25	128	265	-	129	723	723	-	-	1,746	1,388	-	-	-	176,612	4,943	-
4b.1.2.5	BG - Chemical & Volume Control	-	471	71	73	360	783	-	386	2,144	2,144	-	-	4,899	3,559	-	-	-	510,728	14,707	-
4b.1.2.6	BN - Borated Refueling Water Storage	-	183	16	26	405	85	-	133	848	848	-	-	5,512	416	-	-	-	257,593	5,908	-
4b.1.2.7	Control Bldg Non-System Specific	-	110	4	8	157	-	-	53	332	332	-	-	2,139	-	-	-	-	86,849	3,413	-
4b.1.2.8	Control Bldg Non-System Specific Cln	-	877	-	-	-	-	-	132	1,009	-	-	1,009	-	-	-	-	-	-	29,076	-
4b.1.2.9	DO - Diesel Oil	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	48	-
4b.1.2.10	EA - Service Water	-	60	-	-	-	-	-	9	69	-	-	69	-	-	-	-	-	-	2,592	-
4b.1.2.11	EB - Closed Cooling Water	-	29	-	-	-	-	-	4	33	-	-	33	-	-	-	-	-	-	1,267	-
4b.1.2.12	EC - Fuel Pool Cooling & Cleanup	-	204	17	22	191	173	-	128	735	735	-	-	2,600	769	-	-	-	174,505	6,344	-
4b.1.2.13	EF - Essential Service Water	-	67	-	-	-	-	-	10	77	-	-	77	-	-	-	-	-	-	2,951	-
4b.1.2.14	EF - Essential Service Water RCA	-	54	3	5	105	-	-	30	196	196	-	-	1,427	-	-	-	-	57,959	1,677	-
4b.1.2.15	EP - Accumulator Safety Injection	-	86	7	9	115	45	-	52	314	314	-	-	1,568	208	-	-	-	81,536	2,635	-
4b.1.2.16	FA - Auxiliary Steam Generator	-	11	-	-	-	-	-	2	13	-	-	13	-	-	-	-	-	-	521	-
4b.1.2.17	FO - Fuel Oil	-	11	-	-	-	-	-	2	12	-	-	12	-	-	-	-	-	-	486	-
4b.1.2.18	FP - Fire Protection	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	3,826	-
4b.1.2.19	FP - Fire Protection RCA	-	122	8	16	330	-	-	83	559	559	-	-	4,492	-	-	-	-	182,411	3,540	-
4b.1.2.20	Fuel Bldg Non-System Specific	-	27	2	2	13	19	-	14	75	75	-	-	170	85	-	-	-	14,545	827	-
4b.1.2.21	Fuel Bldg Non-System Specific RCA	-	192	6	12	235	-	-	86	530	530	-	-	3,200	-	-	-	-	129,974	5,858	-
4b.1.2.22	Fuel Building Fire Protection	-	94	5	11	216	-	-	58	384	384	-	-	2,941	-	-	-	-	119,444	2,771	-
4b.1.2.23	GA - Plant Heating	-	43	-	-	-	-	-	6	49	-	-	49	-	-	-	-	-	-	1,912	-
4b.1.2.24	GA - Plant Heating RCA	-	68	1	3	55	-	-	26	153	153	-	-	746	-	-	-	-	30,275	1,992	-
4b.1.2.25	GB - Central Chilled Water	-	40	-	-	-	-	-	6	46	-	-	46	-	-	-	-	-	-	1,803	-

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															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Disposal of Plant Systems (continued)																					
4b.1.2.26	GB - Central Chilled Water RCA	-	16	0	1	14	-	-	6	37	37	-	-	187	-	-	-	-	7,591	463	-
4b.1.2.27	GD - Esstl Srvc Wtr Pumphs Bldg HVAC	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	271	-
4b.1.2.28	GG - Fuel Building HVAC	-	157	8	15	274	25	-	90	569	569	-	-	3,729	109	-	-	-	161,237	4,033	-
4b.1.2.29	GH - Radwaste Building HVAC	-	114	5	10	178	16	-	61	384	384	-	-	2,425	69	-	-	-	104,668	2,975	-
4b.1.2.30	GK - Control Building HVAC	-	83	-	-	-	-	-	12	95	-	-	95	-	-	-	-	-	-	3,900	-
4b.1.2.31	GL - Auxiliary Building HVAC	-	285	11	21	372	36	-	140	866	866	-	-	5,064	161	-	-	-	220,066	7,315	-
