

DECOMMISSIONING COST STUDY
for the
HATCH NUCLEAR PLANT



prepared for

SOUTHERN NUCLEAR COMPANY


prepared by

TLG Services, Inc.
Bridgewater, Connecticut

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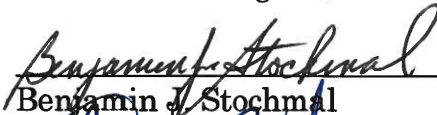
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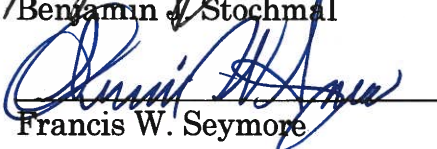
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TABLE OF CONTENTS

SECTION	PAGE
EXECUTIVE SUMMARY	vii-xx
1. INTRODUCTION	1-1
1.1 Objectives of Study	1-1
1.2 Site Description.....	1-2
1.3 Regulatory Guidance	1-3
1.3.1 Nuclear Waste Policy Act.....	1-5
1.3.2 Low-Level Radioactive Waste Regulations.....	1-8
1.3.3 Radiological Criteria for License Termination	1-10
2. DECOMMISSIONING ALTERNATIVE.....	2-1
2.1 Period 1 - Preparations.....	2-2
2.1.1 Engineering and Planning	2-2
2.1.2 Site Preparations	2-3
2.2 Period 2 - Decommissioning Operations	2-4
2.3 Period 3 - Site Restoration, ISFSI Operations and Demolition.....	2-7
2.3.1 Site Restoration	2-7
2.3.2 ISFSI Operations & Demolition	2-8
3. COST ESTIMATE.....	3-1
3.1 Basis of Estimate	3-1
3.2 Methodology	3-1
3.3 Financial Components of the Cost Model	3-3
3.3.1 Contingency.....	3-3
3.3.2 Financial Risk.....	3-6
3.4 Site-Specific Considerations.....	3-7
3.4.1 Spent Fuel	3-7
3.4.2 Reactor Vessel and Internal Components.....	3-11
3.4.3 Primary System Components	3-12
3.4.4 Main Turbine and Condenser	3-13
3.4.5 Transportation Methods.....	3-13
3.4.6 Low-Level Radioactive Waste Disposal	3-14
3.4.7 Site Conditions Following Decommissioning.....	3-15
3.5 Assumptions	3-16
3.5.1 Estimating Basis	3-16
3.5.2 Labor Costs	3-17

TABLE OF CONTENTS
(continued)

<u>SECTION</u>	<u>PAGE</u>
3.5.3 Design Conditions.....	3-18
3.5.4 General.....	3-19
3.6 Impact of Decommissioning Multiple Reactor Units	3-22
3.7 Cost Estimate Summary	3-23
4. SCHEDULE ESTIMATE	4-1
4.1 Schedule Estimate Assumptions	4-1
4.2 Project Schedule.....	4-2
5. RADIOACTIVE WASTES	5-1
6. RESULTS	6-1
7. REFERENCES	7-1

TABLES

Cost Summary.....	xx
3.1a Summary Schedule of Annual Expenditures, Unit 1	3-25
3.1b Schedule of Annual Expenditures-License Termination, Unit 1.....	3-27
3.1c Schedule of Annual Expenditures-Spent Fuel, Unit 1	3-29
3.1d Schedule of Annual Expenditures-Site Restoration, Unit 1	3-31
3.2a Summary Schedule of Annual Expenditures, Unit 2	3-33
3.2b Schedule of Annual Expenditures-License Termination, Unit 2.....	3-35
3.2c Schedule of Annual Expenditures-Spent Fuel, Unit 2.....	3-37
3.2d Schedule of Annual Expenditures-Site Restoration, Unit 2	3-39
5.1 Decommissioning Waste Summary, Unit 1	5-6
5.2 Decommissioning Waste Summary, Unit 2.....	5-7
6.1 Summary of Decommissioning Cost Elements, Unit 1	6-4
6.2 Summary of Decommissioning Cost Elements, Unit 2	6-5

FIGURES

4.1 Decommissioning Activity Schedule	4-3
4.2 Decommissioning Timeline.....	4-5

TABLE OF CONTENTS
(continued)

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

FIGURES

5.1	Radioactive Waste Disposition	5-4
5.2	Decommissioning Waste Destinations Radiological.....	5-5

APPENDICES

A.	Unit Cost Factor Development	A-1
B.	Unit Cost Factor Listing	B-1
C.	Detailed Cost Analyses	C-1
D.	Required Information.....	D-1
E.	ISFSI Decommissioning.....	E-1

REVISION LOG

Rev. No.	Date	Item Revised	Reason for Revision
0	11-07-2018	n/a	Original Issue
1	12-05-2018	Cost Summary, Tables 3.1 & 3.2, Chapter 6, Tables 6.1 & 6.2, Appendices C & E	Revision to ISFSI decontamination costs

EXECUTIVE SUMMARY

This report presents estimates of the costs to promptly decommission (decontaminate and dismantle) the Edwin I. Hatch Nuclear Plant (Hatch) following a scheduled cessation of plant operations. The estimates are designed to provide Georgia Power Company (GPC) and Southern Nuclear Operating Company (SNC) with sufficient information to assess their financial obligations as they pertain to the eventual decommissioning of the nuclear station.

The analysis relies upon the site-specific, technical information developed for an evaluation prepared in 2015,^[1] updated to reflect current assumptions pertaining to the disposition of the nuclear plant, and relevant industry experience in undertaking such projects. The costs are based on several key assumptions in areas of regulation, component characterization, high-level radioactive waste management, low-level radioactive waste disposal, performance uncertainties (contingency) and site restoration requirements.

The 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 cooling period of approximately five years for the spent fuel that resides in the plant's storage pools when operations cease. Any residual fuel remaining in the pools after the five-year period will be relocated to an on-site, interim storage facility to await the transfer to a Department of Energy (DOE) facility. The estimates also include the dismantling of non-essential structures and limited restoration of the site.

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

The 2015 plant inventory, the basis for the decontamination and dismantling requirements and cost, and the decommissioning waste streams, was reviewed for this analysis. Only minor changes to the plant or site over the past three years, that would impact decommissioning, were identified.

¹ "Decommissioning Cost Estimate for the Hatch Nuclear Plant, Units 1 and 2," Document S18-1715-001, Rev. 0, TLG Services, Inc., December 2015

The costs to decommission Hatch is tabulated at the end of this section. Costs are reported in 2018 dollars and include monies anticipated to be spent for radiological remediation and operating license termination, spent fuel management, and site restoration activities.

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

Consistent with the 2015 analysis, the current cost estimates assume that the shutdown of the nuclear units is a scheduled and pre-planned event (e.g., there is no delay in transitioning the plant and workforce from operations or in obtaining regulatory relief from operating requirements).

The analysis recognizes that spent fuel will be stored at the site in the wet storage pools and/or in an independent spent fuel storage installation (ISFSI) until such time that it can be transferred to the U.S. Department of Energy (DOE). Consequently, the estimates also include those costs to manage and subsequently decommission these interim storage facilities.

The primary goal of the decommissioning is the removal and disposal of the contaminated systems and structures so that the operating licenses for the nuclear units can be terminated. The estimates also include the dismantling of site structures and non-essential facilities and the limited restoration of the site.

Alternatives and Regulations

The Nuclear Regulatory Commission (NRC) provided general decommissioning requirements in the rule adopted on June 27, 1988.^[2] In this rule the NRC set forth financial criteria for decommissioning licensed nuclear facilities. The regulations addressed planning needs, timing, funding methods, and environmental review requirements for decommissioning. The rule also defined three decommissioning alternatives as being acceptable to the NRC - DECON, SAFSTOR, and ENTOMB.

DECON is defined as "the alternative in which the equipment, structures, and portions of a facility and site containing radioactive

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.

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 NRC 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 a draft regulatory basis document published in March 2017 in support of rulemaking that would amend NRC regulations concerning nuclear plant decommissioning, the NRC staff proposes removing any discussion of the ENTOMB option from existing guidance documents since the method is not deemed practically feasible.

In 1996, the NRC published revisions to the general requirements for decommissioning nuclear power plants to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process.^[6] The amendments allowed for greater public participation

³ Ibid. FR24022, Column 3.

⁴ Ibid.

⁵ Ibid. FR24023, Column 2.

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

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 that relate to initial activities and major phases of the decommissioning process. The costs and schedules presented in this analysis follow the general guidance and process described in the amended regulations. The format and content of the estimate is also consistent with the recommendations of Regulatory Guide 1.202, issued in February 2005.^[7]

In 2011, the NRC published amended regulations to improve decommissioning planning and thereby reduce the likelihood that any current operating facility will become a legacy site.^[8] The amended regulations require licensees to conduct their operations to minimize the introduction of residual radioactivity into the site, which includes the site's subsurface soil and groundwater. Licensees also may be required to perform site surveys to determine whether residual radioactivity is present in subsurface areas and to keep records of these surveys with records important for decommissioning. The amended regulations require licensees to report additional details in their decommissioning cost estimate as well as requiring additional financial reporting and assurances. These additional details are included in this analysis, including the ISFSI decommissioning estimate (Appendix E).

Decommissioning Scenario

The DECON scenario assumes that decommissioning activities at the two units are sequenced and integrated so as to minimize the total duration of the physical dismantling processes. Spent fuel that cannot be directly transferred to the DOE from the storage pools is relocated to the ISFSI so as to facilitate decontamination and dismantling activities within the fuel handling buildings. Spent fuel storage operations continue at the site until the transfer of the fuel to the DOE is complete, assumed to be in the year 2074.

7 seq.), July 29, 1996
"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 U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70, and 72, "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, (p 35512 et seq.), June 17, 2011

Methodology

The methodology used to develop the estimates described within this document follows the basic approach originally presented in the cost estimating guidelines^[9] developed by the Atomic Industrial Forum (now Nuclear Energy Institute). This reference described a unit factor method for determining decommissioning activity costs. The unit factors used in this analysis incorporate site-specific costs and the latest available information on worker productivity in decommissioning.

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

The estimates also reflect lessons learned from TLG's involvement in the Shippingport Station Decommissioning Project, 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 Rancho Seco, Trojan, Yankee Rowe, Big Rock Point, Maine Yankee, Humboldt Bay-3, Oyster Creek, Connecticut Yankee, Crystal River, San Onofre and Vermont Yankee nuclear units have provided additional insight into the process, the regulatory aspects, and the technical challenges of decommissioning commercial nuclear units.

Contingency

Consistent with cost estimating practice, contingencies are applied to the decontamination and dismantling costs developed as "specific provision for unforeseeable elements of cost within the defined project scope, particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur."^[10] 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

⁹ T.S. LaGuardia et al., "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.

¹⁰ Project and Cost Engineers' Handbook, Second Edition, American Association of Cost Engineers, Marcel Dekker, Inc., New York, New York, p. 239.

these estimates, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

The use and role of contingency within decommissioning estimates is not a safety factor issue. Safety factors provide additional security and address situations that may never occur. Contingency funds, by contrast, are expected to be fully expended throughout the program. Inclusion of contingency is necessary to provide assurance that sufficient funding will be available to accomplish the intended tasks.

Low-Level Radioactive Waste Disposal

The contaminated and activated material generated in the decontamination and dismantling of a commercial nuclear reactor is generally classified as low-level radioactive waste, although not all of the material is suitable for “shallow-land” disposal. With the passage of the “Low-Level Radioactive Waste Disposal Act” in 1980,^[11] and its Amendments of 1985,^[12] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders.

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

Disposition of the various waste streams produced by the decommissioning process considered all options and services currently available to SNC. The majority of the low-level radioactive waste designated for direct disposal (Class A^[13]) can be sent to EnergySolutions’ facility in Clive, Utah. Therefore, disposal costs for Class A waste were based upon SNC’s experience with EnergySolutions. This facility is not licensed to receive the higher activity portion (Classes B and C) of the decommissioning waste stream.

The WCS facility is able to receive the Class B and C waste. As such, for this analysis, Class B and C waste was assumed to be shipped to the WCS facility and disposal costs for the waste using this facility were based upon SNC experience.

The dismantling of the components residing closest to the reactor core generates radioactive waste that may be considered unsuitable for shallow-land disposal (i.e.,

¹¹ “Low-Level Radioactive Waste Policy Act of 1980,” Public Law 96-573, 1980

¹² “Low-Level Radioactive Waste Policy Amendments Act of 1985,” Public Law 99-240, 1986

¹³ Waste is classified in accordance with U.S. Code of Federal Regulations, Title 10, Part 61.55

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

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

A significant portion of the metallic waste generated during decommissioning may potentially be contaminated by radioactive materials. Rather than designating this large volume for controlled disposal, this analysis assumes that the material is sent to a licensed facility for characterization and processing. Processing is routinely used to reduce the volume, for example, by component disassembly, sorting, and compaction. The estimates reflect the savings from waste recovery/volume reduction.

High-Level Radioactive Waste Management

Congress passed the “Nuclear Waste Policy Act”^[14] (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

¹⁴ “Nuclear Waste Policy Act of 1982 and Amendments,” DOE’s Office of Civilian Radioactive Management, 1982

compensation for DOE's partial breach of contract. To date no spent fuel has been accepted from commercial generating sites for disposal.

In 2010 the Obama Administration appointed a Blue Ribbon Commission on America's Nuclear Future (Blue Ribbon Commission) to make recommendations for a new plan for nuclear waste disposal. The Blue Ribbon Commission's charter includes a requirement that it consider "[o]ptions for safe storage of used nuclear fuel while final disposition pathways are selected and deployed."^[15]

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

- "[T]he United States [should] establish a program that leads to the timely development of one or more consolidated storage facilities"^[16]
- "[T]he United States should undertake an integrated nuclear waste management program that leads to the timely development of one or more permanent deep geological facilities for the safe disposal of spent fuel and high-level nuclear waste."^[17]

In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."^[18]

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

¹⁵ Charter of the Blue Ribbon Commission on America's Nuclear Future, "Objectives and Scope of Activities," 2010

¹⁶ "Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy," http://www.brc.gov/sites/default/files/documents/brc_finalreport_jan2012.pdf, p. 32, January 2012

¹⁷ *Ibid.*, p.27

¹⁸ "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," U.S. DOE, January 11, 2013

- Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites;
- Advances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities; and
- Makes demonstrable progress on the siting and characterization of repository sites to facilitate the availability of a geologic repository by 2048.”^[19]

The NRC’s review of DOE’s license application to construct a geologic repository at Yucca Mountain was suspended in 2011 when the Administration significantly reduced the budget for completing that work. However, the US Court of Appeals for the District of Columbia Circuit issued a writ of mandamus (in August 2013)^[20] ordering NRC to comply with federal law and resume its review of DOE’s Yucca Mountain repository license application to the extent allowed by previously appropriated funding for the review. That review is now complete with the publication of the five-volume safety evaluation report. A supplement to DOE’s environmental impact statement and an adjudicatory hearing on the contentions filed by interested parties must be completed before a licensing decision can be made.

Completion of the decommissioning process is dependent upon the DOE’s ability to remove spent fuel from the site in a timely manner. DOE’s repository program had assumed that spent fuel allocations would be accepted for disposal from the nation’s commercial nuclear plants, with limited exceptions, in the order (the “queue”) in which it was discharged from the reactor.^[21] SNC’s current spent fuel management

¹⁹ *Ibid.*, p.2

²⁰ U.S. Court of Appeals for the District Of Columbia Circuit, In Re: Aiken County, et al, Aug. 2013, [http://www.cadc.uscourts.gov/internet/opinions.nsf/BAE0CF34F762EBD985257BC6004DEB18/\\$file/11-1271-1451347.pdf](http://www.cadc.uscourts.gov/internet/opinions.nsf/BAE0CF34F762EBD985257BC6004DEB18/$file/11-1271-1451347.pdf)

²¹ In 2008, the DOE issued a report to Congress in which it concluded that it did not have authority, under present law, to accept spent nuclear fuel for interim storage from decommissioned commercial nuclear power reactor sites. However, the Blue Ribbon Commission, in its final report, noted that: “[A]ccepting spent fuel according to the OFF [Oldest Fuel First] priority ranking instead of giving priority to shutdown reactor sites could greatly reduce the cost savings that could be achieved through consolidated storage if priority could be given to accepting spent fuel from shutdown reactor sites before accepting fuel from still-operating plants. The magnitude of the cost savings that could be achieved by giving priority to shutdown sites appears to be large enough (i.e., in the billions of dollars) to warrant DOE exercising its right

plan for the Hatch spent fuel is based in general upon: 1) a 2032 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the Hatch fuel. The DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. Assuming a maximum rate of transfer of 3,000 metric tons of uranium (MTU)/year, the spent fuel is completely removed from the site by the end of 2074 for a 2038 station shutdown.

The NRC requires that licensees establish a program to manage and provide funding for the caretaking of all irradiated fuel at the reactor site until title of the fuel is transferred to the DOE. ^[22] Interim storage of the fuel, until the DOE has completed the transfer, will be in the fuel handling building's storage pool as well as at an on-site ISFSI. For purposes of this analysis, it is assumed that DOE will accept already-canistered fuel.

An ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K^[23]), has been constructed to support continued plant operations. The facility is assumed to be available to support future decommissioning operations. In the six years following the decision to permanently cease operations, the fuel is packaged for interim storage at the ISFSI. Once the fuel storage pools are emptied, the reactor buildings can be prepared for removal.

For cost estimating purposes, the spent fuel scenario developed for Hatch assumed that the DOE would initiate spent fuel receipt in the year 2032. DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. The information available on the projected rate of transfer and the backlogged national queue indicates that Hatch fuel would not be eligible for pickup until 2035. Supplemental dry cask spent nuclear fuel storage in the form of an ISFSI is assumed to be expanded following cessation of plant operations to accommodate the assemblies in the plant's wet storage pools. By relocating the fuel to the ISFSI, the wet storage pools may be secured and decommissioning of the nuclear units may proceed. Costs are included within the estimates to expand the ISFSI to accommodate the residual spent fuel inventories after pool operations

under the Standard Contract to move this fuel first." For planning purposes only, this estimate does not assume that Hatch, as a permanently shutdown plant, will receive priority; the fuel removal schedule assumed in this estimate is based upon DOE acceptance of fuel according to the "Oldest Fuel First" priority ranking.

²² U.S. Code of Federal Regulations, Title 10, Part 50 – Domestic Licensing of Production and Utilization Facilities, Subpart 54 (bb), "Conditions of Licenses"

²³ U.S. Code of Federal Regulations, Title 10, Part 72, Subpart K, "General License for Storage of Spent Fuel at Power Reactor Sites."

cease and for the long-term caretaking of spent fuel at the site through the year 2074.

Site Restoration

The efficient removal of the contaminated materials at the site may result in damage to many of the site structures. Blasting, coring, drilling, and the other decontamination activities can substantially damage power block structures, potentially weakening the footings and structural supports. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The cost to dismantle site structures with a work force already mobilized is more efficient and less costly than if the process is deferred.

This estimate assumes that some site features will remain following the decommissioning project. These include the existing electrical switchyard, which is assumed to remain functional in support of the regional electrical distribution system.

Consequently, this study assumes that site structures will be removed to a nominal depth of three feet below the local grade level wherever possible. The site will then be graded and stabilized.

Summary

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

Decommissioning is accomplished within the 60-year period required by current NRC regulations. In the interim, the spent fuel remains in storage at the site until such time that the transfer to a DOE facility is complete.

The alternative evaluated in this analysis is 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 Appendix C. 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 (radiological remediation), Spent Fuel Management, and Site Restoration. The subcategory “NRC License Termination” is used to accumulate costs that are consistent with “decommissioning” as defined by the NRC in its financial assurance regulations (i.e., 10 CFR §50.75). The cost reported for this subcategory is generally sufficient to terminate the reactors’ operating licenses, recognizing that there may be some additional cost impact from spent fuel management. The License Termination cost subcategory also includes costs to decommission the ISFSI (as required by 10 CFR §72.30). Section 3.4.1 provides the basis for the ISFSI decommissioning cost, delineated in Appendix E.

The “Spent Fuel Management” subcategory contains costs associated with the containerization and transfer of spent fuel from the wet storage pools to the DOE and/or ISFSI for interim storage, as well as the transfer of the spent fuel in storage at the ISFSI to the DOE. Costs are included for the operation of the storage pools and the management of the ISFSI until such time that the transfer is complete. It does not include any spent fuel management expenses incurred prior to the cessation of plant operations, nor does it include any cost related to the final disposal of the spent fuel.

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

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

As noted within this document, the estimates were developed and costs are presented in 2018 dollars. As such, the estimates do not reflect the escalation of costs (due to

inflationary and market forces) over the remaining operating life of the plant or during the decommissioning period.

COST SUMMARY
(Thousands of 2018 Dollars)

Work Activity	Unit 1	Unit 2 ^[1]	Station
Decontamination	19,723	20,889	40,611
Removal	111,435	137,756	249,191
Packaging	24,934	26,049	50,982
Transportation	17,574	21,531	39,105
Waste Disposal	107,331	121,395	228,725
Off-site Waste Processing	63,805	75,590	139,395
Program Management [1]	293,486	306,148	599,634
Site Security	123,964	140,825	264,789
Spent Fuel Pool Isolation	13,800	9,200	23,000
Spent Fuel Management	85,423	75,320	160,743
Insurance and Regulatory Fees	19,878	15,666	35,544
Energy	4,251	4,266	8,517
Characterization and Licensing Surveys	25,232	21,700	46,932
Property Taxes	0	0	0
Miscellaneous	14,945	18,161	33,106
Total ^[2]	925,781	994,494	1,920,275
NRC License Termination	697,767	768,427	1,466,194
Spent Fuel Management	180,090	162,917	343,007
Site Restoration	47,924	63,150	111,074

^[1] Decommissioning costs associated with “Common” facilities are included with Unit 2

^[2] Columns may not add due to rounding

1. INTRODUCTION

This report presents estimates of the cost to decommission the Hatch Nuclear Plant, Units 1 and 2, (Hatch), assuming a 60-year operating life following a scheduled cessation of plant operations. The estimates are designed to provide Southern Nuclear Company (SNC) with the information to assess its current decommissioning liability, as it relates to Hatch.

The analysis relies upon site-specific, technical information from an earlier evaluation prepared in 2015^[1]* updated to reflect current assumptions pertaining to the disposition of the nuclear plant and relevant industry experience in undertaking such projects. The costs are based on several key assumptions in areas of regulation, component characterization, high-level radioactive waste management, low-level radioactive waste disposal, performance uncertainties (contingency) and site restoration requirements.

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

The 2015 plant inventory, the basis for the decontamination and dismantling requirements and cost, and the decommissioning waste streams, were reviewed for this analysis. Changes to the plant or site over the past three years, that would impact decommissioning, were incorporated into the estimate.

1.1 OBJECTIVES OF STUDY

The objectives of this study are to prepare comprehensive estimates of the costs to decommission Hatch for the scenario outlined in Section 2, to define a sequence of events, and to develop waste stream projections from the decontamination and dismantling activities.

The two units at the Hatch site were designed and constructed concurrently. Unit 1 obtained its operating license on August 6, 1974, with Unit 2 following on June 13, 1978. For the purposes of this study, the shutdown dates were taken as 60 years after the operating license issue dates (the end of the current

* References provided in Section 7 of the document

authorized licenses), or August 6, 2034 for Unit 1 and June 13, 2038 for Unit 2. This time frame was used as input for scheduling the decommissioning.

1.2 SITE DESCRIPTION

The Hatch site is located on the south side of the Altamaha River, southeast of the intersection of the river with U.S. Highway No. 1, in the northwestern section of Appling County, Georgia. The site is across the river from Toombs County, approximately 98 miles southeast of Macon and 73 miles northwest of Brunswick. The station is comprised of two essentially identical nuclear units.

General Electric (GE) boiling water reactors (BWR) are used to produce steam for direct use in the main turbine. The reactors are both BWR/4 models, with forced circulation in the reactor core using two recirculation loops external to the vessel (but inside the primary containment) and jet pumps inside the vessel. The rated core thermal power of each unit is 2804 megawatts (thermal) with a corresponding maximum dependable capacity of 876 and 883 megawatts (electric) from the turbine generator, for Unit 1 and 2 respectively.

The Nuclear Steam Supply System (NSSS) is located within a pressure-suppression primary containment that houses the reactor vessel, the reactor recirculation system, and other branches of the reactor coolant system. The primary containment is a GE Mark I pressure suppression system consisting of a drywell, a pressure suppression chamber which stores a large volume of water, a connecting vent system between the drywell and the pressure suppression chamber, a vacuum relief system, isolation valves, containment cooling systems, and other service equipment. The drywell is a steel pressure vessel in the shape of an inverted light bulb, and the pressure suppression chamber is a torus-shaped steel pressure vessel located below and encircling the drywell.

Each unit utilizes a power conversion system, including a turbine set, generator, main condenser, air ejectors, condensate pumps, turbine gland seal system, turbine bypass system, condensate demineralizer, condensate booster pumps, reactor feed pumps, feedwater heaters, and condensate storage system. The power conversion system produces electrical power from the energy of the steam coming from the reactor, condenses the steam into water, and returns the feedwater to the reactor. The heat rejected to the main condenser is removed by the circulating water system.

Each turbine set is a GE tandem compound, 1800 rpm reheat unit with 43 inch last stage buckets. It consists of a double-flow high-pressure turbine and two

double-flow low-pressure turbines. Exhaust steam from the high-pressure turbine passes through a moisture separator reheater before entering the two low-pressure turbines. The generator is a direct-coupled, conductor-cooled, synchronous unit rated at 1,000,000 kVA.

Two shell, single-pass, single pressure, deaerating type condenser sections are provided to condense the steam from each low-pressure turbine. A condenser section is located below the low-pressure elements of the turbine and has divided water boxes with the tubes oriented transversely to the turbine-generator axis.

The circulating water system provides cooling water to the main condensers via two motor-driven pumps. The flow path consists of suction from the canal through the main condensers and return to the cooling towers. Make-up water is provided by the plant service water and residual heat removal service water systems effluent, in which the Altamaha River is the initial source of water for each of these systems. The circulating water system is designed such that blowdown and canal overflow can be discharged to the Altamaha River.

1.3 REGULATORY GUIDANCE

The Nuclear Regulatory Commission (NRC or Commission) provided initial decommissioning requirements in its rule "General Requirements for Decommissioning Nuclear Facilities," issued in June 1988.^[2] This rule set forth financial criteria for decommissioning licensed nuclear power facilities. The regulation addressed decommissioning planning needs, timing, funding methods, and environmental review requirements. The intent of the rule was to ensure that decommissioning would be accomplished in a safe and timely manner and that adequate funds would be available for this purpose. Subsequent to the rule, the NRC issued Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors,"^[3] which provided additional guidance to the licensees of nuclear facilities on the financial methods acceptable to the NRC staff for complying with the requirements of the rule. The regulatory guide addressed the funding requirements and provided guidance on the content and form of the financial assurance mechanisms indicated in the rule.

The rule defined three decommissioning alternatives as being acceptable to the NRC: DECON, SAFSTOR, and ENTOMB. The DECON alternative assumes that any contaminated or activated portion of the plant's systems, structures and facilities are removed or decontaminated to levels that permit

the site to be released for unrestricted use shortly after the cessation of plant operations, while the SAFSTOR and ENTOMB alternatives defer the process.

The rule also placed limits on the time allowed to complete the decommissioning process. For all alternatives, the process is restricted in overall duration to 60 years, unless it can be shown that a longer duration is necessary to protect public health and safety. At the conclusion of a 60-year dormancy period (or longer if the NRC approves such a case), the site would still require significant remediation to meet the unrestricted release limits for license termination.

The ENTOMB alternative has not been viewed as a viable option for power reactors due to the significant time required to isolate the long-lived radionuclides for decay to permissible levels. However, with rulemaking permitting the controlled release of a site,^[4] the NRC did re-evaluated the alternative. The resulting feasibility study, based upon an assessment by Pacific Northwest National Laboratory, concluded that the method did have conditional merit for some, if not most reactors. The staff also found that additional rulemaking would be needed before this option could be treated as a generic alternative.

The NRC had considered rulemaking to alter the 60-year time for completing decommissioning and to clarify the use of engineered barriers for reactor entombments.^[5] However, the NRC's staff has subsequently recommended that rulemaking be deferred, based upon several factors (e.g., no licensee has committed to pursuing the entombment option, the unresolved issues associated with the disposition of greater-than-Class C material (GTCC), and the NRC's current priorities), at least until after the additional research studies are complete. The Commission concurred with the staff's recommendation.

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

allow for greater public participation and better define the transition process from operations to decommissioning.

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

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

1.3.1 Nuclear Waste Policy Act

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

along with the individual contracts with the utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

Since the original legislation, the DOE has announced several delays in the program schedule. By January 1998, the DOE had failed to accept any spent fuel or high level waste, as required by the NWPA and utility contracts. Delays continue and, as a result, generators have initiated legal action against the DOE in an attempt to obtain compensation for DOE's partial breach of contract [9]. To date no spent fuel has been accepted from commercial generating sites for disposal.

In 2010, the Obama Administration appointed a Blue Ribbon Commission on America's Nuclear Future (Blue Ribbon Commission) to make recommendations for a new plan for nuclear waste disposal. The Blue Ribbon Commission's charter includes a requirement that it consider "[o]ptions for safe storage of used nuclear fuel while final disposition pathways are selected and deployed."^[10]

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

- "[T]he United States [should] establish a program that leads to the timely development of one or more consolidated storage facilities"
- "[T]he United States should undertake an integrated nuclear waste management program that leads to the timely development of one or more permanent deep geological facilities for the safe disposal of spent fuel and high-level nuclear waste."^[12]

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

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

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

The NRC’s review of DOE’s license application to construct a geologic repository at Yucca Mountain was suspended in 2011 when the Administration significantly reduced the budget for completing that work. However, the US Court of Appeals for the District of Columbia Circuit issued a writ of mandamus (in August 2013)^[14] ordering NRC to comply with federal law and resume its review of DOE’s Yucca Mountain repository license application to the extent allowed by previously appropriated funding for the review. That review is now complete with the publication of the five-volume safety evaluation report. A supplement to DOE’s environmental impact statement and an adjudicatory hearing on the contentions filed by interested parties must be completed before a licensing decision can be made.

Completion of the decommissioning process is dependent upon the DOE’s ability to remove spent fuel from the site in a timely manner. DOE’s repository program assumes that spent fuel allocations will be accepted for disposal from the nation’s commercial nuclear plants, with limited exceptions, in the order (the “queue”) in which it was discharged from the reactor.^[15] SNC’s current spent fuel management plan for the Hatch spent fuel is based in general upon: 1) a 2032 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the Hatch fuel. The DOE’s generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. The information available on the projected rate of transfer and the backlogged national queue indicates that the oldest Hatch fuel would not be eligible for pickup until 2035. Assuming a maximum rate of transfer of 3,000 metric tons of uranium (MTU)/year,

the spent fuel is completely removed from the site by year end 2074 for a 2038 station shutdown.

The NRC requires that licensees establish a program to manage and provide funding for the caretaking of all irradiated fuel at the reactor site until title of the fuel is transferred to the DOE.^[16] Interim storage of the fuel, until the DOE has completed the transfer, will be in the fuel handling building's storage pool as well as at an on-site ISFSI. For purposes of this analysis, it is assumed that DOE will accept already-canistered fuel.

An ISFSI, operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K ^[15]), has been constructed to support continued plant operations. The ISFSI is assumed to be expanded following cessation of plant operations to accommodate the assemblies in the plant's wet storage pools. By relocating the fuel to the ISFSI, the wet storage pools may be secured and decommissioning of the nuclear units may proceed. Costs are included within the estimates to expand the ISFSI to accommodate the residual spent fuel inventories after pool operations cease and for the long-term caretaking of spent fuel at the site through the year 2074.

The SNC position is that the DOE has a contractual obligation to accept Hatch's fuel earlier than the projections set out above consistent with its contract commitments. No assumption made in this study should be interpreted to be inconsistent with this claim. However, including the cost of storing spent fuel in this study is appropriate to ensure the availability of sufficient decommissioning funds at the end of the station's life if the DOE has not met its obligation. The cost for the interim storage of spent fuel has been calculated and is separately presented as "Spent Fuel Management" expenditures in this report.

1.3.2 Low-Level Radioactive Waste Regulations

The contaminated and activated material generated in the decontamination and dismantling of a commercial nuclear reactor is classified as low-level (radioactive) waste, although not all of the material is suitable for "shallow-land" disposal. With the passage of the "Low-Level Radioactive Waste Policy Act" in 1980,^[17] and its Amendments of 1985,^[18] the states became ultimately responsible for the disposition of low-level radioactive waste generated within their own borders.

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

Disposition of the various waste streams produced by the decommissioning process considered all options and services currently available to SNC. The majority of the low-level radioactive waste designated for direct disposal (Class A^[19]) can be sent to EnergySolutions' facility in Clive, Utah. Therefore, disposal costs for Class A waste were based upon SNC's current experience-based costs associated with the EnergySolutions facility. This facility is not licensed to receive the higher activity portion (Classes B and C) of the decommissioning waste stream.

The WCS facility is able to receive the Class B and C waste. As such, for this analysis, Class B and C waste was assumed to be shipped to the WCS facility. Disposal costs for this waste were also based upon SNC's current experience-based costs associated with the WCS facility.

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

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

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

A significant portion of the metallic waste generated during decommissioning may potentially be contaminated by radioactive materials. Rather than designating this large volume for controlled disposal, this analysis assumes that the material is sent to a licensed facility for characterization and processing. Processing is routinely used to reduce the volume, for example, by component disassembly, sorting, and compaction. The estimates reflect the savings from waste recovery/volume reduction.

1.3.3 Radiological Criteria for License Termination

In 1997, the NRC published Subpart E, “Radiological Criteria for License Termination,”^[20] amending 10 CFR Part 20. This subpart provides radiological criteria for releasing a facility for unrestricted use. The regulation states that the site can be released for unrestricted use if radioactivity levels are such that the average member of a critical group would not receive a Total Effective Dose Equivalent (TEDE) in excess of 25 millirem per year, and provided that residual radioactivity has been reduced to levels that are As Low As Reasonably Achievable (ALARA). The decommissioning estimates assume that the Hatch 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).^[21] An additional and separate limit of 4 millirem per year, as defined in 40 CFR §141.16, is applied to drinking water.^[22]

On October 9, 2002, the NRC signed an agreement with the EPA on the radiological decommissioning and decontamination of NRC-licensed sites. The Memorandum of Understanding (MOU)^[23] provides that EPA will defer exercise of authority under CERCLA for the majority of facilities decommissioned under NRC authority. The MOU also includes provisions for NRC and EPA consultation for certain sites when, at the time of license termination, (1) groundwater contamination exceeds EPA-permitted levels; (2) NRC contemplates

restricted release of the site; and/or (3) residual radioactive soil concentrations exceed levels defined in the MOU.

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

2. DECOMMISSIONING ALTERNATIVE

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

The operating licenses for Units 1 and 2 currently expire in August 2034 and June 2038, respectively. The DECON scenario assumes that decommissioning activities at the two units are sequenced and integrated so as to minimize the total duration of the physical dismantling processes. Spent fuel that cannot be directly transferred to the DOE from the storage pools is relocated to the ISFSI so as to facilitate decontamination and dismantling activities within the fuel handling buildings. Spent fuel storage operations continue at the site until the transfer of the fuel to the DOE is complete, assumed to be in the year 2074.

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

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

The second phase encompasses activities during the storage period or during major decommissioning activities, or a combination of the two. The third phase pertains to the activities involved in license termination. The decommissioning estimates developed for Hatch 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 PERIOD 1 – PREPARATIONS

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

2.1.1 Engineering and Planning

The PSDAR, required within two years of the notice to cease operations, provides a description of the licensee's planned decommissioning activities, a timetable, and the associated financial requirements of the intended decommissioning program. Upon receipt of the PSDAR, the NRC will make the document available to the public for comment in a local hearing to be held in the vicinity of the reactor site. Ninety days following submittal and NRC receipt of the PSDAR, the licensee may begin to perform major decommissioning activities under a modified 10 CFR §50.59, 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 greater than Class C waste (GTCC), as defined by 10 CFR §61. Major components are further defined as comprising the reactor vessel and internals, large bore recirculation system piping, and other large components that are radioactive. The NRC includes the following additional criteria for use of the §50.59 process in decommissioning. The proposed activity must not:

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

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

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

2.1.2 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 (1) performing detailed radiation surveys of work areas and major components (including the reactor vessel and its internals), and (2) performing contamination surveys of internal piping components levels and primary shield cores.
- Isolation of the spent fuel storage pool and fuel handling systems. This allows decommissioning operations to be performed in plant areas to the greatest extent, with minimum impact to the project schedule. The fuel will be transferred from the spent fuel pool once it decays to the point that it meets the heat load criteria of the spent fuel casks. It is therefore assumed that the fuel pool will remain operational for a minimum of five years and six months following the cessation of plant operations.

- Specification of transport and disposal requirements for activated materials and/or hazardous materials, including shielding and waste stabilization.
- Development of procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and non-metallic components generated in decommissioning), site security and emergency programs, and industrial safety.
- Construction of an ISFSI to DOE transfer facility. This facility will allow the efficient transfer of spent fuel canisters from the ISFSI pad to the DOE transportation overpacks and transportation vehicle.

2.2 PERIOD 2 – DECOMMISSIONING OPERATIONS

This period includes physical decommissioning activities associated with the removal and disposal of systems and structures containing contamination and radioactivity including the successful termination of the Part 50 operating licenses, exclusive of the ISFSI. Significant decommissioning activities in this phase include:

- Construction of temporary facilities and/or modification of existing facilities to support dismantling activities. This may include a centralized processing area to facilitate equipment removal and component preparations for off-site disposal.
- Reconfiguration and modification of site structures and facilities as needed to support decommissioning operations. This may include the upgrading of roads (on and off site) to facilitate hauling and transport. Building modifications may be required to facilitate access of large/heavy equipment. Modifications may also be required to support the segmentation of the reactor vessel internals and component extraction.
- Design and fabrication of temporary and permanent shielding to support removal and transportation activities, construction of contamination control envelopes, and the procurement of specialty tooling.
- Procurement (lease or purchase) of shipping canisters, cask liners, and industrial packages.
- Decontamination of components and piping systems as required to control (minimize) worker exposure.

- Removal of piping and components no longer essential to support decommissioning operations.
- Transfer of the steam separator and dryer assemblies to the dryer-separator pool for segmentation. Segmentation will be conducted considering the weight capacity of the container and the radioactive constituents of the waste material to maximize the loading of the shielded transport casks. The operations are conducted under water using remotely operated tooling and contamination controls.
- Disconnection of the control blades from the drives on the vessel lower head. Blades are transferred to the spent fuel pool for packaging.
- Disassembly, segmentation, and packaging of the core shroud. Some of the material is expected to exceed Class C disposal requirements. As such, those segments are packaged in a modified fuel storage canister for geologic disposal.
- Removal and segmentation of the remaining internals including the jet pump assemblies, fuel support castings, and core plate assembly.
- Draining and decontamination of the reactor well and the permanent sealing of the spent fuel transfer gate. Install shielded platform for segmentation of reactor vessel. Cutting operations are performed in air using remotely operated equipment within a contamination control envelope, with the water level maintained just below the cut to minimize the working area dose rates. Sections are transferred to the dryer-separator pool for packaging and interim storage.
- Disconnection of the control rod drives and instrumentation tubes from reactor vessel lower head. The lower reactor head and vessel supporting structure are then segmented.
- Removal of the reactor recirculation pumps. Exterior surfaces are decontaminated and openings covered. Components can serve as their own burial containers provided that all penetrations are properly sealed.
- Demolition of the sacrificial shield activated concrete by controlled demolition.
- Expansion of the ISFSI and transfer of the spent fuel from the storage pools to the DOE and ISFSI pad for interim storage. Spent fuel storage operations continue throughout the active decommissioning period. Fuel transfer is expected to begin in 2035 and to be completed by the end of the year 2074.

At least two years prior to the anticipated date of license termination, an LTP will be required. Submitted as a supplement to the Final Safety Analysis

Report (FSAR), or 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 NRC. The licensee may then commence with the final remediation of site facilities and services, including:

- Removal of remaining plant systems and associated components as they become nonessential to the decommissioning program or worker health and safety (e.g., waste collection and treatment systems, electrical power and ventilation systems).
- Removal of the steel liners from the drywell, disposing of the activated and contaminated sections as radioactive waste. Removal of any activated/ contaminated concrete.
- Removal of the steel liners from the steam separator and dryer pool, reactor well, and spent fuel storage pools.
- Surveys of the decontaminated areas of the containment structure.
- Remediation and removal of the contaminated equipment and material from the reactor building and any other contaminated facility. Radiation and contamination controls will be utilized until radiation and contamination levels are reduced such 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.
- Removal of the remaining components, equipment, and plant services in support of the area release survey(s).
- Routing of material removed in the decontamination and dismantling to a central processing area. Material certified to be free of contamination is released for unrestricted disposition, e.g., as scrap, recycle, or general disposal. Contaminated material is characterized and segregated for additional off-site processing (disassembly, chemical cleaning, volume reduction, and waste treatment), and/or packaged for controlled disposal at a low-level radioactive waste disposal facility.

Incorporated into the LTP is the Final Survey Plan. This plan identifies the radiological surveys to be performed once the decontamination activities are completed and is developed using the guidance provided in the “Multi-Agency Radiation Survey and Site Investigation Manual” (MARSSIM).^[24] 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 surveys are complete, the results are provided to the NRC in a format that can be verified. The NRC then reviews and evaluates the information, performs an independent confirmation of radiological site conditions, and makes a determination on final termination of the license.

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

2.3 PERIOD 3 - SITE RESTORATION, ISFSI OPERATIONS AND DEMOLITION

2.3.1 Site Restoration

Following completion of decommissioning operations, site restoration activities may begin. Efficient removal of the contaminated materials and verification that residual radionuclide concentrations are below the NRC limits may result in substantial damage to many of the structures. Although performed in a controlled and safe manner, blasting, coring, drilling, scarification (surface removal), and the other decontamination activities will substantially degrade power block structures, including the reactor and radwaste buildings. Verifying that subsurface radionuclide concentrations meet NRC site release requirements may 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 and future workers. Abandonment creates a breeding ground for vermin infestation and 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, and 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 rebar and miscellaneous embedments. The processed material is then used on site to backfill voids. Excess non-contaminated materials are trucked to an off-site area for disposal as construction debris. Removable concrete vehicle barriers are removed intact and transported off site (cost of handling and transport is included in the estimate). Disposal of the barriers is based on no cost or credit to the decommissioning project.

2.3.2 ISFSI Operations & Demolition

The ISFSI will continue to operate under a general license (10 CFR Part 50) following the amendment of the operating licenses to release the adjacent (power block) property. Assuming the DOE starts accepting spent fuel in 2032, transfer of spent fuel from Hatch continues through the year 2074. Any delay in the transfer process, for example, due to a delay in the scheduled opening of the geologic repository, a slower acceptance rate, or a combination of a delayed start date and lower transfer rate, results in a longer on-site residence time for the spent fuel and therefore additional caretaking expenses.

At the conclusion of the spent fuel transfer process, the ISFSI is decommissioned. The NRC will terminate the Part 50 license if it

determines that the remediation of the ISFSI has been performed in accordance with an ISFSI license termination plan and that the final radiation survey and associated documentation demonstrate that the facility is suitable for release.

The existing ISFSI design is based upon the use of a multi-purpose canister (MPC), each with a concrete overpack. The spent fuel is placed inside the MPC, which is placed inside the concrete overpack (cylindrical concrete shielding container), and stored vertically on a storage pad. For purposes of this cost analysis, it is assumed that once the MPCs containing the spent fuel assemblies have been removed, and any residual radioactivity removed from the concrete overpack, the license for the ISFSI will be terminated. Following license termination the concrete overpacks will be dismantled using conventional reinforced concrete demolition techniques. The concrete storage pad will then be removed, and the area graded and landscaped to conform to the surrounding environment.

3. COST ESTIMATE

The cost estimates prepared for decommissioning Hatch consider the unique features of the site, including the nuclear steam supply system, power generation systems, support services, site buildings, and ancillary facilities. The bases of the estimates, including the sources of information relied upon, the estimating methodology employed, site-specific considerations and other pertinent assumptions are described in this section.

3.1 BASIS OF ESTIMATE

The current estimates are developed using the basic design information originally generated for the decommissioning analysis prepared in 1993-94 and subsequently updated on a periodic basis with the most recent analysis completed in 2015. The information was reviewed for the current estimates and updated, as deemed appropriate. The site-specific considerations and assumptions used in the previous estimates were also revisited. Modifications were incorporated where new information was available or where experience from ongoing decommissioning programs provided viable alternatives or improved processes.

3.2 METHODOLOGY

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

The unit factor method provides a demonstrable basis for establishing reliable cost estimates. The detail provided in the unit factors, including activity duration, labor costs (by craft), and equipment and consumable costs, provides a high level of confidence that essential elements have not been omitted.

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

Regulatory Guide 1.184 ^[27] describes the methods and procedures that are acceptable to the NRC staff for implementing the requirements that relate to the initial activities and the major phases of the decommissioning process. The costs and schedules presented in this analysis follow the general guidance and sequence in the regulations. The format and content of the estimates is also consistent with the recommendations of Regulatory Guide 1.202. ^[28]

This estimates reflect lessons learned from TLG's involvement in the Shippingport Station Decommissioning Project, completed in 1989, as well as the decommissioning of the Cintichem reactor, hot cells, and associated facilities, completed in 1997. In addition, the planning and engineering for the Rancho Seco, Trojan, Yankee Rowe, Big Rock Point, Maine Yankee, Humboldt Bay-3, Oyster Creek, Connecticut Yankee, Crystal River, San Onofre and Vermont Yankee 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 radiologically controlled areas and 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 radiological 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. Dismantling of the fuel pool systems and decontamination of the spent fuel pools is also dependent upon the timetable for the transfer of the spent fuel assemblies from the pools to the DOE and/or ISFSI.

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

3.3 FINANCIAL COMPONENTS OF THE COST MODEL

TLG's proprietary decommissioning cost model, DECCER, produces a number of distinct cost elements. These direct expenditures, however, do not comprise the total cost to accomplish the project goal, i.e., license termination, spent fuel management, 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 TLG's 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"^[28] as "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this estimate are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, a contingency factor has been applied. In the AIF/NESP-036 study, the types of unforeseeable events that are likely to occur in decommissioning are discussed and guidelines are provided for percentage contingency in each category. It should be noted that contingency, as used in this estimate, does not account for price escalation and inflation in the cost of decommissioning over the remaining operating life of the station.

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

For example, the most technologically challenging task in decommissioning a commercial nuclear station is the disposition of the reactor vessel and internal components, which have become highly radioactive after a lifetime of exposure to radiation produced in the core. The disposition of these highly radioactive components forms the basis for the critical path (schedule) for decommissioning operations. Cost and schedule are inter-dependent and any deviation in schedule has a significant impact on cost for performing a specific activity.

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

the tooling employed in cutting the various subassemblies. The risks and uncertainties associated with this task are that the expected optimization may not be achieved, resulting in delays and additional program costs. For this reason, contingency must be included to mitigate the consequences of the expected inefficiencies inherent in this complex activity, along with related concerns associated with the operation of highly specialized tooling, field conditions, and water clarity.

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

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

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

The contingency values are applied to the appropriate components of the estimates on a line item basis. A composite value is then reported at the end of each detailed estimate (as provided in Appendix C). The overall contingency, when applied this basis, results in an average value of 19.7% for Unit 1 and 19.7% for Unit 2. Appendix E, the ISFSI decommissioning calculation, uses a flat 25% contingency added at the end of the calculation.

3.3.2 Financial Risk

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

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

previously undiscovered (either radioactive or hazardous material contamination), variations in plant inventory or configuration not indicated by the as-built drawings.

- Regulatory changes, e.g., affecting worker health and safety, site release criteria, waste transportation, and disposal.
- Policy decisions altering national commitments, e.g., in the ability to accommodate certain waste forms for disposition, or in the timetable for such.
- Changes in the DOE's spent fuel transfer schedule and acceptance rate. Changes in these parameters affect the ISFSI size and duration of spent fuel storage and transfer.
- Pricing changes for basic inputs, such as labor, energy, materials, and waste disposal.

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

3.4 SITE-SPECIFIC CONSIDERATIONS

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

The cost to dispose the spent fuel generated from plant operations is not reflected within the estimates to decommission Hatch. 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 surcharge paid into the DOE's waste fund during operations. On November 19, 2013, the U.S. Court of Appeals for the D.C. Circuit ordered the Secretary of the Department of Energy to suspend collecting annual fees for nuclear waste disposal from nuclear power plant operators until the DOE has conducted a legally adequate fee assessment.

The NRC does, however, require licensees to establish a program to manage and provide funding for the management of all irradiated fuel at the reactor site until title of the fuel is transferred to the Secretary of Energy. This requirement is prepared for through inclusion of certain high-level waste cost elements within the estimates, as described below.

The DOE's repository program assumes that spent fuel will be accepted for disposal from the nation's commercial nuclear plants in the order (the "queue") in which it was removed from service ("oldest fuel first").^[30] Repository operations were based upon annual industry-wide receipt of 400 Metric Tons Heavy Metal (MTHM) in the first year of operation, a total of 3,800 MTHM in years 2 through 4 and 3,000 MTHM for year 5 and beyond.^[31] The DOE contracts provide mechanisms for altering the oldest fuel first allocation scheme, including emergency deliveries, exchanges of allocations amongst utilities and the option of providing priority acceptance from permanently shut down nuclear reactors. Because it is unclear how these mechanisms may operate once DOE begins accepting spent fuel from commercial reactors, this study assumes that DOE will accept spent fuel in an oldest fuel first order.

With the storage pools emptied, decommissioning operations can be concluded and the operating licenses terminated.

ISFSI

An ISFSI, which is operated under the plant's general license, has been constructed to support management of the spent fuel during operations. Costs are not included to re-license the ISFSI, but are included to expand the capacity of the ISFSI. The facility is assumed to be available to support spent fuel management once the units cease operation, until the DOE is able to removal all spent fuel from the site.

The ISFSI will continue to operate throughout decommissioning, and beyond the termination of the operating license in the DECON decommissioning alternative, until such time that the transfer of spent fuel to the DOE can be completed. Assuming, that DOE begins to remove spent fuel from the site in 2035, the process is expected to be completed by the year 2074.

Post-shutdown and maintenance costs for the spent fuel pools and the ISFSI are also included and address the cost for staffing the facility, as well as security, insurance, and licensing fees. Costs are provided for the final disposition of the facilities once the transfer is complete. These costs are allocated on a 50:50 basis between Units 1 and 2.

Canister and Overpack

A Holtec HI-STORM 100S Version B system is assumed for future ISFSI capacity expansions. For fuel assemblies transferred from the pools to the ISFSI after shut down, 68 assemblies are loaded into a canister. The cost of the concrete overpack is included in the decommissioning estimate. The cost of the MPC's is assumed to be funded from sources outside the decommissioning fund.

Canister Loading and Transfer

The estimates include the cost for the labor and equipment to transfer and load each spent fuel canister into the DOE transport cask or to the ISFSI from the wet storage pools. Since the DOE has not published details about its cask system, an SNC-provided allowance is used to estimate the cost to transfer the fuel from the ISFSI into the DOE transport cask. However, use of this allowance should not be used to infer that SNC has any detailed information on the cask system DOE will ultimately provide.

Operations and Maintenance

The estimates include the cost of operating and maintaining the spent fuel pools and the ISFSI, respectively. Pool operations are expected to continue approximately five and one half years after the cessation of operations. ISFSI operating costs are based upon a 37 year period of operations following the shutdown of Unit 2.

ISFSI Decommissioning

In accordance with 10 CFR §72.30, licensees must have a proposed decommissioning plan for the ISFSI site and facilities that includes a cost estimate for the plan. The plan should contain sufficient information on the proposed practices and procedures for the decontamination of the ISFSI and for the disposal of residual

radioactive materials after all spent fuel, high-level radioactive waste, and reactor-related GTCC waste have been removed.

A multi-purpose (storage and transport) canister (MPC) with a concrete overpack is used as a basis for the cost analyses. The majority of the overpacks are assumed to be disposed of as “clean” material. As an allowance, the inner steel liners of the remaining overpacks (total of 19) are assumed to have residual radioactivity due to some minor level of neutron-induced activation as a result of the long-term storage of the spent fuel, i.e., contain residual radioactivity. The allowance is based upon the number of modules required for the final core off-load (i.e., 560 offloaded assemblies, 68 assemblies per canister) which results in 9 overpack liners per unit. It is assumed that these are the final modules offloaded; consequently they have the least time for radioactive decay of the neutron activation products.

No contamination or activation of the ISFSI pad is assumed. It would be expected that this assumption would be confirmed as a result of good radiological practice of surveying potentially impacted areas after each spent fuel transfer campaign. As such, only verification surveys are included for the pads in the decommissioning estimate. The estimate is limited to costs necessary to terminate the ISFSI’s NRC license and meet the §20.1402 criteria for unrestricted use.

In accordance with the specific requirements of 10 CFR §72.30 for the ISFSI work scope, the cost estimate for decommissioning the ISFSI reflects: 1) the cost of an independent contractor performing the decommissioning activities; 2) an adequate contingency factor; and 3) the cost of meeting the criteria for unrestricted use. The decommissioning cost for the ISFSI is identified as a separate line item in the Unit 1 and 2 cost tables in Appendix C, and as stand-alone table in Appendix E.

GTCC

The dismantling of the reactor internals is expected to generate radioactive waste considered unsuitable for shallow land disposal (i.e., low-level radioactive waste with concentrations of radionuclides that exceed the limits established by the NRC for Class C radioactive waste (GTCC)). The Low-Level Radioactive Waste Policy Amendments Act of 1985 assigned the federal government the responsibility for the disposal of this material. The Act also stated that the beneficiaries of

the activities resulting in the generation of such radioactive waste bear all reasonable costs of disposing of such waste.^[32]

Although the material is not classified as high-level waste, federal regulations under the Act designate that disposal of this material is a federal responsibility under Section 3(b)(1)(D). However, the DOE has not been forthcoming with an acceptance criteria or disposition schedule for this material, and numerous questions remain as to the ultimate disposal cost and waste form requirements.

As such, for purposes of this study, the GTCC has been packaged and disposed of in the same manner as high-level waste, at a cost equivalent to that envisioned for the spent fuel. The number of canisters required and the packaged volume for GTCC was based upon experience at Maine Yankee (e.g., the constraints on loading as identified in the canister's certificate of compliance), but adjusted for the increased spent fuel capacity of the current MPCs.

It is assumed that the DOE would not accept this waste prior to completing the transfer of spent fuel. Therefore, until such time the DOE is ready to accept GTCC waste, it is reasonable to assume that this material would remain in storage at the Hatch site. GTCC costs have been segregated and included within the "License Termination" expenditures.

3.4.2 Reactor Vessel and Internal Components

The reactor pressure vessel and internal components are segmented in order to meet transportation and disposal requirements. Segmentation is performed in the dryer-separator pool, where a turntable and remote cutter are installed. The vessel is segmented in place, using a mast-mounted cutter supported off the lower head and directed from a shielded work platform installed overhead in the reactor well. Transportation cask specifications and transportation regulations will dictate segmentation and packaging methodology. Material is loaded into single use cask liners that are loaded into shielded and reusable transportation casks.

Intact disposal of the reactor vessel and internal components could provide savings in cost and worker exposure by eliminating the complex segmentation requirements, isolation of the GTCC material, and transport/storage of the resulting waste packages. Portland

General Electric (PGE) was able to dispose of the Trojan reactor as an intact package. However, its location on the Columbia River simplified the transportation analysis since:

- The reactor package could be secured to the transport vehicle for the entire journey, i.e., the package was not lifted during transport.
- There were no man-made or natural terrain features between the plant site and the disposal location that could produce a large drop, and
- Transport speeds were very low, limited by the overland transport vehicle and the river barge.
- As a member of the Northwest Compact, PGE had a site available for disposal of the package-the US Ecology facility in Washington State. The characteristics of this arid site proved favorable in demonstrating compliance with land disposal regulations.

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

3.4.3 Primary System Components

The primary recirculation 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 chemical waste" charge.