4b.1.2.32	GM - Diesel Generator Building HVAC	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	692	-
4b.1.2.33	GN - Containment Cooling	-	297	20	34	541	102	-	188	1,181	1,181	-	-	7,354	454	-	-	-	339,357	8,066	-
4b.1.2.34	GP - Containmnt Integratd Leak Rate Test	-	24	1	2	43	-	-	13	83	83	-	-	580	-	-	-	-	23,570	737	-
4b.1.2.35	GR - Containment Atmospheric Control	-	11	2	4	80	7	-	17	121	121	-	-	1,086	29	-	-	-	46,679	341	-
4b.1.2.36	GT - Containment Purge HVAC	-	71	5	9	143	27	-	48	303	303	-	-	1,948	120	-	-	-	89,887	1,936	-
4b.1.2.37	HA - Gaseous Radwaste	-	190	16	18	204	106	-	109	643	643	-	-	2,782	486	-	-	-	155,095	5,654	-
4b.1.2.38	HB - Liquid Radwaste	-	457	53	51	408	436	-	297	1,702	1,702	-	-	5,544	2,203	-	-	-	398,693	14,038	-
4b.1.2.39	HC - Solid Radwaste	-	246	32	34	204	330	-	183	1,029	1,029	-	-	2,781	1,514	-	-	-	244,386	7,562	-
4b.1.2.40	HD - Decontamination	-	56	4	6	72	27	-	33	198	198	-	-	983	125	-	-	-	50,772	1,722	-
4b.1.2.41	HE - Boron Recycle	-	258	25	25	191	224	-	156	880	880	-	-	2,600	1,111	-	-	-	194,922	7,946	-
4b.1.2.42	JE - Emergency Fuel Oil	-	32	-	-	-	-	-	5	37	-	-	37	-	-	-	-	-	-	1,260	-
4b.1.2.43	KA - Compressed Air and Instrument	-	139	-	-	-	-	-	21	160	-	-	160	-	-	-	-	-	-	6,089	-
4b.1.2.44	KB - Breathing Air	-	24	-	-	-	-	-	4	28	-	-	28	-	-	-	-	-	-	1,075	-
4b.1.2.45	KC - Fire Protection	-	171	-	-	-	-	-	26	196	-	-	196	-	-	-	-	-	-	7,516	-
4b.1.2.46	KC - Fire Protection RCA	-	212	10	22	437	-	-	123	804	804	-	-	5,944	-	-	-	-	241,384	6,276	-
4b.1.2.47	KD - Domestic Water	-	38	-	-	-	-	-	6	44	-	-	44	-	-	-	-	-	-	1,708	-
4b.1.2.48	KE - Fuel Hndlg & Strg Reactor Vssl Serv	-	10	3	4	49	25	-	17	108	108	-	-	661	111	-	-	-	36,859	326	-
4b.1.2.49	KJ - Standby Diesel Engine	-	168	-	-	-	-	-	25	194	-	-	194	-	-	-	-	-	-	6,749	-
4b.1.2.50	LA - Sanitary Drains	-	7	-	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	290	-
4b.1.2.51	LA - Sanitary Drains RCA	-	16	0	1	20	-	-	7	45	45	-	-	272	-	-	-	-	11,053	421	-
4b.1.2.52	LB - Roof Drains	-	29	-	-	-	-	-	4	34	-	-	34	-	-	-	-	-	-	1,276	-
4b.1.2.53	LB - Roof Drains RCA	-	88	4	8	157	-	-	47	304	304	-	-	2,139	-	-	-	-	86,858	2,627	-
4b.1.2.54	LC - Yard Drains	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	96	-
4b.1.2.55	LD - Chemical & Detergent Waste	-	58	4	4	37	33	-	30	166	166	-	-	504	150	-	-	-	33,812	1,833	-
4b.1.2.56	LF - Floor & Equipment Drains	-	756	72	78	275	910	-	476	2,567	2,567	-	-	3,739	4,073	-	-	-	514,287	23,278	-
4b.1.2.57	RM - Process Sampling & Analysis	-	74	6	5	49	38	-	37	208	208	-	-	661	169	-	-	-	42,010	2,343	-
4b.1.2.58	Radwaste Bldg Non-System Specific	-	100	6	8	52	79	-	54	300	300	-	-	705	351	-	-	-	60,095	3,166	-
4b.1.2.59	Radwaste Bldg Non-System Specific RCA	-	710	22	46	932	-	-	327	2,037	2,037	-	-	12,684	-	-	-	-	515,103	21,915	-
4b.1.2.60	Reactor Bldg Non-System Specific	-	50	2	3	20	30	-	23	128	128	-	-	269	131	-	-	-	22,692	1,524	-
4b.1.2.61	Reactor Bldg Non-System Specific RCA	-	350	8	17	350	-	-	143	869	869	-	-	4,768	-	-	-	-	193,612	10,423	-
4b.1.2.62	SJ - Nuclear Sampling	-	40	4	4	31	29	-	23	131	131	-	-	423	130	-	-	-	28,862	1,318	-
4b.1.2.63	ST - Sewage Treatment	-	55	-	-	-	-	-	8	63	-	-	63	-	-	-	-	-	-	2,316	-
4b.1.2.64	SZ - Service Air	-	43	-	-	-	-	-	6	49	-	-	49	-	-	-	-	-	-	1,892	-
4b.1.2.65	VA - I&C Shop HVAC	-	3	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	141	-
4b.1.2.66	VB - I&C Shop Computer Room HVAC	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	95	-
4b.1.2.67	VC - Health Physics Computer Room HVAC	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	202	-
4b.1.2.68	VJ - Shop Bldg Machine Shop Area Vent	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	51	-
4b.1.2.69	VL - Shop Building HVAC	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	92	-
4b.1.2.70	VS - Admin Bldg HVAC	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	238	-
4b.1.2.71	VT - Tech Support Building HVAC	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	79	-
4b.1.2.72	VW - Waste Water Treatment Ventilation	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	48	-
4b.1.2.73	WD - Domestic Water	-	19	-	-	-	-	-	3	22	-	-	22	-	-	-	-	-	-	870	-
4b.1.2.74	WM - Makeup Demineralizer	-	91	-	-	-	-	-	14	105	-	-	105	-	-	-	-	-	-	3,929	-
4b.1.2.75	WS - Plant Services Water	-	76	-	-	-	-	-	11	87	-	-	87	-	-	-	-	-	-	3,297	-
4b.1.2.76	WS - Plant Services Water RCA	-	24	3	7	135	-	-	28	197	197	-	-	1,838	-	-	-	-	74,625	778	-
4b.1.2.77	WT - Waste Water Treatment	-	18	-	-	-	-	-	3	21	-	-	21	-	-	-	-	-	-	769	-
4b.1.2.78	WZ - Radioactive Liquid Waste	-	26	3	3	9	41	-	19	101	101	-	-	120	182	-	-	-	21,219	763	-
4b.1.2.79	Yard Non-System Specific	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	603	-
4b.1.2	Totals	-	8,827	498	653	7,597	3,890	-	4,230	25,694	22,980	-	2,714	103,349	18,104	-	-	-	5,746,679	287,951	-

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2008 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			
4b.1.3	Scaffolding in support of decommissioning	-	1,191	30	9	147	15	-	328	1,721	1,721	-	-	1,809	102	-	-	-	90,989	48,226	-
Decontamination of Site Buildings																					
4b.1.4.1	Reactor	672	582	119	143	438	988	-	828	3,769	3,769	-	-	5,955	7,068	-	-	-	906,206	37,472	-
4b.1.4.2	Auxiliary	343	156	30	39	151	95	-	266	1,081	1,081	-	-	2,058	1,700	-	-	-	250,031	14,927	-
4b.1.4.3	Communication Corridor - Contaminated	8	2	1	1	1	2	-	5	20	20	-	-	17	36	-	-	-	4,294	300	-
4b.1.4.4	Fuel Building	434	444	13	18	199	32	-	370	1,510	1,510	-	-	2,705	487	-	-	-	157,587	26,845	-
4b.1.4.5	Hot Machine Shop	9	4	1	1	-	2	-	7	24	24	-	-	-	44	-	-	-	4,446	412	-
4b.1.4.6	Radwaste	183	73	15	20	62	50	-	136	538	538	-	-	844	893	-	-	-	122,355	7,650	-