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

3.4.4 Main Turbine and Condenser

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

3.4.5 Transportation Methods

Contaminated piping, components, and structural material other than the highly activated reactor vessel and internal components qualifies as LSA-I, II or III or Surface Contaminated Object, SCO-I or II, as described in Title 49 of the Code of Federal Regulations.^[29] The contaminated material is packaged in Industrial Packages (IP I, II, or III) 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,^[30] 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 require that additional shielding be incorporated within the packaging so as to attenuate the dose to levels acceptable for transport.

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

Transport of the highly activated metal, produced in the segmentation of the reactor vessel and internal components, is 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 is based upon the license limits of the available shielded transport casks. The

segmentation scheme for the vessel and internal segments are designed to meet these limits.

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

Transportation costs for Class A radioactive material requiring controlled disposal are based upon the mileage to the EnergySolutions' facility in Clive, Utah. Transportation costs for the higher activity Class B and C radioactive material are based upon the mileage to the WCS facility in Andrews County, Texas. The transportation cost for the GTCC material is assumed to be contained within the disposal cost. Transportation costs for off-site waste processing are based upon the mileage to Oak Ridge, Tennessee. Truck transport costs are developed from published tariffs from Tri-State Motor Transit.^[31]

3.4.6 Low-Level Radioactive Waste Disposal

To the greatest extent practical, metallic material generated in the decontamination and dismantling processes is treated to reduce the total volume requiring controlled disposal. The treated material, meeting the regulatory and/or site release criterion, is released as scrap, requiring no further cost consideration. Conditioning and recovery of the waste stream is performed off site at a licensed processing center. 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 Appendix C, 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 Class A waste), where high concentrations of gamma-emitting radionuclides limit the capacity of the shipping canisters.

The estimates include an allowance for the removal and disposal of contaminated soil (see Appendix D, pages 5 and 6) disposal of a retired low-pressure turbine rotor, and disposal of contaminated tools and equipment used to support operations. Continued plant operations and/or future regulatory actions, such as the development of site-specific release criteria, may increase this volume.

The cost to dispose of the lowest level waste and 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 SNC's current experiences with WCS for the Andrews County facility.

3.4.7 Site Conditions Following Decommissioning

The NRC terminates the site licenses (Part 50) if it determines that site remediation has been performed in accordance with the license termination plan, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release. The NRC's involvement in the decommissioning process, of the Part 50 facility, ends at this point. Building codes, environmental regulations and future plans for the site dictate the next step in the decommissioning process. As an example, the estimates assume that the electrical switchyard will remain operational in support of the electrical transmission and distribution system.

The large underground cooling water piping is isolated, sealed, and abandoned in place. Site utility and service piping is abandoned in place. Electrical manholes are backfilled with suitable earthen material and abandoned. Asphalt surfaces in the immediate vicinity of site buildings are broken up and the material used for backfill on site, if needed. The site access road remains. The ISFSI remains and is subsequently decommissioned as explained in Section 3.4.1.

Structures are removed to a nominal depth of three feet below grade. Concrete rubble generated from demolition activities is processed and used as clean fill. Excess concrete waste is trucked and disposed of at a commercial landfill. The site is graded following the removal of non-essential structures to conform to the adjacent landscape, and vegetation is established to inhibit erosion.

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

3.5 ASSUMPTIONS

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

3.5.1 Estimating Basis

Decommissioning costs are reported in the year of projected expenditure; however, the values are provided in 2018 dollars. Costs are not inflated, escalated, or discounted over the periods of performance.

The 2015 plant inventory, the basis for the decontamination and dismantling requirements and cost, and the decommissioning waste streams, were reviewed for this analysis. The following changes to structures that would impact decommissioning were identified and incorporated into the estimate:

- Simulator Addition
- Visitors Center Building
- Generator Field Storage Pad

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

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

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

The costs associated for the transition of the operating organization to decommissioning, e.g., separation packages, retraining, severance, and incentives are not included in the estimates and were considered to be ongoing operating expenses.

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

Security, while reduced from operating levels, is maintained throughout the decommissioning for access control, material control, and to safeguard the spent fuel (in accordance with the requirements of 10 CFR Part 37, Part 72, and Part 73). Security costs include provisions for recurring expenses. Once the fuel has been transferred to the DOE in 2074, the security organization will be reduced to Part 37 requirements.

The estimates incorporate economies of scale. Examples include the reduction in the manhours and dollars for the preparation of common engineering work packages for the two units. Staff levels are reduced for supervision and management of parallel activities. Cost sharing is also

reflected within the estimates for selective and joint decommissioning activities and in the purchase of specialty decommissioning equipment.

3.5.3 Design Conditions

Any fuel cladding failure that occurred during the lifetime of the plant was assumed to have released fission products at sufficiently low levels so that the buildup of quantities of long-lived isotopes (e.g., cesium-137, strontium-90, or transuranics) have 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 were derived from those listed in NUREG/CR-3474.^[32] Actual estimates were derived from the curie/gram values contained therein and adjusted for the different mass of Hatch components, projected operating life, and different periods of decay. Additional short-lived isotopes are derived from NUREG/CR-0130^[33] and NUREG/CR-0672,^[34] and benchmarked to the long-lived values from NUREG/CR-3474.

The disposal cost for the control blades removed from the vessel with the final core load is included within the estimate. Disposition of any blades stored in the pools from operations is considered an operating expense and therefore not accounted for in the estimates.

Activation of the containment structure was confined to the sacrificial shield in the estimates. More extensive activation (at very low levels) of the interior structures within containment have 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 depends upon the site release criteria selected and the designated end use for the site.

Contaminated Soil

The estimates include an allowance for the remediation of potentially contaminated soil at several site areas that have been identified by SNC that may contain concentrations of radionuclides in excess of NRC release limits. The areas include the primary and refueling water

storage tanks, the east settling pond, storm drain system and the contaminated discharge canal dredge spoils pile. The requirements assumed for soil remediation may be affected by continued plant operations and/or future regulatory actions, such as the development of site-specific release criteria.

3.5.4 General

Transition Activities

Existing warehouses will be cleared of non-essential material and remain for use by SNC and its subcontractors. The warehouses may be dismantled as they become surplus to the decommissioning program. The station's operating staff will perform the following activities at no additional cost or credit to the project during the transition period:

- Drain and collect fuel oils, lubricating oils, and transformer oils for recycle and/or sale.
- Drain and collect acids, caustics, and other chemical stores for recycle and/or sale. It is assumed that these chemicals will have some value; therefore, the cost for their removal will be compensated through their subsequent sale.
- Process operating waste inventories. Disposal of operating wastes (e.g., filtration media, resins) during this initial period is not considered a decommissioning expense. The estimates do not address the disposition of any legacy components, with the exception of the Spare Low Pressure Turbine Rotor, and contaminated operations / maintenance tools and equipment.

Scrap and Salvage

The existing plant equipment was considered obsolete and only suitable for scrap as deadweight quantities. Economically reasonable efforts will be made to salvage equipment following final plant shutdown. However, dismantling techniques assumed by TLG for equipment in these estimates are not consistent with removal techniques required for salvage (resale) of equipment. Experience indicates that some buyers wanted equipment stripped down to very specific requirements before they would consider purchase. This required expensive rework after the equipment has been removed from its installed location. Since placing salvage value on this machinery

and equipment would be speculative, and the value would be small in comparison to the overall decommissioning expenses, these estimates did not attempt to quantify the value that may be realized based upon those efforts.

It is assumed, for purposes of this estimate, 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 did not include the additional cost for size reduction and preparation to meet “furnace ready” conditions. For example, the recovery of copper from electrical cabling from a facility currently being decommissioned has required the removal and disposition of the PCB-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 was 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 such items of property owned by the utility will be removed at no cost or credit to the decommissioning project. Disposition may include relocation to other generating facilities. Spare parts will also be made available for alternative use.

The concrete debris resulting from building demolition activities is crushed on site to reduce the size of the debris. The resulting crushed concrete is used to backfill below grade voids. The rebar removed from the concrete crushing process is disposed of as scrap steel in a similar fashion as other scrap metal as discussed previously.

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.

Emergency Planning

FEMA fees associated with emergency planning are assumed to continue for approximately 18 months following the cessation of operations. At this time, the fees are discontinued. The timing is based upon the anticipated condition of the spent fuel (i.e., the hottest spent fuel assemblies are assumed to be cool enough that no substantial Zircaloy oxidation and off-site event would occur with the loss of spent fuel pool water). State and local fees remain at operating levels until all fuel has been transferred from the pools to the ISFSI. After all spent fuel is in dry storage state and local fees are reduced. These fees are eliminated after all spent fuel is off site.

Insurance

Costs for continuing coverage (nuclear liability and property insurance) following cessation of plant operations and during decommissioning are included and based upon current operating premiums. Reductions in premiums, throughout the decommissioning process, are based upon the guidance provided in SECY-00-0145, "Integrated Rulemaking Plan for Nuclear Power Plant Decommissioning."^[35] The NRC's financial protection requirements are based on various reactor (and spent fuel) configurations.

Property Taxes

The property tax during the decommissioning period is considered negligible and is not considered in these estimates.

Site Modifications

The perimeter fence and in-plant security barriers are moved, as appropriate, to conform to the site security plan in force during the various stages of the project.

Hazardous and Mixed Waste

No significant quantities of asbestos, industrial solvents, chromated water, lead, mercury or mixed waste are expected to be present on site at the time of decommissioning. Therefore, remediation costs were not included in the study.

Overhead Costs

Based upon current corporate and overhead costs provided by SNC, an allowance is included as an overhead rate on utility salaries. These costs include: site overhead costs required to support the site decommissioning staff, and an allowance for corporate costs required to continue at reduced levels during the decommissioning period.

3.6 IMPACT OF DECOMMISSIONING MULTIPLE REACTOR UNITS

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

- The sequence of work generally follows the principal that the work is done at Unit 1 first, followed by similar work at Unit 2. This permits the experience gained at Unit 1 to be applied by the workforce at the second unit. It should be noted however, that the estimates do not consider productivity improvements at the second unit, since there is little documented experience with decommissioning two units simultaneously. The work associated with developing activity specifications and procedures can be considered essentially identical between the two units, therefore the second unit costs are assumed to be a fraction of the first unit (~ 42%).
- Segmenting the reactor vessel and internals will require the use of special equipment. The decommissioning project will be scheduled such that Unit 2's reactor internals and vessel are segmented after the activities at Unit 1 have been completed.
- Some program management and support costs, particularly costs associated with the more senior positions, can be avoided with two reactors undergoing decommissioning simultaneously. As a result, the estimate is based on a "lead" unit that includes these senior positions, and a "second" unit that excludes these positions.
- Unit 1, as the first unit to enter decommissioning, incurs the majority of site characterization costs.

- Unit 1, as the first unit to enter decommissioning, incurs a greater fraction of the NRC hourly charges.
- The final radiological survey schedule is affected by a two-unit decommissioning schedule. It would be considered impractical to try to complete the final status survey of Unit 1, while Unit 2 still has ongoing radiological remediation work and waste handling in process. As such, the final status surveys of Units 1 and 2 are conducted concurrently.
- The final demolition of buildings at Units 1 and 2 are considered to take place concurrently.
- Costs for operating and maintaining the ISFSI after the operating licenses are terminated are allocated equally between Units 1 and 2.
- Shared systems and common structures are generally assigned to Unit 2.
- Station costs such as emergency response fees, corporate overhead, and insurance are generally allocated on an equal basis between the two units.

3.7 COST ESTIMATE SUMMARY

Summary level costs, license termination, spent fuel and site restoration costs projected for the decommissioning of each of the two units are provided in Tables 3.1 and 3.2 (sub-parts a, b, c, and d). The tables delineate the cost contributors by year of expenditures as well as cost contributor (e.g., labor, materials, and waste disposal).

The tables in Appendix C provide additional detail. The cost elements in these tables are assigned to one of three subcategories: “License Termination,” “Spent Fuel Management,” and “Site Restoration.” The subcategory “License Termination” is used to accumulate costs that are consistent with “decommissioning” as defined by the NRC in its financial assurance regulations (i.e., 10 CFR §50.75). The cost reported for this subcategory is generally sufficient to terminate the plant’s operating license, recognizing that there may be some additional cost impact from spent fuel management. The License Termination cost subcategory also includes costs to decommission the ISFSI (as required by 10 CFR §72.30). The basis for the ISFSI decommissioning cost that is included in Appendix C is provided in Appendix E.

The “Spent Fuel Management” subcategory contains costs associated with the containerization and transfer of spent fuel from the wet storage pools to the DOE and/or ISFSI for interim storage, as well as the transfer of the spent fuel in storage at the ISFSI to the DOE. Costs are included for the operation

of the storage pools and the management of the ISFSI until such time that the transfer is complete. It does not include any spent fuel management expenses incurred prior to the cessation of plant operations, nor does it include any cost related to the final disposal of the spent fuel.

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

As discussed in Section 3.4.1, it is assumed that the DOE will not accept the GTCC waste prior to completing the transfer of spent fuel. Therefore, the cost of GTCC disposal is shown in the final year of ISFSI operation. While designated for disposal at the federal facility along with the spent fuel, GTCC waste is still classified as low-level radioactive waste and, as such, included as a “License Termination” expense.

Decommissioning costs are reported in 2018 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 Appendix C, along with the timelines presented in Section 4.

The “Burial” column (Table 3.1 and 3.2) contains costs for the processing of low-level radioactive waste, as well as for the controlled disposal of material that cannot be recovered (released for unrestricted use). Since the following tables are often used in escalation analyses, costs associated with the disposition of GTCC have been reassigned to the “Other” column, commensurate with contractual payments for a one-time disposal service, although the cost is still reported in the “LLRW Disposal Costs” column in Appendix C and as a “Waste Disposal” cost in the summary tables (i.e., on the table on page xix, and Table 6-1 and 6-2). “Off-site Waste Processing,” separately reported in the summary tables, has been included in the “Burial” column as well.

TABLE 3.1a
SUMMARY SCHEDULE OF ANNUAL EXPENDITURES
UNIT 1
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2034	28,259	2,888	292	28	11,552	43,019
2035	71,505	10,530	1,012	995	18,918	102,960
2036	72,308	28,401	761	60,338	9,266	171,075
2037	67,895	26,466	651	54,559	8,840	158,411
2038	54,542	15,582	540	14,675	5,909	91,249
2039	54,542	15,582	540	14,675	5,909	91,249
2040	20,948	5,619	186	16,572	11,519	54,844
2041	3,850	231	0	11	874	4,966
2042	3,850	231	0	11	874	4,966
2043	3,850	231	0	11	874	4,966
2044	17,189	1,091	73	31	1,069	19,453
2045	17,775	6,044	90	13	1,897	25,818
2046	13,618	7,408	72	0	2,110	23,209
2047	6,149	2,532	22	0	1,060	9,764
2048	2,807	347	0	0	591	3,745
2049	2,800	346	0	0	589	3,735
2050	2,800	346	0	0	589	3,735
2051	2,800	346	0	0	589	3,735
2052	2,807	347	0	0	591	3,745
2053	2,800	346	0	0	589	3,735
2054	2,800	346	0	0	589	3,735
2055	2,800	346	0	0	589	3,735
2056	2,807	347	0	0	591	3,745
2057	2,800	346	0	0	589	3,735
2058	2,800	346	0	0	589	3,735
2059	2,800	346	0	0	589	3,735
2060	2,807	347	0	0	591	3,745
2061	2,800	346	0	0	589	3,735
2062	2,800	346	0	0	589	3,735
2063	2,800	346	0	0	589	3,735

TABLE 3.1a (continued)
SUMMARY SCHEDULE OF ANNUAL EXPENDITURES
UNIT 1
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2064	2,807	347	0	0	591	3,745
2065	2,800	346	0	0	589	3,735
2066	2,800	346	0	0	589	3,735
2067	2,800	346	0	0	589	3,735
2068	2,807	347	0	0	591	3,745
2069	2,800	346	0	0	589	3,735
2070	2,800	346	0	0	589	3,735
2071	2,800	346	0	0	589	3,735
2072	2,807	347	0	0	591	3,745
2073	2,800	346	0	0	589	3,735
2074	2,816	895	0	0	6,278	9,989
2075	3,245	1,366	12	3,526	4,525	12,674
Total	515,184	134,090	4,251	165,446	106,811	925,781

TABLE 3.1b
SCHEDULE OF ANNUAL EXPENDITURES – LICENSE TERMINATION
UNIT 1
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2034	27,799	2,134	292	28	7,015	37,268
2035	69,990	7,948	1,012	995	11,648	91,593
2036	69,601	21,998	761	60,338	7,992	160,690
2037	65,225	19,710	651	54,559	7,568	147,713
2038	52,197	8,592	540	14,675	4,540	80,545
2039	52,197	8,592	540	14,675	4,540	80,545
2040	18,499	4,923	186	16,572	11,218	51,397
2041	1,853	185	0	11	687	2,737
2042	1,853	185	0	11	687	2,737
2043	1,853	185	0	11	687	2,737
2044	14,778	885	73	31	882	16,648
2045	6,930	392	36	13	431	7,801
2046	105	0	0	0	218	323
2047	32	0	0	0	68	100
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

TABLE 3.1b (continued)
SCHEDULE OF ANNUAL EXPENDITURES – LICENSE TERMINATION
UNIT 1
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
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	112	528	0	0	5,699	6,339
2075	719	331	0	3,526	4,019	8,595
Total	383,745	76,587	4,090	165,446	67,899	697,767

TABLE 3.1c
SCHEDULE OF ANNUAL EXPENDITURES – SPENT FUEL
UNIT 1
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2034	251	754	0	0	4,537	5,542
2035	861	2,582	0	0	7,270	10,713
2036	2,121	6,362	0	0	1,275	9,758
2037	2,202	6,605	0	0	1,243	10,050
2038	2,163	6,489	0	0	1,243	9,896
2039	2,163	6,489	0	0	1,243	9,896
2040	2,334	643	0	0	289	3,265
2041	1,997	46	0	0	187	2,230
2042	1,997	46	0	0	187	2,230
2043	1,997	46	0	0	187	2,230
2044	2,411	206	0	0	187	2,804
2045	2,799	342	54	0	281	3,476
2046	2,797	335	72	0	312	3,515
2047	2,799	342	22	0	503	3,667
2048	2,807	347	0	0	591	3,745
2049	2,800	346	0	0	589	3,735
2050	2,800	346	0	0	589	3,735
2051	2,800	346	0	0	589	3,735
2052	2,807	347	0	0	591	3,745
2053	2,800	346	0	0	589	3,735
2054	2,800	346	0	0	589	3,735
2055	2,800	346	0	0	589	3,735
2056	2,807	347	0	0	591	3,745
2057	2,800	346	0	0	589	3,735
2058	2,800	346	0	0	589	3,735
2059	2,800	346	0	0	589	3,735
2060	2,807	347	0	0	591	3,745
2061	2,800	346	0	0	589	3,735
2062	2,800	346	0	0	589	3,735
2063	2,800	346	0	0	589	3,735

TABLE 3.1c (continued)
SCHEDULE OF ANNUAL EXPENDITURES – SPENT FUEL
UNIT 1
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2064	2,807	347	0	0	591	3,745
2065	2,800	346	0	0	589	3,735
2066	2,800	346	0	0	589	3,735
2067	2,800	346	0	0	589	3,735
2068	2,807	347	0	0	591	3,745
2069	2,800	346	0	0	589	3,735
2070	2,800	346	0	0	589	3,735
2071	2,800	346	0	0	589	3,735
2072	2,807	347	0	0	591	3,745
2073	2,800	346	0	0	589	3,735
2074	2,704	367	0	0	579	3,650
2075	0	0	0	0	0	0
Total	104,437	40,646	148	0	34,859	180,090

TABLE 3.1d
SCHEDULE OF ANNUAL EXPENDITURES – SITE RESTORATION
UNIT 1
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2034	209	0	0	0	0	209
2035	654	0	0	0	0	654
2036	586	42	0	0	0	627
2037	468	151	0	0	29	648
2038	182	501	0	0	125	808
2039	182	501	0	0	125	808
2040	116	54	0	0	12	182
2041	0	0	0	0	0	0
2042	0	0	0	0	0	0
2043	0	0	0	0	0	0
2044	0	0	0	0	0	0
2045	8,045	5,310	0	0	1,186	14,541
2046	10,717	7,073	0	0	1,580	19,371
2047	3,318	2,190	0	0	489	5,997
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

TABLE 3.1d (continued)
SCHEDULE OF ANNUAL EXPENDITURES – SITE RESTORATION
UNIT 1
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
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	2,526	1,035	12	0	506	4,079
Total	27,002	16,858	12	0	4,053	47,924

TABLE 3.2a
SUMMARY SCHEDULE OF ANNUAL EXPENDITURES
UNIT 2
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2038	33,927	4,624	399	38	7,665	46,653
2039	66,633	13,563	1,081	4,740	9,008	95,026
2040	80,213	30,350	686	71,656	9,840	192,744
2041	76,863	25,147	632	52,455	8,449	163,546
2042	71,271	16,001	540	18,507	6,012	112,331
2043	69,990	15,848	527	19,698	6,965	113,028
2044	39,233	7,530	216	20,661	12,650	80,290
2045	19,638	8,947	90	13	1,844	30,533
2046	15,644	11,247	72	0	2,113	29,076
2047	6,776	3,721	22	0	1,061	11,580
2048	2,807	347	0	0	591	3,745
2049	2,800	346	0	0	589	3,735
2050	2,800	346	0	0	589	3,735
2051	2,800	346	0	0	589	3,735
2052	2,807	347	0	0	591	3,745
2053	2,800	346	0	0	589	3,735
2054	2,800	346	0	0	589	3,735
2055	2,800	346	0	0	589	3,735
2056	2,807	347	0	0	591	3,745
2057	2,800	346	0	0	589	3,735
2058	2,800	346	0	0	589	3,735
2059	2,800	346	0	0	589	3,735
2060	2,807	347	0	0	591	3,745
2061	2,800	346	0	0	589	3,735
2062	2,800	346	0	0	589	3,735
2063	2,800	346	0	0	589	3,735
2064	2,807	347	0	0	591	3,745
2065	2,800	346	0	0	589	3,735
2066	2,800	346	0	0	589	3,735
2067	2,800	346	0	0	589	3,735

TABLE 3.2a (continued)
SUMMARY SCHEDULE OF ANNUAL EXPENDITURES
UNIT 2
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2068	2,807	347	0	0	591	3,745
2069	2,800	346	0	0	589	3,735
2070	2,800	346	0	0	589	3,735
2071	2,800	346	0	0	589	3,735
2072	2,807	347	0	0	591	3,745
2073	2,800	346	0	0	589	3,735
2074	2,816	895	0	0	6,278	9,989
2075	3,245	1,234	0	3,526	4,525	12,530
Total	559,090	148,099	4,266	191,294	91,745	994,494

TABLE 3.2b
SCHEDULE OF ANNUAL EXPENDITURES – LICENSE TERMINATION
UNIT 2
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2038	32,881	1,843	399	38	6,821	41,982
2039	64,685	8,661	1,081	4,740	7,497	86,665
2040	77,373	24,036	686	71,656	8,593	182,344
2041	74,334	19,027	632	52,455	7,160	153,608
2042	69,282	10,196	540	18,507	4,642	103,167
2043	67,784	10,145	527	19,698	5,657	103,810
2044	34,740	5,429	216	20,661	12,463	73,509
2045	7,228	414	36	13	376	8,066
2046	44	0	0	0	218	262
2047	14	0	0	0	68	81
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

TABLE 3.2b (continued)
SCHEDULE OF ANNUAL EXPENDITURES – LICENSE TERMINATION
UNIT 2
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
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	112	528	0	0	5,699	6,339
2075	719	331	0	3,526	4,019	8,595
Total	429,195	80,610	4,118	191,294	63,211	768,427

TABLE 3.2c
SCHEDULE OF ANNUAL EXPENDITURES – SPENT FUEL
UNIT 2
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2038	927	2,781	0	0	844	4,552
2039	1,633	4,899	0	0	1,512	8,043
2040	2,085	6,254	0	0	1,247	9,585
2041	1,967	5,900	0	0	1,243	9,110
2042	1,766	5,298	0	0	1,243	8,308
2043	1,830	5,071	0	0	1,188	8,090
2044	2,911	655	0	0	187	3,753
2045	2,799	342	54	0	281	3,476
2046	2,797	335	72	0	312	3,515
2047	2,799	342	22	0	503	3,667
2048	2,807	347	0	0	591	3,745
2049	2,800	346	0	0	589	3,735
2050	2,800	346	0	0	589	3,735
2051	2,800	346	0	0	589	3,735
2052	2,807	347	0	0	591	3,745
2053	2,800	346	0	0	589	3,735
2054	2,800	346	0	0	589	3,735
2055	2,800	346	0	0	589	3,735
2056	2,807	347	0	0	591	3,745
2057	2,800	346	0	0	589	3,735
2058	2,800	346	0	0	589	3,735
2059	2,800	346	0	0	589	3,735
2060	2,807	347	0	0	591	3,745
2061	2,800	346	0	0	589	3,735
2062	2,800	346	0	0	589	3,735
2063	2,800	346	0	0	589	3,735
2064	2,807	347	0	0	591	3,745
2065	2,800	346	0	0	589	3,735
2066	2,800	346	0	0	589	3,735
2067	2,800	346	0	0	589	3,735

TABLE 3.2c (continued)
SCHEDULE OF ANNUAL EXPENDITURES – SPENT FUEL
UNIT 2
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2068	2,807	347	0	0	591	3,745
2069	2,800	346	0	0	589	3,735
2070	2,800	346	0	0	589	3,735
2071	2,800	346	0	0	589	3,735
2072	2,807	347	0	0	591	3,745
2073	2,800	346	0	0	589	3,735
2074	2,704	367	0	0	579	3,650
2075	0	0	0	0	0	0
Total	97,058	41,235	148	0	24,476	162,917

TABLE 3.2d
SCHEDULE OF ANNUAL EXPENDITURES – SITE RESTORATION
UNIT 2
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2038	119	0	0	0	0	119
2039	315	3	0	0	0	318
2040	755	60	0	0	0	815
2041	563	221	0	0	45	828
2042	223	507	0	0	126	856
2043	376	632	0	0	120	1,128
2044	1,582	1,446	0	0	0	3,028
2045	9,611	8,192	0	0	1,188	18,991
2046	12,803	10,912	0	0	1,583	25,299
2047	3,964	3,378	0	0	490	7,832
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

TABLE 3.2d (continued)
SCHEDULE OF ANNUAL EXPENDITURES – SITE RESTORATION
UNIT 2
(Thousands, 2018 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
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	2,526	903	0	0	506	3,935
Total	32,837	26,254	0	0	4,059	63,150

4. SCHEDULE ESTIMATE

The schedule for the decommissioning scenario considered in this study followed the sequence presented in the AIF/NESP-036 study, with minor changes to reflect recent experience and site-specific constraints. In addition, the scheduling was revised to reflect the required cooling period for the spent fuel.

A schedule or sequence of activities is presented in Figure 4.1. The schedule reflects the prompt decommissioning alternative and the start date consistent with a scheduled shutdown in 2034 for Unit 1 and 2038 for Unit 2. The sequence assumed that fuel would be removed from each units spent fuel pool within the first five years after shutdown. The key activities listed in the schedule do not reflect a one-to-one correspondence with those activities in the Appendix C cost table, but reflect dividing some activities for clarity and combining others for convenience. The schedule was prepared using the “Microsoft Office Project Professional” computer software.^[36]

4.1 SCHEDULE ESTIMATE ASSUMPTIONS

The schedule was generated using a precedence network and associated software. Activity durations were based upon the actual man-hour estimates calculated for each area. The schedule was assembled by sequencing the work areas, considering work crew availability and material access/egress. The following assumptions were made in the development of the decommissioning schedule:

- The spent fuel storage area of the reactor buildings are isolated until such time that all spent fuel has been discharged from the storage pools to the DOE or to the ISFSI. Decontamination and dismantling of the storage pools are initiated once the transfer of spent fuel is complete. The reactor buildings will continue to serve as the spent fuel storage/transfer facility until such time that all spent fuel has been removed from the spent fuel pools. The reactor buildings are expected to operate for approximately five and one-half years after the cessation of operations.
- All work (except vessel and internals removal activities) will be 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 will be performed by using separate crews for different activities working on different shifts, with a corresponding backshift charge for the second shift.