4b.1.4.7	Radwaste Drum Storage	21	7	2	2	5	5	-	15	57	57	-	-	66	99	-	-	-	12,556	833	-
4b.1.4.8	Radwaste Storage Building	52	14	4	5	-	14	-	34	123	123	-	-	-	257	-	-	-	25,740	1,970	-
4b.1.4	Totals	1,722	1,283	185	229	856	1,188	-	1,660	7,121	7,121	-	-	11,646	10,585	-	-	-	1,483,216	90,409	-
4b.1	Subtotal Period 4b Activity Costs	2,120	11,345	915	961	8,600	6,086	-	6,707	36,734	34,020	-	2,714	116,804	33,203	-	-	-	7,716,765	428,307	-
Period 4b Additional Costs																					
4b.2.1	Final Survey Program Management	-	-	-	-	-	-	1,174	352	1,526	1,526	-	-	-	-	-	-	-	-	-	12,480
4b.2	Subtotal Period 4b Additional Costs	-	-	-	-	-	-	1,174	352	1,526	1,526	-	-	-	-	-	-	-	-	-	12,480
Period 4b Collateral Costs																					
4b.3.1	Process liquid waste	80	-	35	173	-	185	-	116	588	588	-	-	-	645	-	-	-	38,721	126	-
4b.3.2	Small tool allowance	-	216	-	-	-	-	-	32	248	248	-	-	-	-	-	-	-	-	-	-
4b.3.3	Decommissioning Equipment Disposition	-	-	100	36	489	84	-	110	818	818	-	-	6,000	373	-	-	-	303,507	88	-
4b.3.4	Survey and Release of Scrap Metal	-	-	-	-	-	-	1,151	173	1,324	1,324	-	-	-	-	-	-	-	-	-	-
4b.3	Subtotal Period 4b Collateral Costs	80	216	135	208	489	269	1,151	430	2,979	2,979	-	-	6,000	1,019	-	-	-	342,228	214	-
Period 4b Period-Dependent Costs																					
4b.4.1	Decon supplies	1,207	-	-	-	-	-	-	302	1,509	1,509	-	-	-	-	-	-	-	-	-	-
4b.4.2	Insurance	-	-	-	-	-	-	1,113	111	1,224	1,224	-	-	-	-	-	-	-	-	-	-
4b.4.3	Property taxes	-	-	-	-	-	-	504	50	554	554	-	-	-	-	-	-	-	-	-	-
4b.4.4	Health physics supplies	-	2,875	-	-	-	-	-	719	3,593	3,593	-	-	-	-	-	-	-	-	-	-
4b.4.5	Heavy equipment rental	-	5,654	-	-	-	-	-	848	6,502	6,502	-	-	-	-	-	-	-	-	-	-
4b.4.6	Disposal of DAW generated	-	-	160	58	-	330	-	107	656	656	-	-	-	7,106	-	-	-	142,399	217	-
4b.4.7	Plant energy budget	-	-	-	-	-	-	4,496	674	5,171	5,171	-	-	-	-	-	-	-	-	-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	1,823	182	2,005	2,005	-	-	-	-	-	-	-	-	-	-
4b.4.9	Radwaste Processing Equipment/Services	-	-	-	-	-	-	1,039	156	1,195	1,195	-	-	-	-	-	-	-	-	-	-
4b.4.10	Corporate Allocations	-	-	-	-	-	-	402	60	463	463	-	-	-	-	-	-	-	-	-	-
4b.4.11	Security Staff Cost	-	-	-	-	-	-	7,886	1,183	9,069	9,069	-	-	-	-	-	-	-	-	-	180,536
4b.4.12	DOC Staff Cost	-	-	-	-	-	-	26,483	3,972	30,456	30,456	-	-	-	-	-	-	-	-	-	387,069
4b.4.13	Utility Staff Cost	-	-	-	-	-	-	39,292	5,894	45,185	45,185	-	-	-	-	-	-	-	-	-	681,703
4b.4	Subtotal Period 4b Period-Dependent Costs	1,207	8,529	160	58	-	330	83,038	14,260	107,582	107,582	-	-	-	7,106	-	-	-	142,399	217	1,249,307
4b.0	TOTAL PERIOD 4b COST	3,407	20,089	1,210	1,228	9,089	6,686	85,363	21,749	148,821	146,107	-	2,714	122,804	41,328	-	-	-	8,201,392	428,738	1,261,787
PERIOD 4e - License Termination																					
Period 4e Direct Decommissioning Activities																					