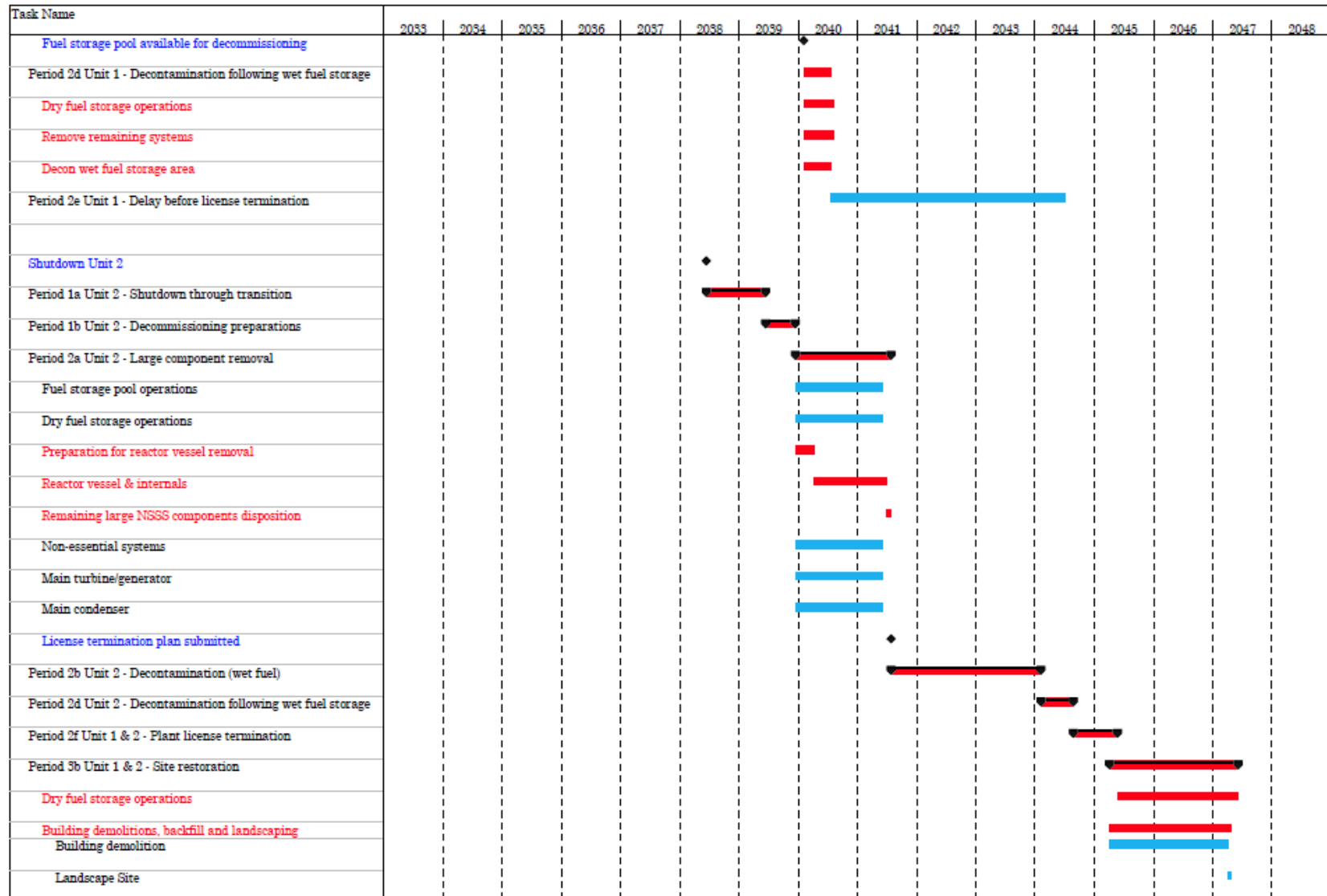
- Multiple crews will work parallel activities to the maximum extent possible, consistent with: optimum efficiency; adequate access for cutting, removal and laydown space; and the stringent safety measures necessary during demolition of heavy components and structures.
- For plant systems removal, the systems with the longest removal durations in areas on the critical path were considered to determine the duration of the activity.

4.2 PROJECT SCHEDULE

The period-dependent costs presented in Appendix C were based upon the durations developed in the schedule for the decommissioning of Hatch. Durations were established between several milestones in each project period; these durations were used to establish a critical path for the entire project. In turn, the critical path duration for each period was used as the basis for determining the period-dependent costs. A second critical path is also shown for the spent fuel cooling period, which determines the release of the reactor buildings for final decontamination.

Project timelines are shown in this section as Figure 4.2. Milestone dates were based on a 60-year plant operating life from the operating license issue date, a five-year wet storage period for the last core discharge, and continued operation of the ISFSI until the DOE can complete the transfer of spent fuel and GTCC waste from the site.

**FIGURE 4.1
DECOMMISSIONING ACTIVITY SCHEDULE**



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

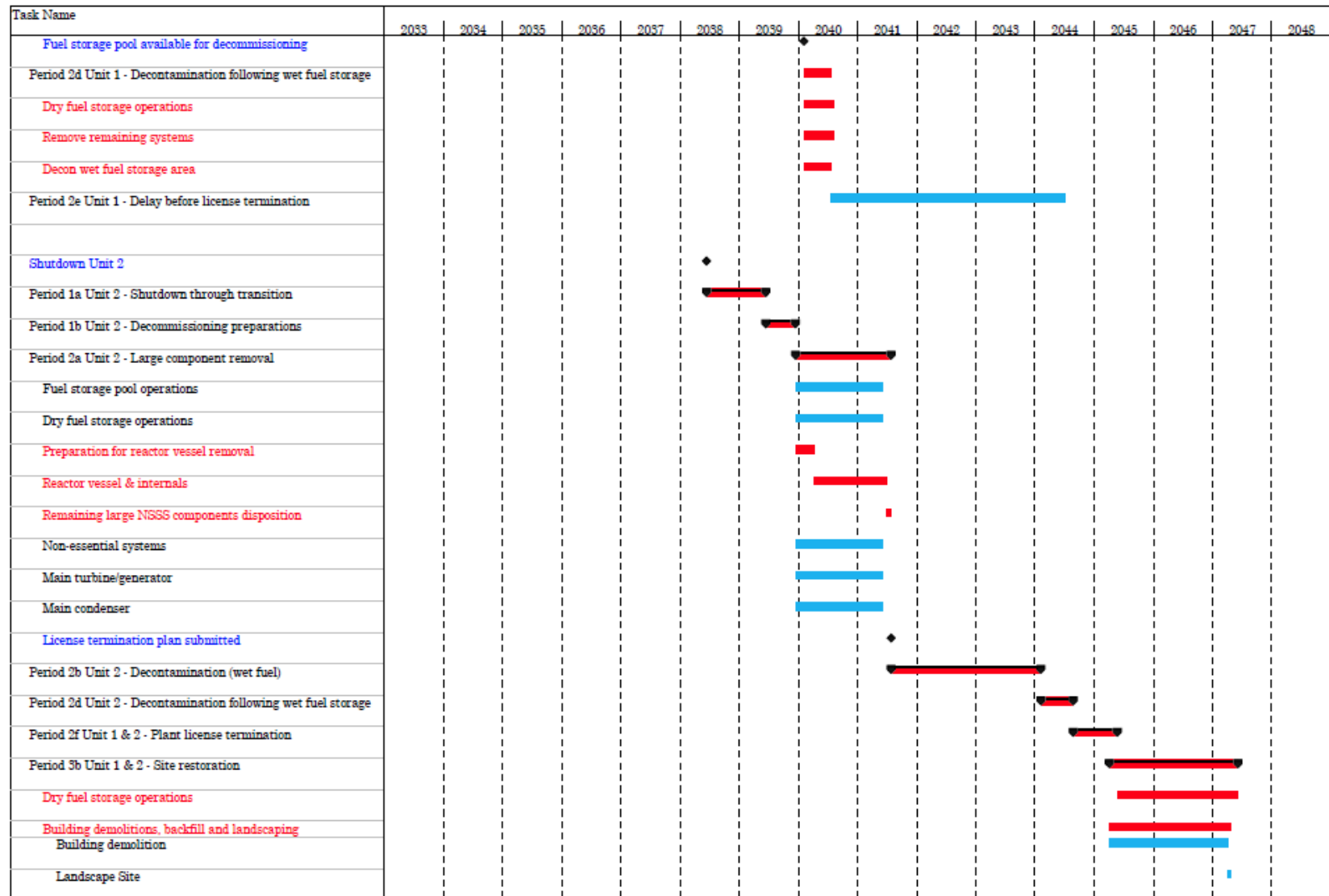
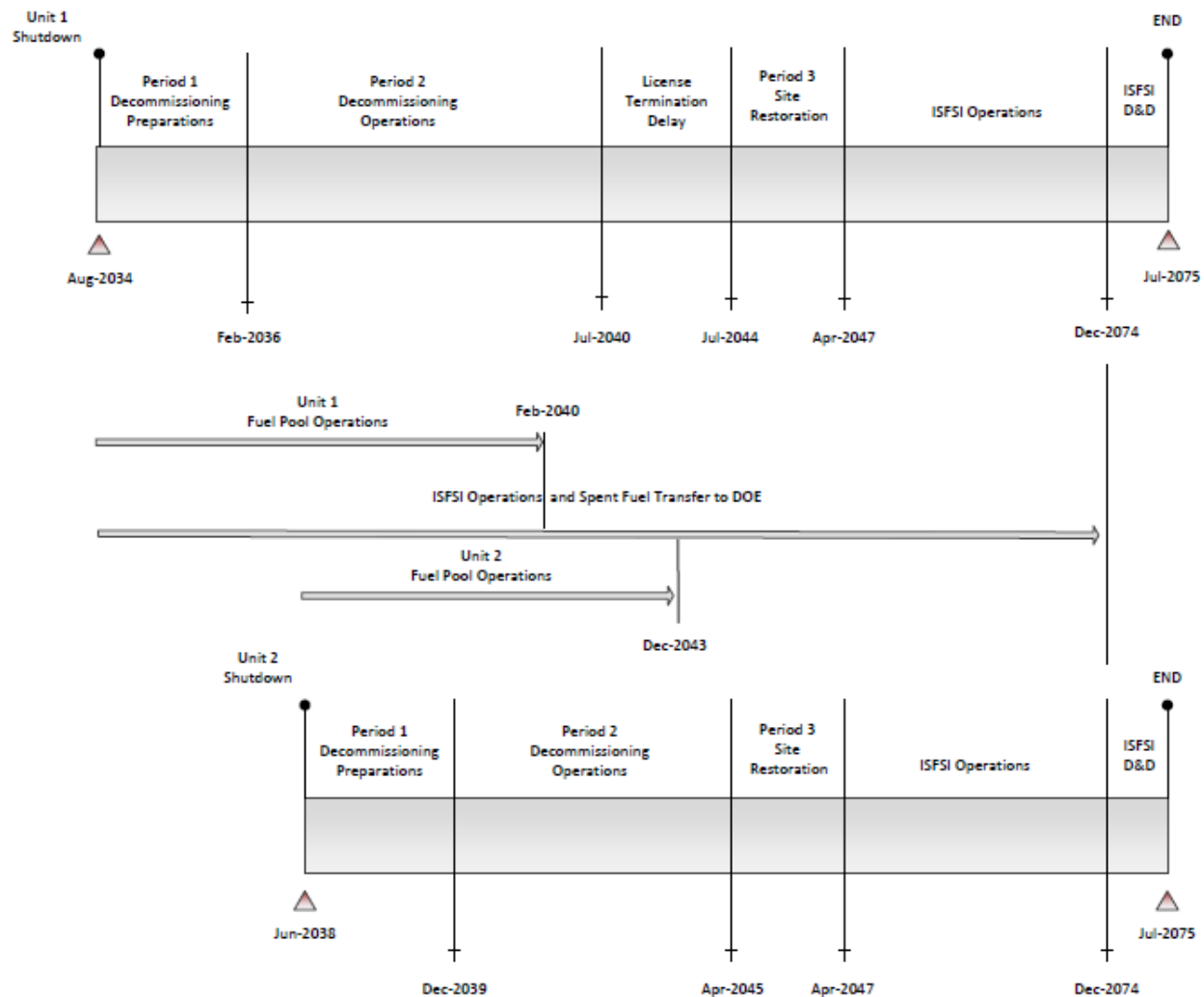


FIGURE 4.2
DECOMMISSIONING TIMELINE
(not to scale)



5. RADIOACTIVE WASTES

The objectives of the decommissioning process are the removal of all radioactive material from the site that would restrict its future use and the termination of the NRC license(s). This currently requires the remediation of all radioactive material at the site in excess of applicable legal limits. Under the Atomic Energy Act,^[37] the NRC is responsible for protecting the public from sources of ionizing radiation. Title 10 of the Code of Federal Regulations (CFR) delineates the production, utilization, and disposal of radioactive materials and processes. In particular, 10 CFR Part 71 defines the requirements for packaging and transportation of radioactive material and 10 CFR Part 61 defines the criteria and procedures by which the NRC issues licenses for the disposal of radioactive waste. 10 CFR 61.55(a)(2)(iv) states that GTCC waste requires disposal in a geologic repository unless otherwise approved by the NRC.

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 Part 173.^[38] Shipping containers are required to be Industrial Packages (IP-1, IP-2 or IP-3). For this study, commercially available steel containers are presumed to be used for the disposal of piping, small components, and concrete. Larger components can serve as their own containers, with proper closure of all openings, access ways, and penetrations.

The destinations for the various waste streams from decommissioning are identified in Figures 5.1 and 5.2. The volumes of radioactive waste generated during the various decommissioning activities at the site are shown on a line-item basis in Appendix C 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 were calculated based on the exterior dimensions for containerized material. The volumes were calculated 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 were applied against the liner volume and the special handling requirements of the payload. Packaging efficiencies are lower for the highly activated materials (greater than Class A waste), where high concentrations of gamma-emitting radionuclides limit the capacity of the shipping canisters.

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 generated in the decontamination and dismantling of the Hatch will primarily be generated during Period 2. A significant portion of the metallic waste will be 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 will be packaged for controlled disposal at a licensed facility. Material considered potentially contaminated when removed from the radiologically controlled area will be sent to processing facilities for conditioning and disposal at an all-inclusive unit cost of \$3.32 per pound. Other contaminated components and activated materials will be routed for controlled disposal. The disposal volumes reported in the tables reflect the reductions resulting from reprocessing.

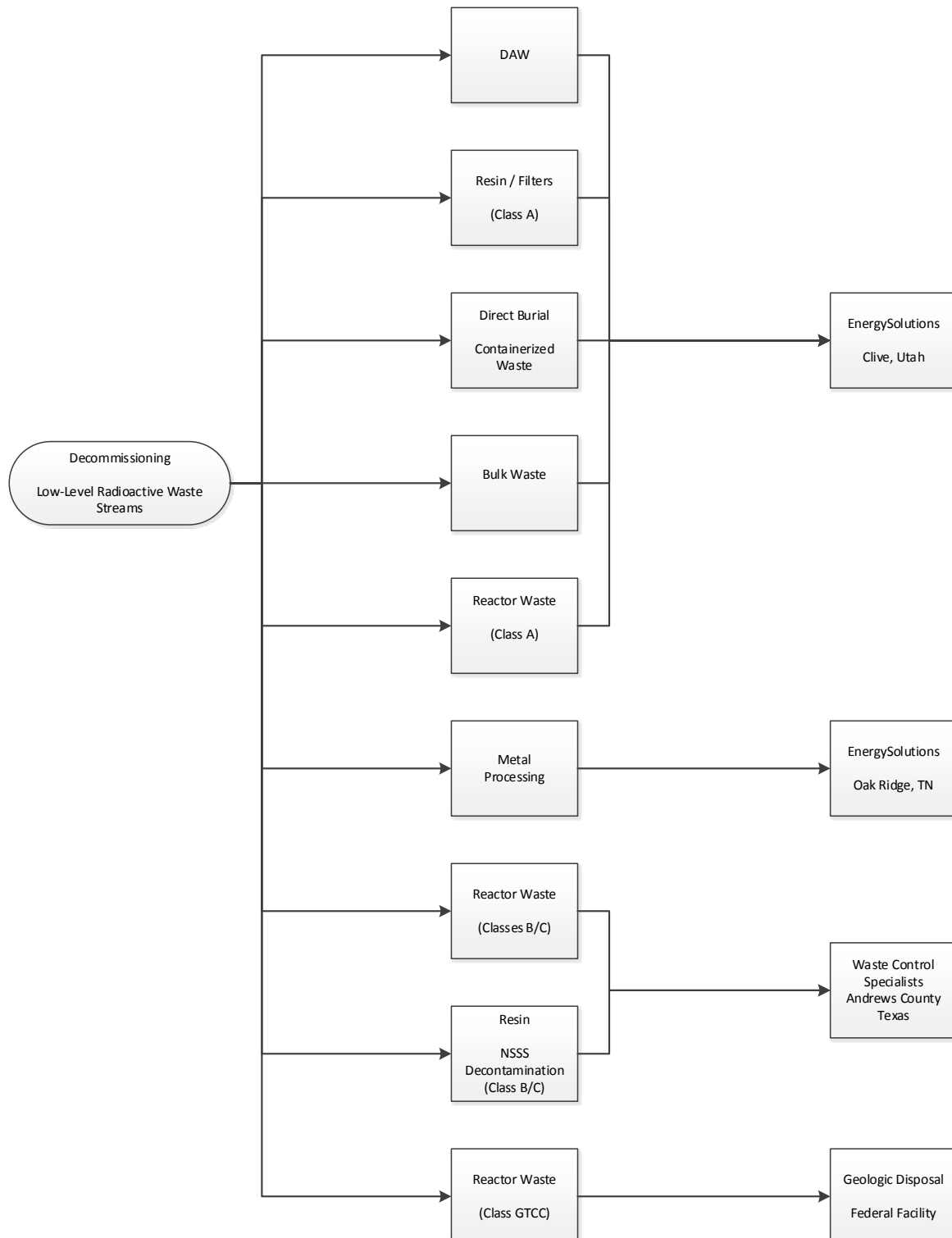
For purposes of constructing the estimate, all Class B and C wastes were assumed to be disposed of at the WCS facility in Andrews, Texas. This schedule was used to estimate the disposal fees for highly activated components, such as the reactor vessel internals (not qualifying as GTCC radioactive material), and concentrated radioactive material resulting from decontamination and water processing operations. Based on current SNC experience, an average disposal rate of \$10,296 per cubic foot was used for irradiated hardware (metallic waste). This rate includes a 32% fee applied to the base WCS rate of \$7,800 per cubic foot. Similarly, an average disposal rate of \$3,260 per cubic foot was used for Class B and C wastes originating from chemical decontamination. This rate also includes a 32% fee applied to the WCS base rate of \$2,470 per cubic foot.

Class A resins shipped in a cask are disposed of at a cost of \$50,275 per cask (includes state taxes). The remaining Class A radioactive waste, including contaminated metallic and concrete debris, will be disposed of at the EnergySolutions facility. This includes lower activity material such as miscellaneous steel, metal siding, scaffolding, structural steel, and large components (including heat exchangers and sections of the reactor vessel). The disposal costs for this material are as follows (includes state taxes):

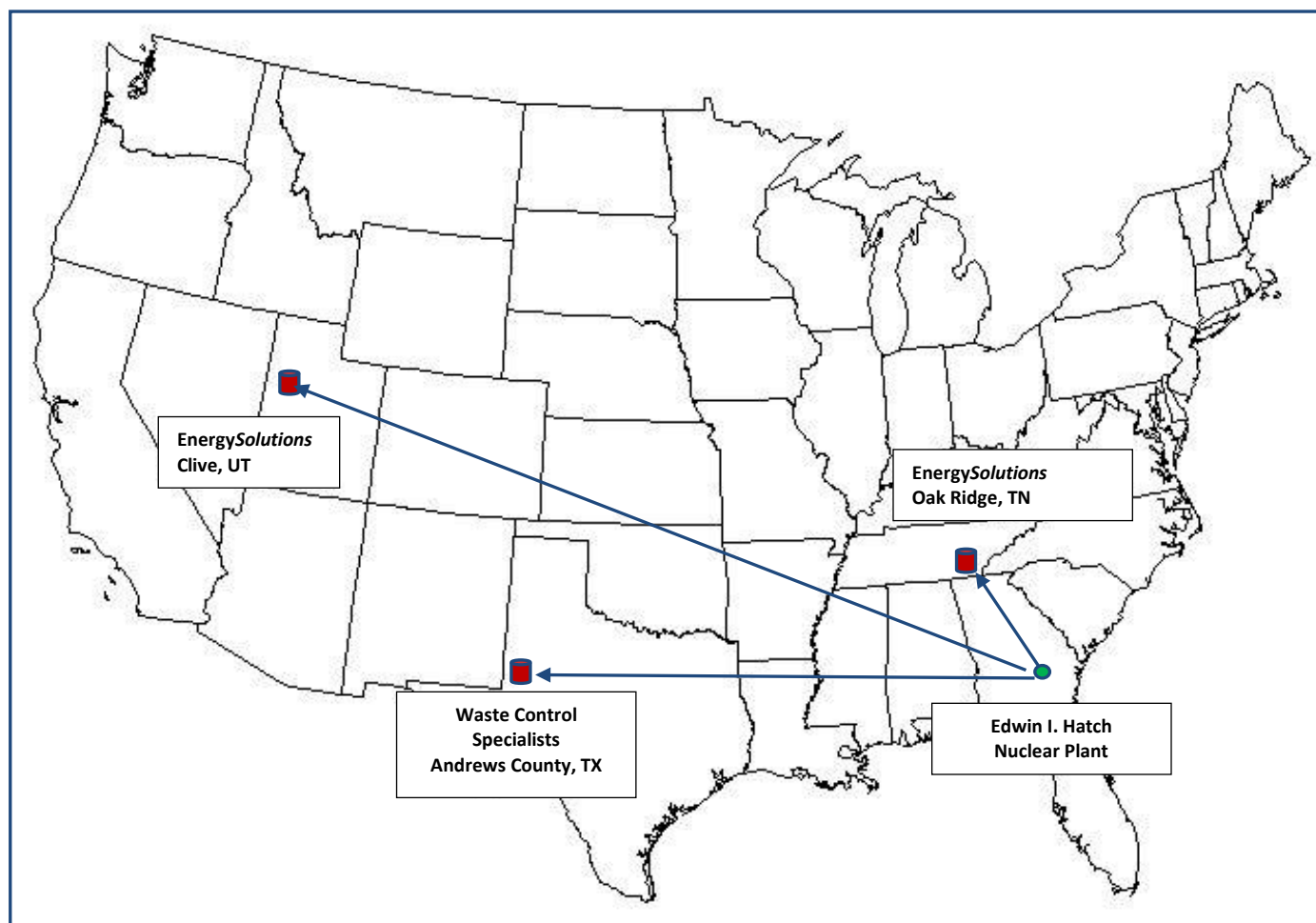
- \$316 per cubic foot for large components that are to be disposed of in their entirety
- \$250 per cubic foot for materials that meets EnergySolutions' "containerized waste" criteria

- \$63 per cubic foot for disposal of material that meets EnergySolutions' "debris" criteria, and
- \$4.54 per pound (\$91 per cubic foot) for disposal of Dry Active Waste (DAW)

**FIGURE 5.1
RADIOACTIVE WASTE DISPOSITION**



**FIGURE 5.2
DECOMMISSIONING WASTE DESTINATIONS
RADIOLOGICAL**



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

Disposal of GTCC is expected to be disposed of in the same location as spent fuel.

**TABLE 5.1
DECOMMISSIONING WASTE SUMMARY
UNIT 1**

	Waste Class^[1]		Volume (cubic feet)	Weight (pounds)
Low-Level Radioactive Waste				
EnergySolutions, Utah, Class A				
Contaminated/activated metallic waste	A		121,045	7,316,689
Dry active waste (DAW)	A		17,854	357,085
Concrete, bulk metallic waste	A		89,422	4,550,494
Soil	A		27,709	2,161,290
Resins, Filters	A		3,249	230,001
Waste Control Specialists Facility, Class B and C				
Resins, Filters	B		250	26,587
Irradiated Hardware	B		2,275	255,717
Irradiated Hardware	C		1,010	87,235
Geologic Repository (Greater-than Class C)				
Irradiated Hardware	>C		1,225	244,357
Total ^[2]			264,038	15,229,455
Processed Metallic Waste			389,024	16,611,640
Scrap Metal				47,104,000

^[1] Waste is classified according to the requirements as delineated in Part 61.55

^[2] Columns may not add due to rounding

**TABLE 5.2
DECOMMISSIONING WASTE SUMMARY
UNIT 2**

	Waste Class^[1]	Volume (cubic feet)	Weight (pounds)
Low-Level Radioactive Waste			
EnergySolutions, Utah, Class A			
Contaminated/activated metallic waste	A	146,217	10,192,943
Dry active waste (DAW)	A	20,837	416,736
Concrete, bulk metallic waste	A	97,322	4,921,324
Soil	A	81,709	6,373,290
Resins, Filters	A	3,227	223,507
Waste Control Specialists Facility, Class B and C			
Resins, Filters	B	250	26,587
Irradiated Hardware	B	2,275	255,717
Irradiated Hardware	C	1,066	90,272
Geologic Repository (Greater-than Class C)			
Irradiated Hardware	>C	1,225	244,357
Total ^[2]		354,127	22,744,733
Processed Metallic Waste		464,419	19,679,650
Scrap Metal			81,674,000

^[1] Waste is classified according to the requirements as delineated in Part 61.55

^[2] Columns may not add due to rounding

6. RESULTS

Costs were developed to decommission Hatch following a scheduled cessation of plant operations. The analyses relied upon the site-specific, technical information developed from a previous analyses, the most recent previous analysis performed in 2015 supplemented with updated information supplied by SNC, to reflect current plant design conditions and operating assumptions. While not an engineering study, the estimates do provide sufficient information to assess the financial obligations as they pertain to the eventual decommissioning of the nuclear station.

The estimates described in this report were based on numerous fundamental assumptions, including a 60-year operating life, regulatory requirements, project contingencies, low-level radioactive waste disposal practices, high-level radioactive waste management options, and site restoration requirements. The decommissioning scenario assumed continued operation of the plant's spent fuel pools for approximately five and one half years following the cessation of operations for continued cooling of the assemblies. The ISFSI will be expanded to allow transfer of all fuel from the spent fuel pools and the orderly progression of decommissioning activities. The ISFSI will be decontaminated and demolished once the DOE completes the transfer of the assemblies and the GTCC material to its repository.

The costs projected to promptly decommission Hatch are estimated to be \$925.8 million for Unit 1 and \$994.5 million for Unit 2. The majority of the \$1,920.3 million cost (approximately 76.4%) is associated with the physical decontamination and dismantling of the nuclear units, so that the operating licenses can be terminated. Caretaking and handling of the spent fuel and termination of the ISFSI license, constitutes an additional 17.8% of the cost. The remaining 5.8% is for the demolition of the remaining structures and limited restoration of the site.

The primary cost contributors, identified in Tables 6.1 and 6.2, are either labor-related, ISFSI 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 and the duration of the program. It was assumed, for purposes of this analysis, that the utility would oversee the decommissioning program, managing the decommissioning labor force and the associated subcontractors. The size and composition of the management organization will vary with the decommissioning phase and associated site activities. However, once the operating licenses have been terminated, the staff will

reduce substantially for the conventional demolition and restoration of the site, and for the long-term care of the spent fuel.

As described in this report, the spent fuel pools will remain operational for approximately five and one half years following the cessation of plant operations. The pools will be isolated and independent spent fuel islands created. This will allow decommissioning operations to proceed in and around the reactor buildings. Over the five and one half-year period, the spent fuel will be packaged into transportable steel canisters for loading into a DOE-provided transport cask. The canisters will be transferred directly to the DOE or stored in concrete overpacks at the ISFSI until the DOE is able to receive them.

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.

The cost for waste disposal includes only those costs associated with the controlled disposition of the low-level radioactive waste generated from decontamination and dismantling activities, including plant equipment and components, structural material, filters, resins and dry-active waste. As described in Section 5, disposal of the lower level radioactive material will be at the EnergySolutions facility. Selective reactor vessel components and processed liquid waste (Class B and C) will be sent to the WCS facility in Andrews County, Texas. Highly radioactive reactor vessel internal components (GTCC waste), requiring additional isolation from the environment, will be packaged for geologic disposal. The cost of geologic disposal was based upon a weight-cost equivalent for spent fuel.

Removal costs reflect the labor-intensive nature of the decommissioning process and 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

could be more cost-effective than deferral, due to the ultimate deterioration of facilities (and therefore the working conditions).

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

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

License termination survey costs were 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, and 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 at a basic functional and regulatory level.

A description of events that resulted in the release of radioactive material that needed to be recorded to assist in future decommissioning activities is provided in Appendix D.

**TABLE 6.1
SUMMARY OF DECOMMISSIONING COST ELEMENTS
UNIT 1**

Work Category	Cost 2018 \$s (thousands)	Percent of Total Costs
Decontamination	19,723	2.1
Removal	111,435	12.0
Packaging	24,934	2.7
Transportation	17,574	1.9
Waste Disposal	107,331	11.6
Off-site Waste Processing	63,805	6.9
Program Management	293,486	31.7
Site Security	123,964	13.4
Spent Fuel Pool Isolation	13,800	1.5
Spent Fuel Management	85,423	9.2
Insurance and Regulatory Fees	19,878	2.1
Energy	4,251	0.5
Characterization and Licensing Surveys	25,232	2.7
Property Taxes	-	-
Miscellaneous	14,945	1.6
Total	925,781	100.0

NOTE: Columns may not add due to rounding

**TABLE 6.2
SUMMARY OF DECOMMISSIONING COST ELEMENTS
UNIT 2**

Work Category	Cost 2018 \$s (thousands)	Percent of Total Costs
Decontamination	20,889	2.1
Removal	137,756	13.9
Packaging	26,049	2.6
Transportation	21,531	2.2
Waste Disposal	121,395	12.2
Off-site Waste Processing	75,590	7.6
Program Management	306,148	30.8
Site Security	140,825	14.2
Spent Fuel Pool Isolation	9,200	0.9
Spent Fuel Management	75,320	7.6
Insurance and Regulatory Fees	15,666	1.6
Energy	4,266	0.4
Characterization and Licensing Surveys	21,700	2.2
Property Taxes	-	-
Miscellaneous	18,161	1.8
Total	994,494	100.0

NOTE: Columns may not add due to rounding

7. REFERENCES

1. “Decommissioning Cost Study for the Hatch Nuclear Plant,” Document S18-1715-001, Rev. 0, TLG Services, Inc., December 2015
2. U.S. Code of Federal Regulations, Title 10, Parts 30, 40, 50, 51, 70 and 72, "General Requirements for Decommissioning Nuclear Facilities," Nuclear Regulatory Commission, 53 Fed. Reg. 24018, June 27, 1988 [\[Open\]](#)
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7. U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70, and 72, "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, (p 35512 et seq.), June 17, 2011 [\[Open\]](#)
8. U.S. Code of Federal Regulations, Title 10, Part 72, “Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste,” Federal Register Volume 53, Number 31658, August 19, 1988 [\[Open\]](#)
9. U.S. Code of Federal Regulations, Title 10, Part 72, Subpart K, “General License for Storage of Spent Fuel at Power Reactor Sites” [\[Open\]](#)
10. “Nuclear Waste Policy Act of 1982,” 42 U.S. Code 10101, et seq. [\[Open\]](#)

7. REFERENCES

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12. "Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy," p. 27, 32, January 2012 [\[Open\]](#)
13. "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," U.S. DOE, January 11, 2013 [\[Open\]](#)
14. U.S. Court of Appeals for the District Of Columbia Circuit, In Re: Aiken County, et al, Aug. 2013 [\[Open\]](#)
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7. REFERENCES

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27. "Decommissioning of Nuclear Power Reactors," Regulatory Guide 1.184 Revision 1, Nuclear Regulatory Commission, October 2013 [\[Open\]](#)
28. "Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors," Regulatory Guide 1.202, Nuclear Regulatory Commission, February 2005 [\[Open\]](#)
29. "Building Construction Cost Data 2018," RSMeans (From the Gordian Group), Rockland, Massachusetts

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30. Project and Cost Engineers' Handbook, Second Edition, p. 239, American Association of Cost Engineers, Marcel Dekker, Inc., New York, New York, 1984
31. U.S. Department of Transportation, Section 49 of the Code of Federal Regulations, "Transportation," Parts 173 through 178 [\[Open\]](#)
32. U.S. Code of Federal Regulations, Title 10, Part 71, "Packaging and Transportation of Radioactive Material" [\[Open\]](#)
33. Tri-State Motor Transit Company, published tariffs, as amended
34. J.C. Evans et al., "Long-Lived Activation Products in Reactor Materials" NUREG/CR-3474, Pacific Northwest Laboratory for the Nuclear Regulatory Commission, August 1984 [\[Open\]](#)
35. R.I. Smith, G.J. Konzek, W.E. Kennedy, Jr., "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130 and addenda, Pacific Northwest Laboratory for the Nuclear Regulatory Commission, June 1978 [\[Open Main Report\]](#) [\[Open Appendices\]](#)
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37. SECY-00-0145, "Integrated Rulemaking Plan for Nuclear Power Plant Decommissioning," June 2000 [\[Open\]](#)
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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	Critical Duration*
a	Remove insulation	60	(b)
b	Mount pipe cutters	60	60
c	Install contamination controls	20	(b)
d	Disconnect inlet and outlet lines	60	60
e	Cap openings	20	(d)
f	Rig for removal	30	30
g	Unbolt from mounts	30	30
h	Remove contamination controls	15	15
i	Remove, wrap in plastic, send to the waste processing area	<u>60</u>	<u>60</u>
	Totals (Activity/Critical)	355	255

Duration adjustment(s):

+ Respiratory protection adjustment (50% of critical duration)	128
+ Radiation/ALARA adjustment (37.1% of critical duration)	<u>95</u>

Adjusted work duration	478
+ Protective clothing adjustment (30% of adjusted duration)	<u>143</u>

Productive work duration	621
+ Work break adjustment (8.33 % of productive duration)	<u>52</u>

Total work duration min	673 min
-------------------------	---------

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

* Note: (alpha designation) indicates activities that can be performed in parallel with corresponding Act ID (within critical duration)

**APPENDIX A
(continued)**

3. LABOR REQUIRED

Crew	Number	Duration (hr)	Rate (\$/hr)	Cost
<hr/>				
Laborers	3.00	11.217	23.85	802.58
Craftsmen	2.00	11.217	49.71	1,115.19
Foreman	1.00	11.217	54.03	606.05
General Foreman	0.25	11.217	56.19	157.57
Fire Watch	0.05	11.217	23.85	13.38
Health Physics Technician	1.00		11.217	57.04
639.82				
Total labor cost				\$3,334.59

4. EQUIPMENT & CONSUMABLES COSTS

Equipment Costs	none
Consumables/Materials Costs	
-Gas torch consumables 1 @ \$21.84/hr x 1 hr {1}	\$21.84
-Blotting paper 50 @ \$0.66/sq ft {2}	\$33.00
-Tarpaulin 50 @ \$0.51/sq ft {3}	\$25.50
Subtotal cost of equipment and materials	\$80.34
Overhead & sales tax on equipment and materials @ 18.00 %	\$14.46
Total costs, equipment & material	\$94.80
TOTAL COST:	
Removal of contaminated heat exchanger <3000 pounds:	\$ 3,429.39
Total labor cost:	\$3,334.59
Total equipment/material costs:	\$94.80
Total craft labor man-hours required per unit:	81.884

5. NOTES AND REFERENCES

- Work difficulty factors were developed in conjunction with the Atomic Industrial Forum (AIF) (now Nuclear Energy Institute) program to standardize nuclear decommissioning cost estimates and are delineated in Volume 1, Chapter 5 of the "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.
- References for equipment & consumables costs:
 1. R.S. Means (2018) Division 01 54 33, Section 40-6360, page 734
 2. www.mcmaster.com online catalog, McMaster Carr Spill Control (7193T88)
 3. R.S. Means (2018) Division 01 56, Section 13.60-0600, page 23
- Material and consumable costs were adjusted using the regional indices for Savannah, Georgia.

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	0.31
Removal of clean pipe 0.25 to 2 inches diameter, \$/linear foot	3.16
Removal of clean pipe >2 to 4 inches diameter, \$/linear foot	4.83
Removal of clean pipe >4 to 8 inches diameter, \$/linear foot	10.35
Removal of clean pipe >8 to 14 inches diameter, \$/linear foot	18.99
Removal of clean pipe >14 to 20 inches diameter, \$/linear foot	24.90
Removal of clean pipe >20 to 36 inches diameter, \$/linear foot	36.59
Removal of clean pipe >36 inches diameter, \$/linear foot	43.38
Removal of clean valve >2 to 4 inches	67.62
Removal of clean valve >4 to 8 inches	103.46
Removal of clean valve >8 to 14 inches	189.93
Removal of clean valve >14 to 20 inches	249.00
Removal of clean valve >20 to 36 inches	365.86
Removal of clean valve >36 inches	433.76
Removal of clean pipe hanger for small bore piping	24.66
Removal of clean pipe hanger for large bore piping	77.68
Removal of clean pump, <300 pound	178.81
Removal of clean pump, 300-1000 pound	512.63
Removal of clean pump, 1000-10,000 pound	1,966.00
Removal of clean pump, >10,000 pound	3,816.86
Removal of clean pump motor, 300-1000 pound	211.42
Removal of clean pump motor, 1000-10,000 pound	812.78
Removal of clean pump motor, >10,000 pound	1,828.76
Removal of clean heat exchanger <3000 pound	1,066.74
Removal of clean heat exchanger >3000 pound	2,705.61

**APPENDIX B
(continued)**

Unit Cost Factor	Cost/Unit (\$)
Removal of clean feedwater heater/deaerator	7,549.08
Removal of clean moisture separator/reheater	15,416.29
Removal of clean tank, <300 gallons	229.50
Removal of clean tank, 300-3000 gallon	715.50
Removal of clean tank, >3000 gallons, \$/square foot surface area	6.35
Removal of clean electrical equipment, <300 pound	94.25
Removal of clean electrical equipment, 300-1000 pound	344.21
Removal of clean electrical equipment, 1000-10,000 pound	688.41
Removal of clean electrical equipment, >10,000 pound	1,678.54
Removal of clean electrical transformer < 30 tons	1,165.73
Removal of clean electrical transformer > 30 tons	3,357.08
Removal of clean standby diesel generator, <100 kW	1,190.68
Removal of clean standby diesel generator, 100 kW to 1 MW	2,657.70
Removal of clean standby diesel generator, >1 MW	5,501.95
Removal of clean electrical cable tray, \$/linear foot	9.05
Removal of clean electrical conduit, \$/linear foot	3.97
Removal of clean mechanical equipment, <300 pound	94.25
Removal of clean mechanical equipment, 300-1000 pound	344.21
Removal of clean mechanical equipment, 1000-10,000 pound	688.41
Removal of clean mechanical equipment, >10,000 pound	1,678.54
Removal of clean HVAC equipment, <300 pound	113.97
Removal of clean HVAC equipment, 300-1000 pound	413.60
Removal of clean HVAC equipment, 1000-10,000 pound	824.28
Removal of clean HVAC equipment, >10,000 pound	1,678.54
Removal of clean HVAC ductwork, \$/pound	0.33

**APPENDIX B
(continued)**

Unit Cost Factor	Cost/Unit (\$)
Removal of contaminated instrument and sampling tubing, \$/linear foot	1.19
Removal of contaminated pipe 0.25 to 2 inches diameter, \$/linear foot	18.32
Removal of contaminated pipe >2 to 4 inches diameter, \$/linear foot	29.69
Removal of contaminated pipe >4 to 8 inches diameter, \$/linear foot	49.99
Removal of contaminated pipe >8 to 14 inches diameter, \$/linear foot	92.32
Removal of contaminated pipe >14 to 20 inches diameter, \$/linear foot	109.83
Removal of contaminated pipe >20 to 36 inches diameter, \$/linear foot	149.55
Removal of contaminated pipe >36 inches diameter, \$/linear foot	175.52
Removal of contaminated valve >2 to 4 inches	366.43
Removal of contaminated valve >4 to 8 inches	437.79
Removal of contaminated valve >8 to 14 inches	854.19
Removal of contaminated valve >14 to 20 inches	1,079.06
Removal of contaminated valve >20 to 36 inches	1,426.48
Removal of contaminated valve >36 inches	1,686.14
Removal of contaminated pipe hanger for small bore piping	119.62
Removal of contaminated pipe hanger for large bore piping	370.54
Removal of contaminated pump, <300 pound	787.86
Removal of contaminated pump, 300-1000 pound	1,835.06
Removal of contaminated pump, 1000-10,000 pound	5,565.86
Removal of contaminated pump, >10,000 pound	13,552.76
Removal of contaminated pump motor, 300-1000 pound	812.87
Removal of contaminated pump motor, 1000-10,000 pound	2,300.50
Removal of contaminated pump motor, >10,000 pound	5,165.23
Removal of contaminated heat exchanger <3000 pound	3,429.39
Removal of contaminated heat exchanger >3000 pound	10,050.13

**APPENDIX B
(continued)**

Unit Cost Factor	Cost/Unit (\$)
Removal of contaminated feedwater heater/deaerator	24,203.71
Removal of contaminated moisture separator/reheater	51,864.54
Removal of contaminated tank, <300 gallons	1,317.50
Removal of contaminated tank, >300 gallons, \$/square foot	25.17
Removal of contaminated electrical equipment, <300 pound	593.15
Removal of contaminated electrical equipment, 300-1000 pound	1,473.41
Removal of contaminated electrical equipment, 1000-10,000 pound	2,839.88
Removal of contaminated electrical equipment, >10,000 pound	5,655.00
Removal of contaminated electrical cable tray, \$/linear foot	28.72
Removal of contaminated electrical conduit, \$/linear foot	15.23
Removal of contaminated mechanical equipment, <300 pound	659.12
Removal of contaminated mechanical equipment, 300-1000 pound	1,624.43
Removal of contaminated mechanical equipment, 1000-10,000 pound	3,125.71
Removal of contaminated mechanical equipment, >10,000 pound	5,655.00
Removal of contaminated HVAC equipment, <300 pound	659.12
Removal of contaminated HVAC equipment, 300-1000 pound	1,624.43
Removal of contaminated HVAC equipment, 1000-10,000 pound	3,125.71
Removal of contaminated HVAC equipment, >10,000 pound	5,655.00
Removal of contaminated HVAC ductwork, \$/pound	1.84
Removal/plasma arc cut of contaminated thin metal components, \$/linear in.	3.12
Additional decontamination of surface by washing, \$/square foot	6.18
Additional decontamination of surfaces by hydrolasing, \$/square foot	31.57
Decontamination rig hook up and flush, \$/ 250 foot length	5,500.67
Chemical flush of components/systems, \$/gallon	22.45
Removal of clean standard reinforced concrete, \$/cubic yard	70.28
Removal of grade slab concrete, \$/cubic yard	79.87
Removal of clean concrete floors, \$/cubic yard	343.66

**APPENDIX B
(continued)**

Unit Cost Factor	Cost/Unit (\$)
Removal of sections of clean concrete floors, \$/cubic yard	999.80
Removal of clean heavily rein concrete w/#9 rebar, \$/cubic yard	101.23
Removal of contaminated heavily rein concrete w/#9 rebar, \$/cubic yard	1,867.84
Removal of clean heavily rein concrete w/#18 rebar, \$/cubic yard	137.16
Removal of contaminated heavily rein concrete w/#18 rebar, \$/cubic yard	2,467.08
Removal heavily rein concrete w/#18 rebar & steel embedments, \$/cubic yard	402.57
Removal of below-grade suspended floors, \$/cubic yard	192.18
Removal of clean monolithic concrete structures, \$/cubic yard	779.92
Removal of contaminated monolithic concrete structures, \$/cubic yard	1,848.26
Removal of clean foundation concrete, \$/cubic yard	617.23
Removal of contaminated foundation concrete, \$/cubic yard	1,722.92
Explosive demolition of bulk concrete, \$/cubic yard	45.22
Removal of clean hollow masonry block wall, \$/cubic yard	24.70
Removal of contaminated hollow masonry block wall, \$/cubic yard	65.06
Removal of clean solid masonry block wall, \$/cubic yard	24.70
Removal of contaminated solid masonry block wall, \$/cubic yard	65.06
Backfill of below-grade voids, \$/cubic yard	32.39
Removal of subterranean tunnels/voids, \$/linear foot	90.46
Placement of concrete for below-grade voids, \$/cubic yard	156.61
Excavation of clean material, \$/cubic yard	2.92
Excavation of contaminated material, \$/cubic yard	39.98
Removal of clean concrete rubble (tipping fee included), \$/cubic yard	25.13
Removal of contaminated concrete rubble, \$/cubic yard	24.30
Removal of building by volume, \$/cubic foot	0.27
Removal of clean building metal siding, \$/square foot	1.02

**APPENDIX B
(continued)**

Unit Cost Factor	Cost/Unit (\$)
Removal of contaminated building metal siding, \$/square foot	3.86
Removal of standard asphalt roofing, \$/square foot	1.47
Removal of transite panels, \$/square foot	1.70
Scarifying contaminated concrete surfaces (drill & spall), \$/square foot	11.46
Scabbling contaminated concrete floors, \$/square foot	6.36
Scabbling contaminated concrete walls, \$/square foot	16.36
Scabbling contaminated ceilings, \$/square foot	55.70
Scabbling structural steel, \$/square foot	5.47
Removal of clean overhead crane/monorail < 10 ton capacity	511.25
Removal of contaminated overhead crane/monorail < 10 ton capacity	1,564.75
Removal of clean overhead crane/monorail >10-50 ton capacity	1,227.02
Removal of contaminated overhead crane/monorail >10-50 ton capacity	3,754.75
Removal of polar crane > 50 ton capacity	5,223.79
Removal of gantry crane > 50 ton capacity	20,981.75
Removal of structural steel, \$/pound	0.16
Removal of clean steel floor grating, \$/square foot	4.23
Removal of contaminated steel floor grating, \$/square foot	12.69
Removal of clean free standing steel liner, \$/square foot	9.52
Removal of contaminated free standing steel liner, \$/square foot	29.28
Removal of clean concrete-anchored steel liner, \$/square foot	4.76
Removal of contaminated concrete-anchored steel liner, \$/square foot	34.16
Placement of scaffolding in clean areas, \$/square foot	16.22
Placement of scaffolding in contaminated areas, \$/square foot	24.25
Landscaping with topsoil, \$/acre	24,924.93
Cost of CPC B-88 LSA box & preparation for use	2,171.92

**APPENDIX B
(continued)**

Unit Cost Factor	Cost/Unit (\$)
Cost of CPC B-25 LSA box & preparation for use	2,030.79
Cost of CPC B-12V 12 gauge LSA box & preparation for use	1,723.35
Cost of CPC B-144 LSA box & preparation for use	11,434.92
Cost of LSA drum & preparation for use	206.25
Cost of cask liner for CNSI 8 120A cask (resins)	12,671.02
Cost of cask liner for CNSI 8 120A cask (filters)	8,978.37
Decontamination of surfaces with vacuuming, \$/square foot	0.66

APPENDIX C
DETAILED COST ANALYSES

	Page
Hatch Nuclear Plant, Unit 1	C-2
Hatch Nuclear Plant, Unit 2.....	C-11

Table C-1
Hatch Nuclear Plant Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2018 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	-	-	-	-	-	-	156	23	180	180	-	-	-	-	-	-	-	-	-	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	-	-	-	-	-	-	241	36	277	277	-	-	-	-	-	-	-	-	-	2,000
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	553	83	636	636	-	-	-	-	-	-	-	-	-	4,600
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	120	18	138	138	-	-	-	-	-	-	-	-	-	1,000
1a.1.10	End product description	-	-	-	-	-	-	120	18	138	138	-	-	-	-	-	-	-	-	-	1,000
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	156	23	180	180	-	-	-	-	-	-	-	-	-	1,300
1a.1.12	Define major work sequence	-	-	-	-	-	-	902	135	1,038	1,038	-	-	-	-	-	-	-	-	-	7,500
1a.1.13	Perform SER and EA	-	-	-	-	-	-	373	56	429	429	-	-	-	-	-	-	-	-	-	3,100
1a.1.14	Prepare/submit Defueled Technical Specifications	-	-	-	-	-	-	902	135	1,038	1,038	-	-	-	-	-	-	-	-	-	7,500
1a.1.15	Perform Site-Specific Cost Study	-	-	-	-	-	-	602	90	692	692	-	-	-	-	-	-	-	-	-	5,000
1a.1.16	Prepare/submit Irradiated Fuel Management Plan	-	-	-	-	-	-	120	18	138	138	-	-	-	-	-	-	-	-	-	1,000
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	592	89	681	613	-	68	-	-	-	-	-	-	-	4,920
1a.1.17.2	Plant systems	-	-	-	-	-	-	501	75	576	519	-	58	-	-	-	-	-	-	-	4,167
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	60	9	69	69	-	-	-	-	-	-	-	-	-	500
1a.1.17.4	Reactor internals	-	-	-	-	-	-	854	128	982	982	-	-	-	-	-	-	-	-	-	7,100
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	782	117	899	899	-	-	-	-	-	-	-	-	-	6,500
1a.1.17.6	Sacrificial shield	-	-	-	-	-	-	60	9	69	69	-	-	-	-	-	-	-	-	-	500
1a.1.17.7	Moisture separators/reheaters	-	-	-	-	-	-	120	18	138	138	-	-	-	-	-	-	-	-	-	1,000
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	192	29	221	111	-	111	-	-	-	-	-	-	-	1,600
1a.1.17.9	Main Turbine	-	-	-	-	-	-	251	38	289	289	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.10	Main Condensers	-	-	-	-	-	-	251	38	289	289	-	-	-	-	-	-	-	-	-	2,088
1a.1.17.11	Pressure suppression structure	-	-	-	-	-	-	241	36	277	277	-	-	-	-	-	-	-	-	-	2,000
1a.1.17.12	Drywell	-	-	-	-	-	-	192	29	221	221	-	-	-	-	-	-	-	-	-	1,600
1a.1.17.13	Plant structures & buildings	-	-	-	-	-	-	375	56	432	216	-	216	-	-	-	-	-	-	-	3,120
1a.1.17.14	Waste management	-	-	-	-	-	-	553	83	636	636	-	-	-	-	-	-	-	-	-	4,600
1a.1.17.15	Facility & site closeout	-	-	-	-	-	-	108	16	125	62	-	62	-	-	-	-	-	-	-	900
1a.1.17	Total	-	-	-	-	-	-	5,135	770	5,905	5,391	-	515	-	-	-	-	-	-	-	42,683
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	289	43	332	332	-	-	-	-	-	-	-	-	-	2,400
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	3,300	495	3,795	3,795	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	168	25	194	194	-	-	-	-	-	-	-	-	-	1,400
1a.1.21	Rigging/Cont. Cntrl Envlp/s/tooling/etc.	-	-	-	-	-	-	2,300	345	2,645	2,645	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	148	22	170	170	-	-	-	-	-	-	-	-	-	1,230
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	15,587	2,338	17,925	17,411	-	515	-	-	-	-	-	-	-	83,013
Period 1a Additional Costs																					
1a.2.1	Spent fuel pool isolation	-	-	-	-	-	-	12,000	1,800	13,800	13,800	-	-	-	-	-	-	-	-	-	-
1a.2.2	Site Characterization	-	-	-	-	-	-	6,226	1,868	8,094	8,094	-	-	-	-	-	-	-	-	30,500	10,852
1a.2.3	ISFSI to DOE Transfer Facility	-	-	-	-	-	-	8,403	1,260	9,663	-	9,663	-	-	-	-	-	-	-	-	-
1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	26,629	4,928	31,557	21,894	9,663	-	-	-	-	-	-	-	30,500	10,852
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	2,156	323	2,479	-	2,479	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	2,156	323	2,479	-	2,479	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	2,038	204	2,242	2,242	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	521	-	-	-	-	-	130	651	651	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	546	-	-	-	-	-	82	628	628	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	14	3	-	55	-	16	88	88	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	626	94	720	720	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	1,141	114	1,255	1,255	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	485	49	534	-	534	-	-	-	-	-	-	-	-	-
1a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	810	121	931	-	931	-	-	-	-	-	-	-	-	-
1a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	53	8	61	-	61	-	-	-	-	-	-	-	-	-
1a.4.11	Security Staff Cost	-	-	-	-	-	-	9,134	1,370	10,504	10,504	-	-	-	-	-	-	-	-	-	167,440
1a.4.12	Utility Staff Cost	-	-	-	-	-	-	31,755	4,763	36,518	36,518	-	-	-	-	-	-	-	-	-	422,240
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,067	14	3	-	55	46,042	6,951	54,132	52,606	1,526	-	-	610	-	-	-	12,190	20	589,680
1a.0	TOTAL PERIOD 1a COST	-	1,067	14	3	-	55	90,414	14,541	106,094	91,911	13,668	515	-	610	-	-	-	12,190	30,520	683,545

Table C-1
Hatch Nuclear Plant Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2018 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
PERIOD 1b - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	569	85	655	589	-	65	-	-	-	-	-	-	-	4,733
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	120	18	138	138	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.3	Reactor internals	-	-	-	-	-	-	481	72	553	553	-	-	-	-	-	-	-	-	-	4,000
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	162	24	187	47	-	140	-	-	-	-	-	-	-	1,350
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	120	18	138	138	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	120	18	138	138	-	-	-	-	-	-	-	-	-	1,000
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	241	36	277	277	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	437	66	502	502	-	-	-	-	-	-	-	-	-	3,630
1b.1.1.9	Facility closeout	-	-	-	-	-	-	144	22	166	83	-	83	-	-	-	-	-	-	-	1,200
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	144	22	166	166	-	-	-	-	-	-	-	-	-	1,200
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	120	18	138	69	-	69	-	-	-	-	-	-	-	1,000
1b.1.1.12	Main Turbine	-	-	-	-	-	-	250	38	288	288	-	-	-	-	-	-	-	-	-	2,080
1b.1.1.13	Main Condensers	-	-	-	-	-	-	251	38	289	289	-	-	-	-	-	-	-	-	-	2,088
1b.1.1.14	Moisture separators & reheaters	-	-	-	-	-	-	241	36	277	277	-	-	-	-	-	-	-	-	-	2,000
1b.1.1.15	Radwaste building	-	-	-	-	-	-	328	49	378	340	-	38	-	-	-	-	-	-	-	2,730
1b.1.1.16	Reactor building	-	-	-	-	-	-	328	49	378	340	-	38	-	-	-	-	-	-	-	2,730
1b.1.1	Total	-	-	-	-	-	-	4,059	609	4,668	4,235	-	433	-	-	-	-	-	-	-	33,741
1b.1.2	Decon NSSS	314	-	-	-	-	-	-	157	470	470	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	314	-	-	-	-	-	4,059	766	5,139	4,705	-	433	-	-	-	-	-	-	1,067	33,741
Period 1b Additional Costs																					
No additional costs in this period																					
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	999	-	-	-	-	-	-	150	1,148	1,148	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,494	224	1,718	1,718	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process decommissioning water waste	39	-	26	71	-	102	-	58	296	296	-	-	-	243	-	-	-	14,592	47	-
1b.3.4	Process decommissioning chemical flush waste	1	-	25	99	-	814	-	221	1,160	1,160	-	-	-	-	250	-	-	26,587	47	-
1b.3.5	Small tool allowance	-	2	-	-	-	-	-	0	2	2	-	-	-	-	-	-	-	-	-	-
1b.3.6	Pipe cutting equipment	-	1,200	-	-	-	-	-	180	1,380	1,380	-	-	-	-	-	-	-	-	-	-
1b.3.7	Decon rig	2,006	-	-	-	-	-	-	301	2,307	2,307	-	-	-	-	-	-	-	-	-	-
1b.3.8	Spent Fuel Capital and Transfer	-	-	-	-	-	-	2,128	319	2,447	-	2,447	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	3,045	1,202	51	170	-	915	3,622	1,454	10,460	8,012	2,447	-	-	243	250	-	-	41,179	94	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	36	-	-	-	-	-	-	9	45	45	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	1,028	103	1,130	1,130	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	294	-	-	-	-	-	74	368	368	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	275	-	-	-	-	-	41	316	316	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	8	2	-	33	-	9	52	52	-	-	-	360	-	-	-	7,197	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	631	95	726	726	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	332	33	365	365	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	245	24	269	-	269	-	-	-	-	-	-	-	-	-
1b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	408	61	469	-	469	-	-	-	-	-	-	-	-	-
1b.4.11	ISFSI Operating Costs	-	-	-	-	-	-	27	4	31	-	31	-	-	-	-	-	-	-	-	-
1b.4.12	Security Staff Cost	-	-	-	-	-	-	4,437	666	5,103	5,103	-	-	-	-	-	-	-	-	-	81,262
1b.4.13	DOC Staff Cost	-	-	-	-	-	-	5,736	860	6,596	6,596	-	-	-	-	-	-	-	-	-	63,961
1b.4.14	Utility Staff Cost	-	-	-	-	-	-	16,103	2,416	18,519	18,519	-	-	-	-	-	-	-	-	-	213,904
1b.4	Subtotal Period 1b Period-Dependent Costs	36	569	8	2	-	33	28,946	4,395	33,989	33,220	769	-	-	360	-	-	-	7,197	12	359,128
1b.0	TOTAL PERIOD 1b COST	3,395	1,771	59	172	-	948	36,628	6,614	49,587	45,938	3,216	433	-	603	250	-	-	48,376	1,172	392,869
PERIOD 1 TOTALS		3,395	2,838	73	175	-	1,004	127,042	21,155	155,681	137,849	16,884	948	-	1,213	250	-	-	60,566	31,692	1,076,413
PERIOD 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Recirculation System Piping & Valves	105	80	37	86	-	470	-	207	986	986	-	-	-	1,753	-	-	-	122,315	3,953	-
2a.1.1.2	Recirculation Pumps & Motors	27	52	106	46	-	451	-	157	838	838	-	-	-	1,427	-	-	-	120,800	1,787	100
2a.1.1.3	CRDMs & NIs Removal	153	775	495	213	-	927	-	583	3,147	3,147	-	-	-	4,167	-	-	-	241,500	21,179	-
2a.1.1.4	Reactor Vessel Internals	175	5,499	9,851	2,966	-	34,120	425	24,540	77,576	77,576	-	-	-	751	2,275	1,010	-	416,060	36,078	1,602
2a.1.1.5	Reactor Vessel	110	7,861	3,399	2,495	-	8,516	425	11,746	34,553	34,553	-	-	-	26,100	-	-	-	1,769,566	36,078	1,602
2a.1.1	Totals	569	14,267	13,889	5,806	-	44,484	851	37,233	117,099	117,099	-	-	-	34,198	2,275	1,010	-	2,670,241	99,074	3,303