4e.1.1	ORISE confirmatory survey	-	-	-	-	-	-	151	45	197	197	-	-	-	-	-	-	-	-	-	-
4e.1.2	Terminate license									a											
4e.1	Subtotal Period 4e Activity Costs	-	-	-	-	-	-	151	45	197	197	-	-	-	-	-	-	-	-	-	-
Period 4e Additional Costs																					
4e.2.1	Final Site Survey	-	-	-	-	-	-	5,987	1,796	7,783	7,783	-	-	-	-	-	-	-	-	151,236	6,240
4e.2	Subtotal Period 4e Additional Costs	-	-	-	-	-	-	5,987	1,796	7,783	7,783	-	-	-	-	-	-	-	-	151,236	6,240
Period 4e Collateral Costs																					
4e.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,083	162	1,245	1,245	-	-	-	-	-	-	-	-	-	-

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2008 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			
4e.3	Subtotal Period 4e Collateral Costs	-	-	-	-	-	-	1,083	162	1,245	1,245	-	-	-	-	-	-	-	-	-	-
Period 4e Period-Dependent Costs																					
4e.4.1	Insurance	-	-	-	-	-	-	310	31	341	341	-	-	-	-	-	-	-	-	-	-
4e.4.2	Property taxes	-	-	-	-	-	-	141	14	155	155	-	-	-	-	-	-	-	-	-	-
4e.4.3	Health physics supplies	-	875	-	-	-	-	-	219	1,094	1,094	-	-	-	-	-	-	-	-	-	-
4e.4.4	Disposal of DAW generated	-	-	9	3	-	19	-	6	37	37	-	-	-	399	-	-	-	7,996	12	-
4e.4.5	Plant energy budget	-	-	-	-	-	-	334	50	385	385	-	-	-	-	-	-	-	-	-	-
4e.4.6	NRC Fees	-	-	-	-	-	-	545	55	600	600	-	-	-	-	-	-	-	-	-	-
4e.4.7	Corporate Allocations	-	-	-	-	-	-	45	7	52	52	-	-	-	-	-	-	-	-	-	-
4e.4.8	Security Staff Cost	-	-	-	-	-	-	908	136	1,044	1,044	-	-	-	-	-	-	-	-	-	19,337
4e.4.9	DOC Staff Cost	-	-	-	-	-	-	4,301	645	4,946	4,946	-	-	-	-	-	-	-	-	-	58,817
4e.4.10	Utility Staff Cost	-	-	-	-	-	-	5,010	751	5,761	5,761	-	-	-	-	-	-	-	-	-	76,543
4e.4	Subtotal Period 4e Period-Dependent Costs	-	875	9	3	-	19	11,594	1,914	14,414	14,414	-	-	-	399	-	-	-	7,996	12	154,697
4e.0	TOTAL PERIOD 4e COST	-	875	9	3	-	19	18,816	3,918	23,640	23,640	-	-	-	399	-	-	-	7,996	151,248	160,937
PERIOD 4 TOTALS		3,642	44,597	9,921	5,507	18,359	36,488	141,843	51,854	312,212	307,211	-	5,001	242,912	99,598	3,330	470	500	18,779,370	903,908	1,980,160
PERIOD 5b - Site Restoration																					
Period 5b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
5b.1.1.1	Reactor	-	3,624	-	-	-	-	544	4,168	-	-	4,168	-	-	-	-	-	-	60,067	-	
5b.1.1.2	Access Vaults	-	13	-	-	-	-	2	15	-	-	15	-	-	-	-	-	-	250	-	
5b.1.1.3	Administration	-	164	-	-	-	-	25	189	-	-	189	-	-	-	-	-	-	4,467	-	
5b.1.1.4	Auxiliary	-	2,837	-	-	-	-	426	3,263	-	-	3,263	-	-	-	-	-	-	49,968	-	
5b.1.1.5	Auxiliary Boiler	-	23	-	-	-	-	3	26	-	-	26	-	-	-	-	-	-	619	-	
5b.1.1.6	Chemical Addition Structure	-	31	-	-	-	-	5	36	-	-	36	-	-	-	-	-	-	735	-	
5b.1.1.7	Circ Water Pump Enclosure	-	4	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	164	-	
5b.1.1.8	Circ Water Travel Screen Enclosure	-	4	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	160	-	
5b.1.1.9	Circulating Water Discharge Structure	-	118	-	-	-	-	18	136	-	-	136	-	-	-	-	-	-	2,373	-	