Table C-1
Hatch Nuclear Plant Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2018 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				
Removal of Major Equipment																						
2a.1.2	Main Turbine/Generator	-	289	1,877	326	6,054	388	-	1,314	10,248	10,248	-	-	30,212	1,682	-	-	-	1,919,603	6,616	-	
2a.1.3	Main Condensers	-	844	1,330	349	8,492	576	-	1,814	13,404	13,404	-	-	56,498	2,360	-	-	-	2,692,321	19,927	-	
Cascading Costs from Clean Building Demolition																						
2a.1.4.1	Reactor	-	354	-	-	-	-	-	53	407	407	-	-	-	-	-	-	-	-	2,676	-	
2a.1.4.2	Radwaste Building and Addition	-	63	-	-	-	-	-	9	72	72	-	-	-	-	-	-	-	-	443	-	
2a.1.4.3	Turbine Building	-	114	-	-	-	-	-	17	131	131	-	-	-	-	-	-	-	-	1,212	-	
2a.1.4	Totals	-	531	-	-	-	-	-	80	610	610	-	-	-	-	-	-	-	-	4,331	-	
Disposal of Plant Systems																						
2a.1.5.1	Auxiliary Storage (N40)	-	3	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	90	-	
2a.1.5.2	Chilled Water (P63) - RCA	-	211	15	37	1,108	-	-	226	1,596	1,596	-	-	8,167	-	-	-	-	331,669	4,373	-	
2a.1.5.3	Circulating Water (N71)	-	121	-	-	-	-	-	18	139	-	-	139	-	-	-	-	-	-	3,465	-	
2a.1.5.4	Circulating Water (N71) - RCA	-	87	10	24	724	-	-	135	979	979	-	-	5,335	-	-	-	-	216,644	1,990	-	
2a.1.5.5	Condensate & Feedwater (N21)	-	929	198	316	3,768	1,634	-	1,273	8,120	8,120	-	-	27,781	6,686	-	-	-	1,553,867	22,266	-	
2a.1.5.6	Condensate Storage (P11)	-	373	23	41	744	142	-	249	1,573	1,573	-	-	5,487	580	-	-	-	259,799	8,410	-	
2a.1.5.7	Core Spray (E21)	-	379	46	74	1,052	332	-	351	2,235	2,235	-	-	7,756	1,353	-	-	-	401,459	8,858	-	
2a.1.5.8	Domestic Water (Y42)	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	105	-	
2a.1.5.9	Domestic Water (Y42) - RCA	-	1	0	0	3	-	-	1	6	6	-	-	23	-	-	-	-	925	29	-	
2a.1.5.10	Drywell Cooling (T47)	-	116	9	11	141	50	-	65	391	391	-	-	1,040	199	-	-	-	55,261	2,384	-	
2a.1.5.11	Drywell Pneumatic (P70)	-	60	5	6	62	34	-	34	201	201	-	-	459	134	-	-	-	27,412	1,265	-	
2a.1.5.12	Electrical - Clean	-	629	-	-	-	-	-	94	724	-	-	724	-	-	-	-	-	-	16,430	-	
2a.1.5.13	Extraction Steam (N36)	-	165	21	35	432	178	-	158	991	991	-	-	3,189	729	-	-	-	175,852	3,998	-	
2a.1.5.14	Fire Protection - Cooling Tower (W43)	-	58	-	-	-	-	-	9	67	-	-	67	-	-	-	-	-	-	1,622	-	
2a.1.5.15	Generator (N41) - RCA	-	2	0	0	3	-	-	1	7	7	-	-	26	-	-	-	-	1,039	53	-	
2a.1.5.16	H2 & O2 Analyzer (P33) - RCA	-	43	1	1	41	-	-	17	103	103	-	-	304	-	-	-	-	12,331	884	-	
2a.1.5.17	H2 Recombiner (T49)	-	35	2	3	27	21	-	19	107	107	-	-	198	87	-	-	-	13,559	768	-	
2a.1.5.18	Heating & Process Steam (P61) - RCA	-	121	3	6	194	-	-	61	384	384	-	-	1,427	-	-	-	-	57,944	2,432	-	
2a.1.5.19	High Pressure Coolant Injection (E41)	-	307	26	38	447	195	-	201	1,214	1,214	-	-	3,293	794	-	-	-	184,593	7,130	-	
2a.1.5.20	Hypochlorination (W23)	-	2	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	65	-	
2a.1.5.21	Instrument Calibration (D40)	-	12	-	-	-	-	-	2	14	-	-	14	-	-	-	-	-	-	341	-	
2a.1.5.22	Main Steam (B21/N11/N33)	-	448	44	66	743	356	-	327	1,983	1,983	-	-	5,477	1,451	-	-	-	315,124	10,343	-	
2a.1.5.23	Meterological Data Collection (Y33)	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	161	-	
2a.1.5.24	Off Gas (N62)	-	173	12	18	225	92	-	104	624	624	-	-	1,660	374	-	-	-	91,340	3,862	-	
2a.1.5.25	Plant Heating (P44)	-	11	-	-	-	-	-	2	13	-	-	13	-	-	-	-	-	-	300	-	
2a.1.5.26	Plant Heating (P44) - RCA	-	59	1	3	79	-	-	27	169	169	-	-	581	-	-	-	-	23,612	1,148	-	
2a.1.5.27	Reactor Bldg-Chilled Water (P64)-RCA	-	36	1	2	65	-	-	19	123	123	-	-	476	-	-	-	-	19,337	634	-	
2a.1.5.28	Reactor Core Isolation Cooling (E51)	92	121	16	19	60	148	-	127	584	584	-	-	443	601	-	-	-	56,609	3,752	-	
2a.1.5.29	Reactor Protection (C71) - RCA	-	4	0	1	28	-	-	5	39	39	-	-	206	-	-	-	-	8,368	97	-	
2a.1.5.30	Reheat (N38)	-	223	153	223	1,210	1,562	-	677	4,048	4,048	-	-	8,924	6,402	-	-	-	769,177	5,619	-	
2a.1.5.31	Residual Heat Removal (E11)	-	864	356	443	1,975	3,224	-	1,420	8,283	8,283	-	-	14,560	13,098	-	-	-	1,430,812	20,832	-	
2a.1.5.32	Sanitary Water (X42) - RCA	-	10	1	1	3	9	-	5	30	30	-	-	25	36	-	-	-	3,347	190	-	
2a.1.5.33	Standby Liquid Control (C41)	-	35	1	2	56	-	-	18	112	112	-	-	415	-	-	-	-	16,835	771	-	
2a.1.5.34	Torus Drainage & Purification (G51)	-	78	7	9	69	58	-	46	266	266	-	-	506	236	-	-	-	35,653	1,679	-	
2a.1.5.35	Turbine Generator Auxiliary (N43) - RCA	-	45	1	3	83	-	-	24	156	156	-	-	611	-	-	-	-	24,802	903	-	
2a.1.5.36	Turbine Generator Seal Oil (N42) - RCA	-	42	1	2	49	-	-	18	111	111	-	-	362	-	-	-	-	14,700	821	-	
2a.1.5.37	Turbine Lube Oil (N34) - RCA	-	92	3	8	230	-	-	59	392	392	-	-	1,696	-	-	-	-	68,884	1,965	-	
2a.1.5	Totals	92	5,908	955	1,393	13,622	8,036	-	5,795	35,801	34,828	-	973	100,426	32,760	-	-	-	6,170,955	140,034	-	
2a.1.6	Scaffolding in support of decommissioning	-	2,347	34	10	208	30	-	630	3,260	3,260	-	-	1,383	122	-	-	-	69,972	30,297	-	
2a.1	Subtotal Period 2a Activity Costs	662	24,187	18,084	7,885	28,376	53,513	851	46,866	180,422	179,449	-	973	188,519	71,123	2,275	1,010	-	13,523,090	300,278	3,303	
Period 2a Additional Costs																						
2a.2.1	Remedial Action Surveys	-	-	-	-	-	-	1,907	572	2,479	2,479	-	-	-	-	-	-	-	-	33,429	-	
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	1,907	572	2,479	2,479	-	-	-	-	-	-	-	-	33,429	-	
Period 2a Collateral Costs																						
2a.3.1	Process decommissioning water waste	84	-	55	153	-	219	-	125	636	636	-	-	-	524	-	-	-	31,437	102	-	
2a.3.2	Process decommissioning chemical flush waste	0	-	12	47	-	88	-	31	178	178	-	-	-	119	-	-	-	12,639	22	-	
2a.3.3	Small tool allowance	-	270	-	-	-	-	-	40	310	279	-	31	-	-	-	-	-	-	-	-	-
2a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	12,887	1,933	14,820	-	14,820	-	-	-	-	-	-	-	-	-	-
2a.3.5	On-site survey and release of 0.0 tons clean metallic waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2a.3	Subtotal Period 2a Collateral Costs	84	270	67	200	-	308	12,887	2,129	15,945	1,094	14,820	31	-	643	-	-	-	44,076	124	-	
Period 2a Period-Dependent Costs																						
2a.4.1	Decon supplies	121	-	-	-	-	-	-	30	151	151	-	-	-	-	-	-	-	-	-	-	-
2a.4.2	Insurance	-	-	-	-	-	-	664	66	731	731	-	-	-	-	-	-	-	-	-	-	-
2a.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2a.4.4	Health physics supplies	-	2,503	-	-	-	-	-	626	3,128	3,128	-	-	-	-	-	-	-	-	-	-	-
2a.4.5	Heavy equipment rental	-	3,565	-	-	-	-	-	535	4,099	4,099	-	-	-	-	-	-	-	-	-	-	-
2a.4.6	Disposal of DAW generated	-	-	143	31	-	577	-	163													

Table C-1
Hatch Nuclear Plant Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2018 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.4.9	Emergency Planning Fees	-	-	-	-	-	-	383	38	421	-	421	-	-	-	-	-	-	-	-	-
2a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	1,355	203	1,558	-	1,558	-	-	-	-	-	-	-	-	-
2a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	89	13	102	-	102	-	-	-	-	-	-	-	-	-
2a.4.12	Security Staff Cost	-	-	-	-	-	-	13,384	2,008	15,391	15,391	-	-	-	-	-	-	-	-	-	269,844
2a.4.13	DOC Staff Cost	-	-	-	-	-	-	23,237	3,486	26,723	26,723	-	-	-	-	-	-	-	-	-	264,622
2a.4.14	Utility Staff Cost	-	-	-	-	-	-	38,678	5,802	44,479	44,479	-	-	-	-	-	-	-	-	-	492,684
2a.4	Subtotal Period 2a Period-Dependent Costs	121	6,067	143	31	-	577	79,781	13,219	99,938	97,857	2,082	-	-	6,339	-	-	-	126,783	207	1,027,150
2a.0	TOTAL PERIOD 2a COST	866	30,524	18,295	8,116	28,376	54,397	95,425	62,786	298,784	280,878	16,901	1,005	188,519	78,104	2,275	1,010	-	13,693,950	334,038	1,030,453
PERIOD 2b - Site Decontamination																					
Period 2b Direct Decommissioning Activities																					
Disposal of Plant Systems																					
2b.1.1.1	Auxiliary Drains & Vents (N22)	-	161	15	17	97	118	-	88	496	496	-	-	716	475	-	-	-	59,788	3,399	-
2b.1.1.2	Closed Cooling Water (P42) - RCA	-	232	7	18	554	-	-	145	957	957	-	-	4,083	-	-	-	-	165,831	4,935	-
2b.1.1.3	Control Rod Drive (C11)	-	97	8	10	72	66	-	54	307	307	-	-	528	266	-	-	-	38,569	2,101	-
2b.1.1.4	Diesel Engine & Fuel Oil (Y52)	-	53	-	-	-	-	-	8	61	-	-	61	-	-	-	-	-	-	1,290	-
2b.1.1.5	Diesel Generators (R43)	-	24	-	-	-	-	-	4	27	-	-	27	-	-	-	-	-	-	640	-
2b.1.1.6	Electrical - Clean RCA	-	3,619	82	202	6,094	-	-	1,857	11,854	11,854	-	-	44,927	-	-	-	-	1,824,495	68,738	-
2b.1.1.7	Electrical - Contaminated	-	534	17	36	876	59	-	287	1,809	1,809	-	-	6,455	243	-	-	-	277,610	10,146	-
2b.1.1.8	Equipment & Floor Drains (T45)	-	31	3	4	26	25	-	19	107	107	-	-	195	102	-	-	-	14,462	647	-
2b.1.1.9	Fire Protection-Reactor Bldg (T43)-RCA	-	123	2	5	146	-	-	54	330	330	-	-	1,077	-	-	-	-	43,748	2,375	-
2b.1.1.10	Fire Protection-Turbine Bldg (U43)-RCA	-	276	5	12	370	-	-	127	790	790	-	-	2,729	-	-	-	-	110,841	5,508	-
2b.1.1.11	Makeup Demin (P21)	-	52	-	-	-	-	-	8	59	-	-	59	-	-	-	-	-	-	1,324	-
2b.1.1.12	Makeup Demin (P21) - RCA	-	113	2	5	165	-	-	54	339	339	-	-	1,216	-	-	-	-	49,382	2,213	-
2b.1.1.13	Miscellaneous Reactor Recirc (B31)	-	76	1	2	67	-	-	29	175	175	-	-	491	-	-	-	-	19,948	1,610	-
2b.1.1.14	Plant Service Water (P41)	-	46	-	-	-	-	-	7	53	-	-	53	-	-	-	-	-	-	1,257	-
2b.1.1.15	Plant Service Water (P41) - RCA	-	539	22	53	1,605	-	-	385	2,603	2,603	-	-	11,829	-	-	-	-	480,396	11,404	-
2b.1.1.16	Prim Containment Purge & Inerting (T48)	-	385	33	53	719	247	-	277	1,713	1,713	-	-	5,303	1,007	-	-	-	279,602	8,929	-
2b.1.1.17	Process Rad Monitor (D11)	-	50	3	3	21	22	-	22	121	121	-	-	154	86	-	-	-	11,867	1,156	-
2b.1.1.18	RB & Radwaste Chilled Water (P65) - RCA	-	209	5	13	407	-	-	116	751	751	-	-	3,003	-	-	-	-	121,941	4,017	-
2b.1.1.19	Radwaste (G11)	888	1,121	137	175	499	1,352	-	1,177	5,349	5,349	-	-	3,679	5,512	-	-	-	501,504	39,946	-
2b.1.1.20	Radwaste Bldg HVAC (V41)	-	53	2	4	69	15	-	28	171	171	-	-	506	62	-	-	-	24,492	1,142	-
2b.1.1.21	Reactor Bldg HVAC (T41)	-	130	8	15	307	43	-	92	596	596	-	-	2,267	173	-	-	-	103,155	2,795	-
2b.1.1.22	Reactor Water Clean Up (G31)	147	204	24	26	25	211	-	187	824	824	-	-	186	854	-	-	-	62,611	6,889	-
2b.1.1.23	Service & Instrument Air (P51/P52) - RCA	-	234	5	12	371	-	-	116	738	738	-	-	2,732	-	-	-	-	110,960	4,633	-
2b.1.1.24	Standby Gas Treatment (T46)	-	183	33	56	863	232	-	245	1,610	1,610	-	-	6,359	947	-	-	-	318,587	4,378	-
2b.1.1.25	Turbine Building Ventilation (U41)	-	282	16	32	687	76	-	199	1,291	1,291	-	-	5,064	312	-	-	-	225,492	5,860	-
2b.1.1	Totals	1,035	8,825	431	754	14,039	2,465	-	5,584	33,133	32,932	-	201	103,501	10,039	-	-	-	4,845,281	197,331	-
2b.1.2	Scaffolding in support of decommissioning	-	2,934	43	13	260	37	-	788	4,075	4,075	-	-	1,729	152	-	-	-	87,465	37,872	-
Decontamination of Site Buildings																					
2b.1.3.1	*Reactor	4,902	3,102	241	617	8,412	1,003	-	4,856	23,132	23,132	-	-	62,015	13,933	-	-	-	3,232,814	166,729	-
2b.1.3.2	Decontamination Calibration Building	4	3	0	2	3	2	-	4	19	19	-	-	19	59	-	-	-	3,530	171	-
2b.1.3.3	Radwaste Building and Addition	205	132	8	63	26	83	-	170	688	688	-	-	192	2,395	-	-	-	121,034	7,408	-
2b.1.3.4	Radwaste Solidification Pad	3	1	0	1	-	1	-	2	9	9	-	-	-	37	-	-	-	1,758	90	-
2b.1.3.5	Turbine Building	705	412	31	241	271	320	-	615	2,596	2,596	-	-	1,996	8,958	-	-	-	504,615	24,472	-
2b.1.3	Totals	5,819	3,651	280	924	8,711	1,409	-	5,648	26,443	26,443	-	-	64,221	25,383	-	-	-	3,863,751	198,870	-
2b.1.4	Prepare/submit License Termination Plan	-	-	-	-	-	-	493	74	567	567	-	-	-	-	-	-	-	-	-	4,096
2b.1.5	Receive NRC approval of termination plan								a												
2b.1	Subtotal Period 2b Activity Costs	6,854	15,410	754	1,691	23,010	3,912	493	12,094	64,217	64,017	-	201	169,451	35,574	-	-	-	8,796,497	434,073	4,096
Period 2b Additional Costs																					
2b.2.1	Remedial Action Surveys	-	-	-	-	-	-	2,836	851	3,686	3,686	-	-	-	-	-	-	-	-	49,716	-
2b.2.2	Fuel Inspection & Failed Fuel Containerization	-	-	-	-	-	-	936	140	1,076	1,076	-	-	-	-	-	-	-	-	-	-
2b.2.3	Excavation of Underground Services	-	1,207	-	-	-	-	253	219	1,679	-	-	1,679	-	-	-	-	-	-	7,000	-
2b.2.4	Operational Tools & Equipment	-	-	10	22	587	-	-	92	711	711	-	-	5,855	-	-	-	-	175,650	16	-
2b.2	Subtotal Period 2b Additional Costs	-	1,207	10	22	587	-	4,025	1,302	7,153	5,474	-	1,679	5,855	-	-	-	-	175,650	56,732	-
Period 2b Collateral Costs																					
2b.3.1	Process decommissioning water waste	191	-	130	359	-	515	-	291	1,485	1,485	-	-	-	1,229	-	-	-	73,746	240	-
2b.3.2	Process decommissioning chemical flush waste	2	-	64	253	-	472	-	163	954	954	-	-	-	634	-	-	-	67,605	119	-
2b.3.3	Small tool allowance	-	321	-	-	-	-	-	48	369	369	-	-	-	-	-	-	-	-	-	-
2b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	17,501	2,625	20,126	-	20,126	-	-	-	-	-	-	-	-	-
2b.3.5	On-site survey and release of 0.0 tons clean metallic waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	193	321	194	611	-	987	17,501	3,127	22,933	2,808	20,126	-	-	1,864	-	-	-	141,351	358	-

Table C-1
Hatch Nuclear Plant Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2018 Dollars)

Activity Index		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
Activity Description															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	1,861	-	-	-	-	-	-	465	2,327	2,327	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	923	92	1,016	1,016	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	3,518	-	-	-	-	-	879	4,397	4,397	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	5,105	-	-	-	-	-	766	5,871	5,871	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	174	38	-	701	-	198	1,111	1,111	-	-	-	7,702	-	-	-	154,042	251	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	1,092	164	1,256	1,256	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	1,383	138	1,521	1,521	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	532	53	585	-	585	-	-	-	-	-	-	-	-	-
2b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	1,883	282	2,166	-	2,166	-	-	-	-	-	-	-	-	-
2b.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	474	71	545	545	-	-	-	-	-	-	-	-	-	-
2b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	123	18	142	-	142	-	-	-	-	-	-	-	-	-
2b.4.13	Security Staff Cost	-	-	-	-	-	-	18,480	2,772	21,252	21,252	-	-	-	-	-	-	-	-	-	362,365
2b.4.14	DOC Staff Cost	-	-	-	-	-	-	24,760	3,714	28,473	28,473	-	-	-	-	-	-	-	-	-	288,003
2b.4.15	Utility Staff Cost	-	-	-	-	-	-	41,114	6,167	47,282	47,282	-	-	-	-	-	-	-	-	-	535,497
2b.4	Subtotal Period 2b Period-Dependent Costs	1,861	8,623	174	38	-	701	90,765	15,782	117,943	115,051	2,892	-	-	7,702	-	-	-	154,042	251	1,185,865
2b.0	TOTAL PERIOD 2b COST	8,908	25,561	1,131	2,362	23,596	5,599	112,783	32,306	212,247	187,349	23,018	1,880	175,306	45,140	-	-	-	9,267,540	491,415	1,189,961
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	550	50	167	311	-	2,655	-	1,015	4,748	4,748	-	-	-	10,882	-	-	-	691,330	1,288	-
Disposal of Plant Systems																					
2d.1.2.1	Electrical - Clean Spent Fuel	-	1,189	25	63	1,890	-	-	593	3,761	3,761	-	-	13,936	-	-	-	-	565,966	22,542	-
2d.1.2.2	Fire Protection - Other Buildings (X43)	-	91	-	-	-	-	-	14	104	-	-	104	-	-	-	-	-	-	2,406	-
2d.1.2.3	Fuel Pool Cooling (G41)	-	386	31	43	320	275	-	223	1,278	1,278	-	-	2,360	1,122	-	-	-	167,544	8,335	-
2d.1.2.4	Reactor Spent Fuel HVAC	-	40	2	4	92	11	-	27	177	177	-	-	676	44	-	-	-	30,295	860	-
2d.1.2.5	Sanitary Water (X42)	-	89	6	8	95	43	-	49	291	291	-	-	702	175	-	-	-	39,734	1,938	-
2d.1.2	Totals	-	1,795	65	118	2,397	329	-	906	5,611	5,506	-	104	17,674	1,341	-	-	-	803,539	36,080	-
Decontamination of Site Buildings																					
2d.1.3.1	Reactor (post fuel)	321	960	86	745	160	3,626	-	1,451	7,348	7,348	-	-	1,178	35,354	-	-	-	1,539,031	24,526	-
2d.1.3	Totals	321	960	86	745	160	3,626	-	1,451	7,348	7,348	-	-	1,178	35,354	-	-	-	1,539,031	24,526	-
2d.1.4	Scaffolding in support of decommissioning	-	587	9	3	52	7	-	158	815	815	-	-	346	30	-	-	-	17,493	7,574	-
2d.1	Subtotal Period 2d Activity Costs	871	3,392	326	1,177	2,609	6,617	-	3,529	18,522	18,418	-	104	19,198	47,608	-	-	-	3,051,393	69,469	-
Period 2d Additional Costs																					
2d.2.1	Remedial Action Surveys	-	-	-	-	-	-	552	166	718	718	-	-	-	-	-	-	-	-	9,681	-
2d.2.2	Soil Remediation	-	39	10	976	-	1,750	-	594	3,369	3,369	-	-	-	27,709	-	-	-	2,161,290	495	-
2d.2.3	SFP non-fuel cleanout	-	-	-	-	-	-	4,900	1,470	6,370	6,370	-	-	-	-	-	-	-	-	-	-
2d.2	Subtotal Period 2d Additional Costs	-	39	10	976	-	1,750	5,452	2,230	10,457	10,457	-	-	-	27,709	-	-	-	2,161,290	10,176	-
Period 2d Collateral Costs																					
2d.3.1	Process decommissioning water waste	77	-	53	146	-	209	-	118	603	603	-	-	-	500	-	-	-	29,982	97	-
2d.3.2	Process decommissioning chemical flush waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2d.3.3	Small tool allowance	-	59	-	-	-	-	-	9	68	68	-	-	-	-	-	-	-	-	-	-
2d.3.4	Decommissioning Equipment Disposition	-	-	148	50	902	129	-	190	1,418	1,418	-	-	6,000	529	-	-	-	303,608	147	-
2d.3	Subtotal Period 2d Collateral Costs	77	59	201	196	902	338	-	317	2,089	2,089	-	-	6,000	1,029	-	-	-	333,590	244	-
Period 2d Period-Dependent Costs																					
2d.4.1	Decon supplies	82	-	-	-	-	-	-	21	103	103	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	185	18	203	203	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	587	-	-	-	-	-	147	734	734	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,022	-	-	-	-	-	153	1,176	1,176	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	48	10	-	192	-	54	305	305	-	-	-	2,114	-	-	-	42,283	69	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	117	17	134	134	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	234	23	257	257	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	53	5	59	-	59	-	-	-	-	-	-	-	-	-
2d.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	190	28	218	218	-	-	-	-	-	-	-	-	-	-
2d.4.11	ISFSI Operating Costs	-	-	-	-	-	-	25	4	28	-	28	-	-	-	-	-	-	-	-	-
2d.4.12	Security Staff Cost	-	-	-	-	-	-	1,073	161	1,234	225	1,009	-	-	-	-	-	-	-	-	17,438
2d.4.13	DOC Staff Cost	-	-	-	-	-	-	3,006	451	3,457	3,457	-	-	-	-	-	-	-	-	-	35,360
2d.4.14	Utility Staff Cost	-	-	-	-	-	-	4,285	643	4,928	4,692	237	-	-	-	-	-	-	-	-	58,610
2d.4	Subtotal Period 2d Period-Dependent Costs	82	1,609	48	10	-	192	9,167	1,727	12,835	11,503	1,333	-	-	2,114	-	-	-	42,283	69	111,408
2d.0	TOTAL PERIOD 2d COST	1,031	5,099	585	2,359	3,511	8,897	14,619	7,803	43,904	42,467	1,333	104	25,198	78,460	-	-	-	5,588,556	79,959	111,408

Table C-1
Hatch Nuclear Plant Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2018 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 2e - Delay before License Termination																					
Period 2e Direct Decommissioning Activities																					
No direct activities in this period																					
2e.1	Subtotal Period 2e Activity Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 2e Additional Costs																					
2e.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,129	339	1,468	1,468	-	-	-	-	-	-	-	-	-	6,240
2e.2	Subtotal Period 2e Additional Costs	-	-	-	-	-	-	1,129	339	1,468	1,468	-	-	-	-	-	-	-	-	-	6,240
Period 2e Collateral Costs																					
2e.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	210	31	241	-	241	-	-	-	-	-	-	-	-	-
2e.3	Subtotal Period 2e Collateral Costs	-	-	-	-	-	-	210	31	241	-	241	-	-	-	-	-	-	-	-	-
Period 2e Period-Dependent Costs																					
2e.4.1	Insurance	-	-	-	-	-	-	1,564	156	1,720	1,720	-	-	-	-	-	-	-	-	-	-
2e.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2e.4.3	Health physics supplies	-	370	-	-	-	-	-	92	462	462	-	-	-	-	-	-	-	-	-	-
2e.4.4	Disposal of DAW generated	-	-	9	2	-	36	-	10	57	57	-	-	-	393	-	-	-	7,854	13	-
2e.4.5	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2e.4.6	NRC Fees	-	-	-	-	-	-	895	90	985	985	-	-	-	-	-	-	-	-	-	-
2e.4.7	Emergency Planning Fees	-	-	-	-	-	-	450	45	496	-	496	-	-	-	-	-	-	-	-	-
2e.4.8	ISFSI Operating Costs	-	-	-	-	-	-	209	31	240	-	240	-	-	-	-	-	-	-	-	-
2e.4.9	Security Staff Cost	-	-	-	-	-	-	7,893	1,184	9,077	1,607	7,470	-	-	-	-	-	-	-	-	147,503
2e.4.10	Utility Staff Cost	-	-	-	-	-	-	4,192	629	4,821	4,483	337	-	-	-	-	-	-	-	-	57,362
2e.4	Subtotal Period 2e Period-Dependent Costs	-	370	9	2	-	36	15,203	2,238	17,857	9,314	8,543	-	-	393	-	-	-	7,854	13	204,866
2e.0	TOTAL PERIOD 2e COST	-	370	9	2	-	36	16,542	2,608	19,566	10,781	8,785	-	-	393	-	-	-	7,854	13	211,106
PERIOD 2f - License Termination																					
Period 2f Direct Decommissioning Activities																					
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	165	50	215	215	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license	-	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	165	50	215	215	-	-	-	-	-	-	-	-	-	-
Period 2f Additional Costs																					
2f.2.1	License Termination Survey	-	-	-	-	-	-	6,594	1,978	8,573	8,573	-	-	-	-	-	-	-	-	133,401	3,120
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	6,594	1,978	8,573	8,573	-	-	-	-	-	-	-	-	133,401	3,120
Period 2f Collateral Costs																					
2f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,494	224	1,718	1,718	-	-	-	-	-	-	-	-	-	-
2f.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	317	48	365	-	365	-	-	-	-	-	-	-	-	-
2f.3	Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,812	272	2,083	1,718	365	-	-	-	-	-	-	-	-	-
Period 2f Period-Dependent Costs																					
2f.4.1	Insurance	-	-	-	-	-	-	299	30	329	329	-	-	-	-	-	-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2f.4.3	Health physics supplies	-	701	-	-	-	-	-	175	876	876	-	-	-	-	-	-	-	-	-	-
2f.4.4	Disposal of DAW generated	-	-	8	2	-	31	-	9	49	49	-	-	-	337	-	-	-	6,734	11	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	94	14	109	109	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	432	43	475	475	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	86	9	95	-	95	-	-	-	-	-	-	-	-	-
2f.4.8	ISFSI Operating Costs	-	-	-	-	-	-	40	6	46	-	46	-	-	-	-	-	-	-	-	-
2f.4.9	Security Staff Cost	-	-	-	-	-	-	1,558	234	1,791	310	1,482	-	-	-	-	-	-	-	-	28,208
2f.4.10	DOC Staff Cost	-	-	-	-	-	-	4,154	623	4,777	4,777	-	-	-	-	-	-	-	-	-	46,622
2f.4.11	Utility Staff Cost	-	-	-	-	-	-	5,178	777	5,955	5,413	542	-	-	-	-	-	-	-	-	59,942
2f.4	Subtotal Period 2f Period-Dependent Costs	-	701	8	2	-	31	11,841	1,919	14,501	12,337	2,164	-	-	337	-	-	-	6,734	11	134,773
2f.0	TOTAL PERIOD 2f COST	-	701	8	2	-	31	20,413	4,219	25,372	22,843	2,529	-	-	337	-	-	-	6,734	133,412	137,893
PERIOD 2 TOTALS		10,805	62,254	20,027	12,841	55,483	68,961	259,782	109,721	599,873	544,318	52,566	2,988	389,024	202,434	2,275	1,010	-	28,564,640	1,038,836	2,680,821
PERIOD 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor	-	2,111	-	-	-	-	-	317	2,428	-	-	2,428	-	-	-	-	-	-	17,332	-
3b.1.1.2	Chilled Water System Building	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	125	-
3b.1.1.3	Cooling Towers & Canal	-	2,279	-	-	-	-	-	342	2,621	-	-	2,621	-	-	-	-	-	-	23,508	-
3b.1.1.4	Decontamination Calibration Building	-	20	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	158	-
3b.1.1.5	Helper Cooling Tower	-	391	-	-	-	-	-	59	449	-	-	449	-	-	-	-	-	-	3,545	-
3b.1.1.6	Radwaste Building and Addition	-	565	-	-	-	-	-	85	650	-	-	650	-	-	-	-	-	-	3,986	-
3b.1.1.7	Radwaste Solidification Pad	-	3	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	56	-

Table C-1
Hatch Nuclear Plant Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2018 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Demolition of Remaining Site Buildings (Continued)																					
3b.1.1.8	Tank Pads & Foundations	-	139	-	-	-	-	-	21	159	-	-	159	-	-	-	-	-	-	800	-
3b.1.1.9	Turbine Building	-	1,715	-	-	-	-	-	257	1,973	-	-	1,973	-	-	-	-	-	-	14,601	-
3b.1.1.10	Turbine Pedestal	-	409	-	-	-	-	-	61	470	-	-	470	-	-	-	-	-	-	2,366	-
3b.1.1.11	Reactor (post fuel)	-	21	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	512	-
3b.1.1	Totals	-	7,664	-	-	-	-	-	1,150	8,813	-	-	8,813	-	-	-	-	-	-	66,988	-
Site Closeout Activities																					
3b.1.2	Grade & landscape site	-	1,246	-	-	-	-	-	187	1,433	-	-	1,433	-	-	-	-	-	-	2,630	-
3b.1.3	Final report to NRC	-	-	-	-	-	-	188	28	216	216	-	-	-	-	-	-	-	-	-	1,560
3b.1	Subtotal Period 3b Activity Costs	-	8,910	-	-	-	-	188	1,365	10,462	216	-	10,246	-	-	-	-	-	-	69,619	1,560
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	471	-	-	-	-	3	71	545	-	-	545	-	-	-	-	-	-	2,326	-
3b.2.2	Construction Debris	-	-	-	-	-	-	2,828	424	3,252	-	-	3,252	-	-	-	-	-	-	-	-
3b.2	Subtotal Period 3b Additional Costs	-	471	-	-	-	-	2,831	495	3,797	-	-	3,797	-	-	-	-	-	-	2,326	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	52	-	-	-	-	-	8	59	-	-	59	-	-	-	-	-	-	-	-
3b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	799	120	919	-	919	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	52	-	-	-	-	799	128	979	-	919	59	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	409	41	450	450	-	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	6,160	-	-	-	-	-	924	7,084	-	-	7,084	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	129	19	148	-	148	-	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	234	23	258	-	258	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	236	24	259	-	259	-	-	-	-	-	-	-	-	-
3b.4.7	ISFSI Operating Costs	-	-	-	-	-	-	109	16	126	-	126	-	-	-	-	-	-	-	-	-
3b.4.8	Security Staff Cost	-	-	-	-	-	-	4,218	633	4,850	-	4,050	800	-	-	-	-	-	-	-	77,137
3b.4.9	DOC Staff Cost	-	-	-	-	-	-	10,492	1,574	12,066	-	-	12,066	-	-	-	-	-	-	-	113,562
3b.4.10	Utility Staff Cost	-	-	-	-	-	-	6,380	957	7,337	-	1,482	5,855	-	-	-	-	-	-	-	72,316
3b.4	Subtotal Period 3b Period-Dependent Costs	-	6,160	-	-	-	-	22,207	4,211	32,578	450	6,323	25,806	-	-	-	-	-	-	-	263,015
3b.0	TOTAL PERIOD 3b COST	-	15,592	-	-	-	-	26,025	6,199	47,817	666	7,242	39,909	-	-	-	-	-	-	71,944	264,575
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
No direct activities in this period																					
3c.1	Subtotal Period 3c Activity Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3c Additional Costs																					
No additional costs in this period																					
3c.2	Subtotal Period 3c Additional Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	11,087	1,663	12,750	-	12,750	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	11,087	1,663	12,750	-	12,750	-	-	-	-	-	-	-	-	-
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	5,492	549	6,041	-	6,041	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	4,639	464	5,103	-	5,103	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	3,164	316	3,480	-	3,480	-	-	-	-	-	-	-	-	-
3c.4.6	ISFSI Operating Costs	-	-	-	-	-	-	1,466	220	1,686	-	1,686	-	-	-	-	-	-	-	-	-
3c.4.7	Security Staff Cost	-	-	-	-	-	-	47,304	7,096	54,399	-	54,399	-	-	-	-	-	-	-	-	863,343
3c.4.8	Utility Staff Cost	-	-	-	-	-	-	17,287	2,593	19,880	-	19,880	-	-	-	-	-	-	-	-	194,252
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	79,351	11,238	90,589	-	90,589	-	-	-	-	-	-	-	-	1,057,595
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	90,438	12,901	103,339	-	103,339	-	-	-	-	-	-	-	-	1,057,595
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	422	-	-	4,948	-	848	6,218	6,218	-	-	-	-	-	-	1,225	244,357	-	-
3d.1.1	Totals	-	-	422	-	-	4,948	-	848	6,218	6,218	-	-	-	-	-	-	1,225	244,357	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	422	-	-	4,948	-	848	6,218	6,218	-	-	-	-	-	-	1,225	244,357	-	-

Table C-1
Hatch Nuclear Plant Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2018 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 3d Additional Costs																					
No additional costs in this period																					
3d.2	Subtotal Period 3d Additional Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3d Collateral Costs																					
3d.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	40	6	47	-	47	-	-	-	-	-	-	-	-	-
3d.3	Subtotal Period 3d Collateral Costs	-	-	-	-	-	-	40	6	47	-	47	-	-	-	-	-	-	-	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	8	1	8	8	-	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3d.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	4	0	5	-	5	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	4	0	5	-	5	-	-	-	-	-	-	-	-	-
3d.4.6	ISFSI Operating Costs	-	-	-	-	-	-	2	0	2	-	2	-	-	-	-	-	-	-	-	-
3d.4.7	Security Staff Cost	-	-	-	-	-	-	74	11	85	85	-	-	-	-	-	-	-	-	-	1,197
3d.4.8	Utility Staff Cost	-	-	-	-	-	-	24	4	28	28	-	-	-	-	-	-	-	-	-	269
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	116	17	133	121	12	-	-	-	-	-	-	-	-	1,466
3d.0	TOTAL PERIOD 3d COST	-	-	422	-	-	4,948	157	870	6,397	6,339	59	-	-	-	-	-	1,225	244,357	-	1,466
PERIOD 3e - ISFSI Decontamination																					
Period 3e Direct Decommissioning Activities																					
No direct activities in this period																					
3e.1	Subtotal Period 3e Activity Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3e Additional Costs																					
3e.2.1	License Termination ISFSI	-	271	247	1,648	-	2,821	1,524	1,628	8,138	8,138	-	-	-	55,633	-	-	-	2,971,535	11,603	1,233
3e.2	Subtotal Period 3e Additional Costs	-	271	247	1,648	-	2,821	1,524	1,628	8,138	8,138	-	-	-	55,633	-	-	-	2,971,535	11,603	1,233
Period 3e Collateral Costs																					
3e.3	Subtotal Period 3e Collateral Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	43	11	54	54	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3e.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3e.4.4	Security Staff Cost	-	-	-	-	-	-	153	38	191	191	-	-	-	-	-	-	-	-	-	2,500
3e.4.5	Utility Staff Cost	-	-	-	-	-	-	170	42	212	212	-	-	-	-	-	-	-	-	-	1,896
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	366	91	457	457	-	-	-	-	-	-	-	-	-	4,396
3e.0	TOTAL PERIOD 3e COST	-	271	247	1,648	-	2,821	1,890	1,719	8,595	8,595	-	-	-	55,633	-	-	-	2,971,535	11,603	5,628
PERIOD 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
No direct activities in this period																					
3f.1	Subtotal Period 3f Activity Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3f Additional Costs																					
3f.2.1	Site Restoration ISFSI	-	2,792	-	-	-	-	440	485	3,717	-	-	3,717	-	-	-	-	-	-	34,821	80
3f.2	Subtotal Period 3f Additional Costs	-	2,792	-	-	-	-	440	485	3,717	-	-	3,717	-	-	-	-	-	-	34,821	80
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	40	-	-	-	-	-	6	46	-	-	46	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	40	-	-	-	-	-	6	46	-	-	46	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3f.4.3	Heavy equipment rental	-	115	-	-	-	-	-	17	132	-	-	132	-	-	-	-	-	-	-	-
3f.4.4	Plant energy budget	-	-	-	-	-	-	10	2	12	-	-	12	-	-	-	-	-	-	-	-
3f.4.5	Security Staff Cost	-	-	-	-	-	-	76	11	87	-	-	87	-	-	-	-	-	-	-	1,239
3f.4.6	Utility Staff Cost	-	-	-	-	-	-	73	11	84	-	-	84	-	-	-	-	-	-	-	769
3f.4	Subtotal Period 3f Period-Dependent Costs	-	115	-	-	-	-	159	41	315	-	-	315	-	-	-	-	-	-	-	2,009
3f.0	TOTAL PERIOD 3f COST	-	2,947	-	-	-	-	600	532	4,079	-	-	4,079	-	-	-	-	-	-	34,821	2,089
PERIOD 3 TOTALS		-	18,811	669	1,648	-	7,769	119,110	22,221	170,227	15,600	110,640	43,988	-	55,633	-	-	1,225	3,215,892	118,368	1,331,352
TOTAL COST TO DECOMMISSION		14,200	83,903	20,769	14,664	55,483	77,733	505,933	153,097	925,781	697,767	180,090	47,924	389,024	259,279	2,524	1,010	1,225	31,841,090	1,188,896	5,088,586

Table C-1
Hatch Nuclear Plant Unit 1
DECON Decommissioning Cost Estimate
(Thousands of 2018 Dollars)

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

TOTAL COST TO DECOMMISSION WITH 19.81% CONTINGENCY:	\$925,781	thousands of 2018	dollars
TOTAL NRC LICENSE TERMINATION COST IS 75.37% OR:	\$697,767	thousands of 2018	dollars
SPENT FUEL MANAGEMENT COST IS 19.45% OR:	\$180,090	thousands of 2018	dollars
NON-NUCLEAR DEMOLITION COST IS 5.18% OR:	\$47,924	thousands of 2018	dollars
TOTAL PRIMARY SITE RADWASTE VOLUME BURIED:	127,828	Cubic Feet	
TOTAL PRIMARY SITE RADWASTE WEIGHT BURIED:	7,916,229	Pounds	
TOTAL SECONDARY SITE RADWASTE VOLUME BURIED:	134,985	Cubic Feet	
TOTAL SECONDARY SITE RADWASTE WEIGHT BURIED:	7,068,869	Pounds	
TOTAL TERTIARY SITE RADWASTE VOLUME BURIED:	0	Cubic Feet	
TOTAL TERTIARY SITE RADWASTE WEIGHT BURIED:	0	Pounds	
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,225	Cubic Feet	
TOTAL SCRAP METAL REMOVED:	23,552	Tons	
TOTAL CRAFT LABOR REQUIREMENTS:	1,188,896	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

Table C-2
Hatch Nuclear Plant Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2018 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	-	-	-	-	-	-	66	10	75	75	-	-	-	-	-	-	-	-	-	545
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	-	-	-	-	-	-	101	15	116	116	-	-	-	-	-	-	-	-	-	838
1a.1.7	Review plant dwgs & specs.	-	-	-	-	-	-	232	35	267	267	-	-	-	-	-	-	-	-	-	1,927
1a.1.8	Perform detailed rad survey									a											
1a.1.9	Estimate by-product inventory	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	419
1a.1.10	End product description	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	419
1a.1.11	Detailed by-product inventory	-	-	-	-	-	-	66	10	75	75	-	-	-	-	-	-	-	-	-	545
1a.1.12	Define major work sequence	-	-	-	-	-	-	378	57	435	435	-	-	-	-	-	-	-	-	-	3,143
1a.1.13	Perform SER and EA	-	-	-	-	-	-	156	23	180	180	-	-	-	-	-	-	-	-	-	1,299
1a.1.14	Prepare/submit Defueled Technical Specifications	-	-	-	-	-	-	378	57	435	435	-	-	-	-	-	-	-	-	-	3,143
1a.1.15	Perform Site-Specific Cost Study	-	-	-	-	-	-	252	38	290	290	-	-	-	-	-	-	-	-	-	2,095
1a.1.16	Prepare/submit Irradiated Fuel Management Plan	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	419
Activity Specifications																					
1a.1.17.1	Plant & temporary facilities	-	-	-	-	-	-	248	37	285	257	-	29	-	-	-	-	-	-	-	2,061
1a.1.17.2	Plant systems	-	-	-	-	-	-	210	32	242	217	-	24	-	-	-	-	-	-	-	1,746
1a.1.17.3	NSSS Decontamination Flush	-	-	-	-	-	-	25	4	29	29	-	-	-	-	-	-	-	-	-	210
1a.1.17.4	Reactor internals	-	-	-	-	-	-	358	54	412	412	-	-	-	-	-	-	-	-	-	2,975
1a.1.17.5	Reactor vessel	-	-	-	-	-	-	328	49	377	377	-	-	-	-	-	-	-	-	-	2,724
1a.1.17.6	Sacrificial shield	-	-	-	-	-	-	25	4	29	29	-	-	-	-	-	-	-	-	-	210
1a.1.17.7	Moisture separators/reheaters	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	419
1a.1.17.8	Reinforced concrete	-	-	-	-	-	-	81	12	93	46	-	46	-	-	-	-	-	-	-	670
1a.1.17.9	Main Turbine	-	-	-	-	-	-	105	16	121	121	-	-	-	-	-	-	-	-	-	875
1a.1.17.10	Main Condensers	-	-	-	-	-	-	105	16	121	121	-	-	-	-	-	-	-	-	-	875
1a.1.17.11	Pressure suppression structure	-	-	-	-	-	-	101	15	116	116	-	-	-	-	-	-	-	-	-	838
1a.1.17.12	Drywell	-	-	-	-	-	-	81	12	93	93	-	-	-	-	-	-	-	-	-	670
1a.1.17.13	Plant structures & buildings	-	-	-	-	-	-	157	24	181	90	-	90	-	-	-	-	-	-	-	1,307
1a.1.17.14	Waste management	-	-	-	-	-	-	232	35	267	267	-	-	-	-	-	-	-	-	-	1,927
1a.1.17.15	Facility & site closeout	-	-	-	-	-	-	45	7	52	26	-	26	-	-	-	-	-	-	-	377
1a.1.17	Total	-	-	-	-	-	-	2,152	323	2,474	2,259	-	216	-	-	-	-	-	-	-	17,884
Planning & Site Preparations																					
1a.1.18	Prepare dismantling sequence	-	-	-	-	-	-	121	18	139	139	-	-	-	-	-	-	-	-	-	1,006
1a.1.19	Plant prep. & temp. svces	-	-	-	-	-	-	3,300	495	3,795	3,795	-	-	-	-	-	-	-	-	-	-
1a.1.20	Design water clean-up system	-	-	-	-	-	-	71	11	81	81	-	-	-	-	-	-	-	-	-	587
1a.1.21	Rigging/Cont. Cntrl Envlp/s/tooling/etc.	-	-	-	-	-	-	2,300	345	2,645	2,645	-	-	-	-	-	-	-	-	-	-
1a.1.22	Procure casks/liners & containers	-	-	-	-	-	-	62	9	71	71	-	-	-	-	-	-	-	-	-	515
1a.1	Subtotal Period 1a Activity Costs	-	-	-	-	-	-	9,785	1,468	11,252	11,037	-	216	-	-	-	-	-	-	-	34,782
Period 1a Additional Costs																					
1a.2.1	Spent fuel pool isolation	-	-	-	-	-	-	8,000	1,200	9,200	9,200	-	-	-	-	-	-	-	-	-	-
1a.2.2	Site Characterization	-	-	-	-	-	-	2,609	783	3,391	3,391	-	-	-	-	-	-	-	-	12,779	4,547
1a.2	Subtotal Period 1a Additional Costs	-	-	-	-	-	-	10,609	1,983	12,591	12,591	-	-	-	-	-	-	-	-	12,779	4,547
Period 1a Collateral Costs																					
1a.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	5,826	874	6,700	-	6,700	-	-	-	-	-	-	-	-	-
1a.3	Subtotal Period 1a Collateral Costs	-	-	-	-	-	-	5,826	874	6,700	-	6,700	-	-	-	-	-	-	-	-	-
Period 1a Period-Dependent Costs																					
1a.4.1	Insurance	-	-	-	-	-	-	2,038	204	2,242	2,242	-	-	-	-	-	-	-	-	-	-
1a.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1a.4.3	Health physics supplies	-	521	-	-	-	-	-	130	651	651	-	-	-	-	-	-	-	-	-	-
1a.4.4	Heavy equipment rental	-	546	-	-	-	-	-	82	628	628	-	-	-	-	-	-	-	-	-	-
1a.4.5	Disposal of DAW generated	-	-	14	3	-	55	-	16	88	88	-	-	-	610	-	-	-	12,190	20	-
1a.4.6	Plant energy budget	-	-	-	-	-	-	626	94	720	720	-	-	-	-	-	-	-	-	-	-
1a.4.7	NRC Fees	-	-	-	-	-	-	799	80	879	879	-	-	-	-	-	-	-	-	-	-
1a.4.8	Emergency Planning Fees	-	-	-	-	-	-	485	49	534	-	534	-	-	-	-	-	-	-	-	-
1a.4.9	Spent Fuel Pool O&M	-	-	-	-	-	-	810	121	931	-	931	-	-	-	-	-	-	-	-	-
1a.4.10	ISFSI Operating Costs	-	-	-	-	-	-	53	8	61	-	61	-	-	-	-	-	-	-	-	-
1a.4.11	Security Staff Cost	-	-	-	-	-	-	9,134	1,370	10,504	10,504	-	-	-	-	-	-	-	-	-	167,440
1a.4.12	Utility Staff Cost	-	-	-	-	-	-	31,755	4,763	36,518	36,518	-	-	-	-	-	-	-	-	-	422,240
1a.4	Subtotal Period 1a Period-Dependent Costs	-	1,067	14	3	-	55	45,700	6,917	53,756	52,230	1,526	-	-	610	-	-	-	12,190	20	589,680
1a.0	TOTAL PERIOD 1a COST	-	1,067	14	3	-	55	71,920	11,241	84,299	75,858	8,226	216	-	610	-	-	-	12,190	12,799	629,009

Table C-2
Hatch Nuclear Plant Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2018 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
PERIOD 1b - Decommissioning Preparations																					
Period 1b Direct Decommissioning Activities																					
Detailed Work Procedures																					
1b.1.1.1	Plant systems	-	-	-	-	-	-	239	36	274	247	-	27	-	-	-	-	-	-	-	1,983
1b.1.1.2	NSSS Decontamination Flush	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	419
1b.1.1.3	Reactor internals	-	-	-	-	-	-	202	30	232	232	-	-	-	-	-	-	-	-	-	1,676
1b.1.1.4	Remaining buildings	-	-	-	-	-	-	68	10	78	20	-	59	-	-	-	-	-	-	-	566
1b.1.1.5	CRD housings & NIs	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	419
1b.1.1.6	Incore instrumentation	-	-	-	-	-	-	50	8	58	58	-	-	-	-	-	-	-	-	-	419
1b.1.1.7	Removal primary containment	-	-	-	-	-	-	101	15	116	116	-	-	-	-	-	-	-	-	-	838
1b.1.1.8	Reactor vessel	-	-	-	-	-	-	183	27	210	210	-	-	-	-	-	-	-	-	-	1,521
1b.1.1.9	Facility closeout	-	-	-	-	-	-	60	9	70	35	-	35	-	-	-	-	-	-	-	503
1b.1.1.10	Sacrificial shield	-	-	-	-	-	-	60	9	70	70	-	-	-	-	-	-	-	-	-	503
1b.1.1.11	Reinforced concrete	-	-	-	-	-	-	50	8	58	29	-	29	-	-	-	-	-	-	-	419
1b.1.1.12	Main Turbine	-	-	-	-	-	-	105	16	121	121	-	-	-	-	-	-	-	-	-	872
1b.1.1.13	Main Condensers	-	-	-	-	-	-	105	16	121	121	-	-	-	-	-	-	-	-	-	875
1b.1.1.14	Moisture separators & reheaters	-	-	-	-	-	-	101	15	116	116	-	-	-	-	-	-	-	-	-	838
1b.1.1.15	Radwaste building	-	-	-	-	-	-	138	21	158	142	-	16	-	-	-	-	-	-	-	1,144
1b.1.1.16	Reactor building	-	-	-	-	-	-	138	21	158	142	-	16	-	-	-	-	-	-	-	1,144
1b.1.1	Total	-	-	-	-	-	-	1,701	255	1,956	1,774	-	182	-	-	-	-	-	-	-	14,137
1b.1.2	Decon NSSS	314	-	-	-	-	-	-	157	470	470	-	-	-	-	-	-	-	-	1,067	-
1b.1	Subtotal Period 1b Activity Costs	314	-	-	-	-	-	1,701	412	2,426	2,245	-	182	-	-	-	-	-	-	1,067	14,137
Period 1b Additional Costs																					
No additional costs in this period																					
1b.2	Subtotal Period 1b Additional Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 1b Collateral Costs																					
1b.3.1	Decon equipment	999	-	-	-	-	-	-	150	1,148	1,148	-	-	-	-	-	-	-	-	-	-
1b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,494	224	1,718	1,718	-	-	-	-	-	-	-	-	-	-
1b.3.3	Process decommissioning water waste	39	-	26	71	-	102	-	58	296	296	-	-	-	243	-	-	-	14,592	47	-
1b.3.4	Process decommissioning chemical flush waste	1	-	25	99	-	814	-	221	1,160	1,160	-	-	-	-	250	-	-	26,587	47	-
1b.3.5	Small tool allowance	-	2	-	-	-	-	-	0	2	2	-	-	-	-	-	-	-	-	-	-
1b.3.6	Pipe cutting equipment	-	1,200	-	-	-	-	-	180	1,380	1,380	-	-	-	-	-	-	-	-	-	-
1b.3.7	Decon rig	2,006	-	-	-	-	-	-	301	2,307	2,307	-	-	-	-	-	-	-	-	-	-
1b.3.8	Spent Fuel Capital and Transfer	-	-	-	-	-	-	2,721	408	3,130	-	3,130	-	-	-	-	-	-	-	-	-
1b.3	Subtotal Period 1b Collateral Costs	3,045	1,202	51	170	-	915	4,215	1,543	11,142	8,012	3,130	-	-	243	250	-	-	41,179	94	-
Period 1b Period-Dependent Costs																					
1b.4.1	Decon supplies	36	-	-	-	-	-	-	9	45	45	-	-	-	-	-	-	-	-	-	-
1b.4.2	Insurance	-	-	-	-	-	-	1,028	103	1,130	1,130	-	-	-	-	-	-	-	-	-	-
1b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1b.4.4	Health physics supplies	-	294	-	-	-	-	-	74	368	368	-	-	-	-	-	-	-	-	-	-
1b.4.5	Heavy equipment rental	-	275	-	-	-	-	-	41	316	316	-	-	-	-	-	-	-	-	-	-
1b.4.6	Disposal of DAW generated	-	-	8	2	-	33	-	9	52	52	-	-	-	360	-	-	-	7,197	12	-
1b.4.7	Plant energy budget	-	-	-	-	-	-	631	95	726	726	-	-	-	-	-	-	-	-	-	-
1b.4.8	NRC Fees	-	-	-	-	-	-	220	22	242	242	-	-	-	-	-	-	-	-	-	-
1b.4.9	Emergency Planning Fees	-	-	-	-	-	-	245	24	269	-	269	-	-	-	-	-	-	-	-	-
1b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	408	61	469	-	469	-	-	-	-	-	-	-	-	-
1b.4.11	ISFSI Operating Costs	-	-	-	-	-	-	27	4	31	-	31	-	-	-	-	-	-	-	-	-
1b.4.12	Security Staff Cost	-	-	-	-	-	-	4,843	726	5,569	5,569	-	-	-	-	-	-	-	-	-	88,493
1b.4.13	DOC Staff Cost	-	-	-	-	-	-	5,736	860	6,596	6,596	-	-	-	-	-	-	-	-	-	63,961
1b.4.14	Utility Staff Cost	-	-	-	-	-	-	16,103	2,416	18,519	18,519	-	-	-	-	-	-	-	-	-	213,904
1b.4	Subtotal Period 1b Period-Dependent Costs	36	569	8	2	-	33	29,240	4,445	34,333	33,564	769	-	-	360	-	-	-	7,197	12	366,358
1b.0	TOTAL PERIOD 1b COST	3,395	1,771	59	172	-	948	35,157	6,399	47,901	43,821	3,899	182	-	603	250	-	-	48,376	1,172	380,496
PERIOD 1 TOTALS		3,395	2,838	73	175	-	1,004	107,076	17,640	132,201	119,679	12,124	397	-	1,213	250	-	-	60,566	13,971	1,009,505
PERIOD 2a - Large Component Removal																					
Period 2a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
2a.1.1.1	Recirculation System Piping & Valves	105	80	37	86	-	470	-	207	986	986	-	-	-	1,753	-	-	-	122,315	3,953	-
2a.1.1.2	Recirculation Pumps & Motors	27	52	106	46	-	451	-	157	838	838	-	-	-	1,427	-	-	-	120,800	1,787	100
2a.1.1.3	CRDMs & NIs Removal	153	775	495	213	-	927	-	583	3,147	3,147	-	-	-	4,167	-	-	-	241,500	21,179	-
2a.1.1.4	Reactor Vessel Internals	178	5,518	9,900	3,035	-	34,698	428	24,874	78,631	78,631	-	-	-	751	2,275	1,066	-	419,097	36,328	1,612
2a.1.1.5	Reactor Vessel	110	7,880	3,420	2,495	-	8,516	428	11,766	34,616	34,616	-	-	-	26,100	-	-	-	1,769,566	36,328	1,612
2a.1.1	Totals	572	14,306	13,959	5,875	-	45,062	856	37,587	118,218	118,218	-	-	-	34,198	2,275	1,066	-	2,673,278	99,574	3,323