5b.1.1.10	Circulating Water Intake & Screenhouse	-	115	-	-	-	-	17	132	-	-	132	-	-	-	-	-	-	2,059	-	
5b.1.1.11	Communication Corridor - Clean	-	895	-	-	-	-	134	1,030	-	-	1,030	-	-	-	-	-	-	17,215	-	
5b.1.1.12	Communication Corridor - Contaminated	-	40	-	-	-	-	6	46	-	-	46	-	-	-	-	-	-	674	-	
5b.1.1.13	Covered Walkways	-	7	-	-	-	-	1	8	-	-	8	-	-	-	-	-	-	242	-	
5b.1.1.14	Diesel Generator	-	348	-	-	-	-	52	401	-	-	401	-	-	-	-	-	-	5,492	-	
5b.1.1.15	E.S.W.S. Pumphouse	-	192	-	-	-	-	29	220	-	-	220	-	-	-	-	-	-	3,019	-	
5b.1.1.16	ESWS Valve House	-	10	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	243	-	
5b.1.1.17	Fuel Building	-	1,468	-	-	-	-	220	1,688	-	-	1,688	-	-	-	-	-	-	22,580	-	
5b.1.1.18	GOB - Administration Building	-	217	-	-	-	-	33	250	-	-	250	-	-	-	-	-	-	5,819	-	
5b.1.1.19	Hot Machine Shop	-	14	-	-	-	-	2	16	-	-	16	-	-	-	-	-	-	417	-	
5b.1.1.20	M.M.O. Building	-	205	-	-	-	-	31	236	-	-	236	-	-	-	-	-	-	3,483	-	
5b.1.1.21	Material Center West	-	82	-	-	-	-	12	94	-	-	94	-	-	-	-	-	-	2,512	-	
5b.1.1.22	Misc Structures and Additions	-	60	-	-	-	-	9	68	-	-	68	-	-	-	-	-	-	1,523	-	
5b.1.1.23	Miscellaneous Site Foundations	-	292	-	-	-	-	44	335	-	-	335	-	-	-	-	-	-	7,073	-	
5b.1.1.24	Miscellaneous Site Structures	-	1,174	-	-	-	-	176	1,350	-	-	1,350	-	-	-	-	-	-	20,147	-	
5b.1.1.25	New Covered Walkway	-	6	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	160	-	
5b.1.1.26	Oil Separator and Waste Tank	-	2	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	48	-	
5b.1.1.27	Radwaste	-	1,278	-	-	-	-	192	1,470	-	-	1,470	-	-	-	-	-	-	21,798	-	
5b.1.1.28	Radwaste Drum Storage	-	176	-	-	-	-	26	202	-	-	202	-	-	-	-	-	-	3,840	-	
5b.1.1.29	Radwaste Storage Building	-	81	-	-	-	-	12	93	-	-	93	-	-	-	-	-	-	2,323	-	
5b.1.1.30	Security Additions - Main Gate North	-	72	-	-	-	-	11	83	-	-	83	-	-	-	-	-	-	1,720	-	
5b.1.1.31	Security/Guardhouse	-	36	-	-	-	-	5	42	-	-	42	-	-	-	-	-	-	845	-	
5b.1.1.32	Site Diesel Generator	-	3	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	61	-	
5b.1.1.33	Support Complex	-	23	-	-	-	-	4	27	-	-	27	-	-	-	-	-	-	697	-	

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															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Demolition of Remaining Site Buildings (continued)																					
5b.1.1.34	Turbine Building	-	2,310	-	-	-	-	-	347	2,657	-	-	2,657	-	-	-	-	-	-	55,694	-
5b.1.1.35	Turbine Pedestal	-	776	-	-	-	-	-	116	893	-	-	893	-	-	-	-	-	-	10,928	-
5b.1.1.36	Waste Water Treatment	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	407	-
5b.1.1.37	Water Treatment Building North (Z110)	-	44	-	-	-	-	-	7	50	-	-	50	-	-	-	-	-	-	911	-
5b.1.1	Totals	-	16,759	-	-	-	-	-	2,514	19,273	-	-	19,273	-	-	-	-	-	-	310,729	-
Site Closeout Activities																					
5b.1.2	Remove Rubble	-	653	-	-	-	-	-	98	751	-	-	751	-	-	-	-	-	-	4,860	-
5b.1.3	Grade & landscape site	-	95	-	-	-	-	-	14	109	-	-	109	-	-	-	-	-	-	512	-
5b.1.4	Final report to NRC	-	-	-	-	-	-	165	25	190	190	-	-	-	-	-	-	-	-	-	1,560
5b.1	Subtotal Period 5b Activity Costs	-	17,507	-	-	-	-	165	2,651	20,323	190	-	20,133	-	-	-	-	-	-	316,101	1,560
Period 5b Additional Costs																					
5b.2.1	Circulating Water Intake Cofferdam	-	239	-	-	-	-	-	36	275	-	-	275	-	-	-	-	-	-	2,540	-
5b.2.2	E.S.W.S. Pumphouse Cofferdam	-	319	-	-	-	-	-	48	367	-	-	367	-	-	-	-	-	-	3,386	-
5b.2.3	Concrete Crushing	-	750	-	-	-	-	8	114	871	-	-	871	-	-	-	-	-	-	4,308	-
5b.2	Subtotal Period 5b Additional Costs	-	1,309	-	-	-	-	8	197	1,514	-	-	1,514	-	-	-	-	-	-	10,234	-
Period 5b Collateral Costs																					
5b.3.1	Small tool allowance	-	155	-	-	-	-	-	23	179	-	-	179	-	-	-	-	-	-	-	-
5b.3	Subtotal Period 5b Collateral Costs	-	155	-	-	-	-	-	23	179	-	-	179	-	-	-	-	-	-	-	-
Period 5b Period-Dependent Costs																					
5b.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5b.4.2	Property taxes	-	-	-	-	-	-	271	27	298	-	-	298	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	4,069	-	-	-	-	-	610	4,679	-	-	4,679	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	322	48	370	-	-	370	-	-	-	-	-	-	-	-
5b.4.5	Corporate Allocations	-	-	-	-	-	-	36	5	41	41	-	-	-	-	-	-	-	-	-	-
5b.4.6	Security Staff Cost	-	-	-	-	-	-	1,749	262	2,011	-	-	2,011	-	-	-	-	-	-	-	37,234
5b.4.7	DOC Staff Cost	-	-	-	-	-	-	7,838	1,176	9,014	-	-	9,014	-	-	-	-	-	-	-	105,497
5b.4.8	Utility Staff Cost	-	-	-	-	-	-	3,758	564	4,322	-	-	4,322	-	-	-	-	-	-	-	60,506
5b.4	Subtotal Period 5b Period-Dependent Costs	-	4,069	-	-	-	-	13,973	2,693	20,735	41	-	20,694	-	-	-	-	-	-	-	203,237
5b.0	TOTAL PERIOD 5b COST	-	23,040	-	-	-	-	14,146	5,564	42,751	231	-	42,520	-	-	-	-	-	-	326,335	204,797
PERIOD 5 TOTALS		-	23,040	-	-	-	-	14,146	5,564	42,751	231	-	42,520	-	-	-	-	-	-	326,335	204,797
TOTAL COST TO DECOMMISSION		8,721	76,114	10,654	6,409	18,427	38,365	545,644	118,461	822,794	699,414	74,520	48,860	244,979	126,705	3,330	470	500	19,558,740	1,329,014	6,979,156

Table D
Wolf Creek Generating Station
SAFSTOR Decommissioning Cost Estimate
(thousands of 2008 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 16.82% CONTINGENCY:	$822,794	thousands of 2008	dollars
TOTAL NRC LICENSE TERMINATION COST IS 85% OR:	$699,414	thousands of 2008	dollars
SPENT FUEL MANAGEMENT COST IS 9.06% OR:	$74,520	thousands of 2008	dollars
NON-NUCLEAR DEMOLITION COST IS 5.94% OR:	$48,860	thousands of 2008	dollars
TOTAL LOW-LEVEL RADIOACTIVE WASTE VOLUME BURIED (EXCLUDING GTCC):	130,505	cubic feet	
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	500	cubic feet	
TOTAL SCRAP METAL REMOVED:	67,249	tons	
TOTAL CRAFT LABOR REQUIREMENTS:	1,309,914	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