Table C-2
Hatch Nuclear Plant Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2018 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				GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet					
Removal of Major Equipment																						
2a.1.2	Main Turbine/Generator	-	291	1,886	327	6,085	390	-	1,321	10,299	10,299	-	-	30,364	1,691	-	-	-	1,929,246	6,649	-	
2a.1.3	Main Condensers	-	844	1,330	349	8,492	576	-	1,814	13,404	13,404	-	-	56,498	2,360	-	-	-	2,692,321	19,927	-	
Cascading Costs from Clean Building Demolition																						
2a.1.4.1	*Reactor	-	354	-	-	-	-	-	53	407	407	-	-	-	-	-	-	-	-	2,676	-	
2a.1.4.2	Radwaste Building	-	100	-	-	-	-	-	15	114	114	-	-	-	-	-	-	-	-	782	-	
2a.1.4.3	Turbine Building	-	141	-	-	-	-	-	21	162	162	-	-	-	-	-	-	-	-	1,289	-	
2a.1.4	Totals	-	595	-	-	-	-	-	89	684	684	-	-	-	-	-	-	-	-	4,748	-	
Disposal of Plant Systems																						
2a.1.5.1	Aux Steam Boiler (0P61)	-	11	-	-	-	-	-	2	13	-	-	13	-	-	-	-	-	-	312	-	
2a.1.5.2	Aux Steam Boiler (0P61) - RCA	-	55	1	3	89	-	-	28	176	176	-	-	656	-	-	-	-	26,651	1,109	-	
2a.1.5.3	Circulating Water (2N71)	-	163	-	-	-	-	-	24	187	-	-	187	-	-	-	-	-	-	4,708	-	
2a.1.5.4	Circulating Water (2N71) - RCA	-	126	13	32	974	-	-	184	1,328	1,328	-	-	7,177	-	-	-	-	291,482	2,873	-	
2a.1.5.5	Circulating Water Drains (2U45)	-	3	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	91	-	
2a.1.5.6	Condensate & Feedwater (2N21)	-	2,351	341	533	6,015	2,849	-	2,316	14,405	14,405	-	-	44,344	11,645	-	-	-	2,542,719	54,868	-	
2a.1.5.7	Condensate Storage (2P11)	-	236	13	27	638	48	-	172	1,134	1,134	-	-	4,703	198	-	-	-	203,599	5,440	-	
2a.1.5.8	Control Rod Drive (2C11)	-	345	22	31	308	180	-	184	1,071	1,071	-	-	2,269	730	-	-	-	138,908	7,679	-	
2a.1.5.9	Core Spray (2E21)	-	277	37	60	891	264	-	282	1,811	1,811	-	-	6,568	1,076	-	-	-	335,531	6,459	-	
2a.1.5.10	Drywell Cooling (2T47)	-	80	3	7	175	12	-	51	328	328	-	-	1,289	49	-	-	-	55,450	1,665	-	
2a.1.5.11	Drywell Pneumatic (2P70)	-	49	5	5	27	36	-	27	149	149	-	-	202	143	-	-	-	17,569	980	-	
2a.1.5.12	EHC Overspeed Trip (2N32)	-	2	-	-	-	-	-	0	2	-	-	2	-	-	-	-	-	-	55	-	
2a.1.5.13	Electrical - Clean	-	946	-	-	-	-	-	142	1,088	-	-	1,088	-	-	-	-	-	-	24,728	-	
2a.1.5.14	Extraction Steam (2N36)	-	514	63	101	1,166	530	-	457	2,831	2,831	-	-	8,597	2,170	-	-	-	487,194	12,140	-	
2a.1.5.15	Fire Protection - Intake Structure (Y43)	-	3	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	82	-	
2a.1.5.16	Gen Cooling (Stator Cooling) (2N43)-RCA	-	22	0	1	28	-	-	10	61	61	-	-	206	-	-	-	-	8,372	418	-	
2a.1.5.17	Gen Excitation (2N51) - RCA	-	2	0	0	3	-	-	1	7	7	-	-	26	-	-	-	-	1,039	53	-	
2a.1.5.18	Generator (2N41) - RCA	-	2	0	0	3	-	-	1	7	7	-	-	26	-	-	-	-	1,039	53	-	
2a.1.5.19	Generator and Auxiliary (2N40) - RCA	-	13	1	1	40	-	-	10	65	65	-	-	296	-	-	-	-	12,037	277	-	
2a.1.5.20	H2 Recombiner (2T49)	-	39	3	3	21	23	-	19	109	109	-	-	154	94	-	-	-	12,306	868	-	
2a.1.5.21	H2O2 Analyzer (2P33) - RCA	-	111	1	3	105	-	-	44	265	265	-	-	772	-	-	-	-	31,343	2,324	-	
2a.1.5.22	Heating & Process Steam (2P61) - RCA	-	74	1	4	106	-	-	35	220	220	-	-	784	-	-	-	-	31,831	1,456	-	
2a.1.5.23	High Pressure Coolant Injection (2E4)	-	280	25	38	458	198	-	196	1,196	1,196	-	-	3,373	807	-	-	-	188,560	6,472	-	
2a.1.5.24	Hypochlorination (2W23)	-	16	-	-	-	-	-	2	18	-	-	18	-	-	-	-	-	-	435	-	
2a.1.5.25	MSIV Leakage Control (2E32)	-	13	1	1	4	9	-	6	34	34	-	-	32	35	-	-	-	3,573	261	-	
2a.1.5.26	Main Steam (2B21/2N33/2N11)	-	553	68	106	1,211	558	-	482	2,978	2,978	-	-	8,929	2,280	-	-	-	507,979	12,902	-	
2a.1.5.27	Miscellaneous Equipment (2W21)	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	19	-	
2a.1.5.28	Off Gas (2N62)	-	251	25	34	318	201	-	168	996	996	-	-	2,341	815	-	-	-	147,326	5,485	-	
2a.1.5.29	Plant Heating (2P44)	-	16	-	-	-	-	-	2	18	-	-	18	-	-	-	-	-	-	451	-	
2a.1.5.30	Plant Heating (2P44) - RCA	-	83	2	5	140	-	-	43	272	272	-	-	1,032	-	-	-	-	41,898	1,535	-	
2a.1.5.31	Reactor Bldg Chilled Water (2P64)-RCA	-	141	3	7	217	-	-	69	437	437	-	-	1,598	-	-	-	-	64,895	2,704	-	
2a.1.5.32	Reactor Core Isolation Cooling (2E51)	72	97	13	15	37	115	-	98	447	447	-	-	274	468	-	-	-	41,176	3,183	-	
2a.1.5.33	Reactor Protection (2C71)	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	18	-	
2a.1.5.34	Reheat (2N38)	-	397	170	251	1,545	1,702	-	811	4,875	4,875	-	-	11,387	6,974	-	-	-	905,649	9,697	-	
2a.1.5.35	Residual Heat Removal (2E11)	-	1,389	452	578	2,655	4,179	-	1,922	11,176	11,176	-	-	19,576	17,007	-	-	-	1,883,355	33,038	-	
2a.1.5.36	Standby Liquid Control (2C41)	-	40	1	2	59	-	-	19	120	120	-	-	432	-	-	-	-	17,527	863	-	
2a.1.5.37	Sump Pump (2X45)	-	0	-	-	-	-	-	0	0	-	-	0	-	-	-	-	-	-	5	-	
2a.1.5.38	Technical Support Center HVAC (X75)	-	3	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	71	-	
2a.1.5.39	Torus Drainage & Purification (2G51)	-	54	4	6	45	37	-	31	177	177	-	-	333	152	-	-	-	23,237	1,178	-	
2a.1.5.40	Turbine Bldg Chilled Water (2P63)-RCA	-	253	5	13	402	-	-	126	799	799	-	-	2,962	-	-	-	-	120,298	4,972	-	
2a.1.5.41	Turbine Generator Seal Oil (2N42) - RCA	-	6	0	1	19	-	-	5	31	31	-	-	141	-	-	-	-	5,706	132	-	
2a.1.5.42	Turbine Lube Oil (2N34) - RCA	-	126	3	7	225	-	-	67	427	427	-	-	1,656	-	-	-	-	67,232	2,625	-	
2a.1.5.43	Waste Gas Trtmnt Bldg Chill Wtr (0N62)	-	65	1	2	52	-	-	24	144	144	-	-	387	-	-	-	-	15,698	1,358	-	
2a.1.5	Totals	72	9,209	1,278	1,878	17,975	10,942	-	8,063	49,418	48,079	-	1,339	132,521	44,643	-	-	-	8,231,178	216,043	-	
2a.1.6	Scaffolding in support of decommissioning	-	2,849	41	13	252	36	-	765	3,956	3,956	-	-	1,678	148	-	-	-	84,917	36,769	-	
2a.1	Subtotal Period 2a Activity Costs	645	28,092	18,495	8,442	32,804	57,005	856	49,639	195,979	194,640	-	1,339	221,062	83,040	2,275	1,066	-	15,610,940	383,709	3,323	
Period 2a Additional Costs																						
2a.2.1	Remedial Action Surveys	-	-	-	-	-	-	1,916	575	2,491	2,491	-	-	-	-	-	-	-	-	33,600	-	
2a.2	Subtotal Period 2a Additional Costs	-	-	-	-	-	-	1,916	575	2,491	2,491	-	-	-	-	-	-	-	-	33,600	-	
Period 2a Collateral Costs																						
2a.3.1	Process decommissioning water waste	88	-	58	160	-	230	-	131	666	666	-	-	-	549	-	-	-	32,921	107	-	
2a.3.2	Process decommissioning chemical flush waste	0	-	7	28	-	52	-	18	105	105	-	-	-	70	-	-	-	7,419	13	-	
2a.3.3	Small tool allowance	-	324	-	-	-	-	-	49	373	336	-	37	-	-	-	-	-	-	-	-	
2a.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	12,243	1,836	14,079	-	14,079	-	-	-	-	-	-	-	-	-	
2a.3.5	On-site survey and release of 2.35 tons clean metallic waste	-	-	-	-	-	-	3	0	3	3	-	-	-	-	-	-	-	-	-	-	
2a.3	Subtotal Period 2a Collateral Costs	88	324	65	188	-	282	12,246	2,034	15,226	1,110	14,079	37	-	618	-	-	-	40,340	120	-	

Table C-2
Hatch Nuclear Plant Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2018 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				GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet					
Period 2a Period-Dependent Costs																						
2a.4.1	Decon supplies	122	-	-	-	-	-	-	31	153	153	-	-	-	-	-	-	-	-	-	-	
2a.4.2	Insurance	-	-	-	-	-	-	672	67	739	739	-	-	-	-	-	-	-	-	-	-	
2a.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2a.4.4	Health physics supplies	-	2,916	-	-	-	-	-	729	3,645	3,645	-	-	-	-	-	-	-	-	-	-	
2a.4.5	Heavy equipment rental	-	3,605	-	-	-	-	-	541	4,146	4,146	-	-	-	-	-	-	-	-	-	-	
2a.4.6	Disposal of DAW generated	-	-	170	37	-	685	-	194	1,085	1,085	-	-	-	7,525	-	-	-	150,500	245	-	
2a.4.7	Plant energy budget	-	-	-	-	-	-	1,007	151	1,158	1,158	-	-	-	-	-	-	-	-	-	-	
2a.4.8	NRC Fees	-	-	-	-	-	-	689	69	757	757	-	-	-	-	-	-	-	-	-	-	
2a.4.9	Emergency Planning Fees	-	-	-	-	-	-	387	39	426	-	426	-	-	-	-	-	-	-	-	-	
2a.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	1,371	206	1,576	-	1,576	-	-	-	-	-	-	-	-	-	
2a.4.11	ISFSI Operating Costs	-	-	-	-	-	-	90	13	103	-	103	-	-	-	-	-	-	-	-	-	
2a.4.12	Security Staff Cost	-	-	-	-	-	-	22,564	3,385	25,949	25,949	-	-	-	-	-	-	-	-	-	454,306	
2a.4.13	DOC Staff Cost	-	-	-	-	-	-	23,503	3,525	27,029	27,029	-	-	-	-	-	-	-	-	-	267,653	
2a.4.14	Utility Staff Cost	-	-	-	-	-	-	39,121	5,868	44,989	44,989	-	-	-	-	-	-	-	-	-	498,328	
2a.4	Subtotal Period 2a Period-Dependent Costs	122	6,522	170	37	-	685	89,404	14,817	111,757	109,651	2,105	-	-	7,525	-	-	-	150,500	245	1,220,288	
2a.0	TOTAL PERIOD 2a COST	855	34,939	18,730	8,667	32,804	57,971	104,422	67,066	325,453	307,892	16,184	1,376	221,062	91,183	2,275	1,066	-	15,801,780	417,674	1,223,611	
PERIOD 2b - Site Decontamination																						
Period 2b Direct Decommissioning Activities																						
Disposal of Plant Systems																						
2b.1.1.1	Auxiliary Drains & Vent (2N22)	-	1,673	133	197	2,080	1,089	-	1,045	6,217	6,217	-	-	15,333	4,438	-	-	-	906,303	38,036	-	
2b.1.1.2	Closed Cooling Water (2P42) - RCA	-	337	10	25	752	-	-	202	1,326	1,326	-	-	5,540	-	-	-	-	225,002	6,748	-	
2b.1.1.3	Decay Heat (G71)	-	171	94	111	427	828	-	340	1,970	1,970	-	-	3,145	3,355	-	-	-	343,268	3,996	-	
2b.1.1.4	Diesel Engine & Fuel Oil (2Y52)	-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	880	-	
2b.1.1.5	Diesel Generators (2R43)	-	14	-	-	-	-	-	2	16	-	-	16	-	-	-	-	-	-	391	-	
2b.1.1.6	Electrical - Clean RCA	-	5,347	115	282	8,504	-	-	2,666	16,914	16,914	-	-	62,696	-	-	-	-	2,546,133	101,191	-	
2b.1.1.7	Electrical - Contaminated	-	793	25	52	1,262	86	-	419	2,637	2,637	-	-	9,304	351	-	-	-	400,119	15,025	-	
2b.1.1.8	Equip & Floor Drains - Reactor (2T45)	-	65	5	7	38	47	-	35	198	198	-	-	280	194	-	-	-	23,745	1,415	-	
2b.1.1.9	Fire Protection - Control Bldg (2Z43)	-	23	-	-	-	-	-	3	26	-	-	26	-	-	-	-	-	-	689	-	
2b.1.1.10	Fire Protection-Radwaste Bldg (2V43)-RCA	-	13	0	0	13	-	-	5	32	32	-	-	97	-	-	-	-	3,926	256	-	
2b.1.1.11	Fire Protection-Reactor (2T42/2T43)-RCA	-	260	5	12	360	-	-	121	757	757	-	-	2,651	-	-	-	-	107,667	4,979	-	
2b.1.1.12	Fire Protection-Turbine Bldg (2U43)-RCA	-	175	4	9	277	-	-	87	553	553	-	-	2,045	-	-	-	-	83,043	3,451	-	
2b.1.1.13	Makeup Demin (2P21)	-	62	-	-	-	-	-	9	72	-	-	72	-	-	-	-	-	-	1,556	-	
2b.1.1.14	Makeup Demin (2P21) - RCA	-	63	1	3	78	-	-	28	173	173	-	-	577	-	-	-	-	23,413	1,162	-	
2b.1.1.15	Miscellaneous Reactor Recirc (2B31)	-	80	1	2	71	-	-	31	186	186	-	-	526	-	-	-	-	21,357	1,670	-	
2b.1.1.16	Plant Service Water (2P41)	-	71	-	-	-	-	-	11	82	-	-	82	-	-	-	-	-	-	1,949	-	
2b.1.1.17	Plant Service Water (2P41) - RCA	-	1,150	35	87	2,620	-	-	697	4,589	4,589	-	-	19,314	-	-	-	-	784,343	23,892	-	
2b.1.1.18	Prim Containment Purge & Inerting (2T48)	-	243	23	34	327	196	-	166	988	988	-	-	2,409	797	-	-	-	148,758	5,479	-	
2b.1.1.19	Primary Containment (2T23)	-	21	2	2	14	16	-	12	67	67	-	-	100	62	-	-	-	8,099	449	-	
2b.1.1.20	Process & Rad Monitor (2D11)	-	91	6	6	23	41	-	38	204	204	-	-	168	163	-	-	-	17,498	2,139	-	
2b.1.1.21	RB & Radwaste Chilled Water (2P65) - RCA	-	116	2	6	176	-	-	57	358	358	-	-	1,299	-	-	-	-	52,764	2,210	-	
2b.1.1.22	Radwaste (2G11)	814	1,031	128	167	512	1,283	-	1,100	5,035	5,035	-	-	3,773	5,239	-	-	-	487,430	36,445	-	
2b.1.1.23	Radwaste HVAC (2V41)	-	101	9	11	108	60	-	59	349	349	-	-	798	241	-	-	-	48,095	2,053	-	
2b.1.1.24	Radwaste Solidification (2G12)	-	70	8	8	21	60	-	38	204	204	-	-	154	241	-	-	-	21,882	1,462	-	
2b.1.1.25	Reactor Building HVAC (2T41)	-	111	6	9	187	28	-	65	406	406	-	-	1,380	111	-	-	-	63,201	2,342	-	
2b.1.1.26	Reactor Water Cleanup (2G31)	100	141	17	18	20	150	-	130	577	577	-	-	151	605	-	-	-	45,114	4,683	-	
2b.1.1.27	Service & Instrument Air (2P51/2P52)	-	37	-	-	-	-	-	6	43	-	-	43	-	-	-	-	-	-	1,137	-	
2b.1.1.28	Service & Instrument Air (2P51/2P52)-RCA	-	189	2	6	166	-	-	73	437	437	-	-	1,225	-	-	-	-	49,756	3,739	-	
2b.1.1.29	Standby Gas Treatment (2T46)	-	198	21	34	413	171	-	161	997	997	-	-	3,044	699	-	-	-	168,102	4,666	-	
2b.1.1.30	Turbine Building Ventilation (2U41)	-	245	12	24	492	63	-	156	991	991	-	-	3,626	258	-	-	-	163,650	5,013	-	
2b.1.1.31	Ventilation - Control Bldg (2Z41)	-	15	-	-	-	-	-	2	17	-	-	17	-	-	-	-	-	-	413	-	
2b.1.1	Totals	914	12,943	664	1,110	18,940	4,117	-	7,770	46,458	46,162	-	296	139,634	16,753	-	-	-	6,742,670	279,518	-	
2b.1.2	Scaffolding in support of decommissioning	-	3,561	52	16	315	45	-	956	4,945	4,945	-	-	2,098	185	-	-	-	106,147	45,961	-	
Decontamination of Site Buildings																						
2b.1.3.1	*Reactor	4,902	3,087	238	613	8,412	997	-	4,850	23,099	23,099	-	-	62,015	13,811	-	-	-	3,224,685	166,468	-	
2b.1.3.2	Condensate Storage Tank Enclosure	55	68	3	24	-	32	-	56	238	238	-	-	-	934	-	-	-	44,100	2,686	-	
2b.1.3.3	Hot Machine Shop & R.R. Airlock	61	27	2	20	3	26	-	48	188	188	-	-	19	772	-	-	-	37,232	1,967	-	
2b.1.3.4	Low Level Radwaste Storage	101	44	4	35	-	45	-	79	308	308	-	-	-	1,329	-	-	-	62,790	3,213	-	
2b.1.3.5	Main Stack	107	344	10	70	119	95	-	192	937	937	-	-	876	2,566	-	-	-	157,338	9,499	-	
2b.1.3.6	Off Gas Recombiner Building	34	17	1	11	7	15	-	28	113	113	-	-	50	429	-	-	-	22,323	1,118	-	
2b.1.3.7	Radwaste Building	234	114	9	78	34	103	-	189	761	761	-	-	253	2,957	-	-	-	150,007	7,691	-	
2b.1.3.8	Radwaste Solidification Pad	3	1	0	1	-	1	-	2	9	9	-	-	-	37	-	-	-	1,758	90	-	
2b.1.3.9	Turbine Building	759	457	34	262	346	348	-	675	2,881	2,881	-	-	2,550	9,642	-	-	-	560,380	26,452	-	
2b.1.3.10	Waste Gas Treatment Building	68	32	3	23	10	30	-	55	220	220	-	-	73	856	-	-	-	43,455	2,210	-	
2b.1.3	Totals	6,324	4,190	305	1,138	8,930	1,691	-	6,173	28,752	28,752	-	-	65,836	33,333	-	-	-	4,304,068	221,395	-	

Table C-2
Hatch Nuclear Plant Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2018 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
2b.1.4	Prepare/submit License Termination Plan	-	-	-	-	-	-	206	31	237	237	-	-	-	-	-	-	-	-	-	1,716
2b.1.5	Receive NRC approval of termination plan									a											
2b.1	Subtotal Period 2b Activity Costs	7,238	20,694	1,021	2,263	28,185	5,853	206	14,931	80,392	80,096	-	296	207,568	50,271	-	-	-	11,152,890	546,874	1,716
Period 2b Additional Costs																					
2b.2.1	Remedial Action Surveys	-	-	-	-	-	-	2,826	848	3,674	3,674	-	-	-	-	-	-	-	-	49,546	-
2b.2.2	Fuel Inspection & Failed Fuel Containerization	-	-	-	-	-	-	936	140	1,076	1,076	-	-	-	-	-	-	-	-	-	-
2b.2.3	Excavation of Underground Services	-	1,207	-	-	-	-	253	219	1,679	-	-	1,679	-	-	-	-	-	-	7,000	-
2b.2.4	Operational Tools & Equipment	-	-	10	22	587	-	-	92	711	711	-	-	5,855	-	-	-	-	175,650	16	-
2b.2	Subtotal Period 2b Additional Costs	-	1,207	10	22	587	-	4,015	1,299	7,140	5,461	-	1,679	5,855	-	-	-	-	175,650	56,561	-
Period 2b Collateral Costs																					
2b.3.1	Process decommissioning water waste	201	-	137	378	-	542	-	306	1,564	1,564	-	-	-	1,294	-	-	-	77,670	252	-
2b.3.2	Process decommissioning chemical flush waste	2	-	58	228	-	426	-	147	861	861	-	-	-	573	-	-	-	61,019	107	-
2b.3.3	Small tool allowance	-	395	-	-	-	-	-	59	455	455	-	-	-	-	-	-	-	-	-	-
2b.3.4	Spent Fuel Capital and Transfer	-	-	-	-	-	-	14,170	2,126	16,296	-	16,296	-	-	-	-	-	-	-	-	-
2b.3.5	On-site survey and release of 0.0 tons clean metallic waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b.3	Subtotal Period 2b Collateral Costs	203	395	195	606	-	968	14,170	2,639	19,175	2,880	16,296	-	-	1,867	-	-	-	138,689	360	-
Period 2b Period-Dependent Costs																					
2b.4.1	Decon supplies	2,330	-	-	-	-	-	-	582	2,912	2,912	-	-	-	-	-	-	-	-	-	-
2b.4.2	Insurance	-	-	-	-	-	-	916	92	1,007	1,007	-	-	-	-	-	-	-	-	-	-
2b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b.4.4	Health physics supplies	-	4,125	-	-	-	-	-	1,031	5,156	5,156	-	-	-	-	-	-	-	-	-	-
2b.4.5	Heavy equipment rental	-	5,063	-	-	-	-	-	760	5,823	5,823	-	-	-	-	-	-	-	-	-	-
2b.4.6	Disposal of DAW generated	-	-	214	47	-	863	-	244	1,368	1,368	-	-	-	9,485	-	-	-	189,697	309	-
2b.4.7	Plant energy budget	-	-	-	-	-	-	1,083	163	1,246	1,246	-	-	-	-	-	-	-	-	-	-
2b.4.8	NRC Fees	-	-	-	-	-	-	938	94	1,032	1,032	-	-	-	-	-	-	-	-	-	-
2b.4.9	Emergency Planning Fees	-	-	-	-	-	-	528	53	580	-	580	-	-	-	-	-	-	-	-	-
2b.4.10	Spent Fuel Pool O&M	-	-	-	-	-	-	1,868	280	2,148	-	2,148	-	-	-	-	-	-	-	-	-
2b.4.11	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	470	71	541	541	-	-	-	-	-	-	-	-	-	-
2b.4.12	ISFSI Operating Costs	-	-	-	-	-	-	122	18	141	-	141	-	-	-	-	-	-	-	-	-
2b.4.13	Security Staff Cost	-	-	-	-	-	-	31,488	4,723	36,211	36,211	-	-	-	-	-	-	-	-	-	618,974
2b.4.14	DOC Staff Cost	-	-	-	-	-	-	30,856	4,628	35,484	35,484	-	-	-	-	-	-	-	-	-	350,272
2b.4.15	Utility Staff Cost	-	-	-	-	-	-	51,107	7,666	58,773	58,773	-	-	-	-	-	-	-	-	-	650,162
2b.4	Subtotal Period 2b Period-Dependent Costs	2,330	9,189	214	47	-	863	119,376	20,405	152,422	149,554	2,869	-	-	9,485	-	-	-	189,697	309	1,619,408
2b.0	TOTAL PERIOD 2b COST	9,771	31,485	1,439	2,938	28,772	7,684	137,768	39,273	259,130	237,991	19,164	1,975	213,423	61,623	-	-	-	11,656,920	604,104	1,621,125
PERIOD 2d - Decontamination Following Wet Fuel Storage																					
Period 2d Direct Decommissioning Activities																					
2d.1.1	Remove spent fuel racks	550	50	167	311	-	2,655	-	1,015	4,748	4,748	-	-	-	10,882	-	-	-	691,330	1,288	-
Disposal of Plant Systems																					
2d.1.2.1	Electrical Clean Spent Fuel	-	1,767	37	90	2,716	-	-	866	5,476	5,476	-	-	20,027	-	-	-	-	813,315	33,384	-
2d.1.2.2	Fire Protection - Other Buildings (2X43)	-	61	-	-	-	-	-	9	71	-	-	71	-	-	-	-	-	-	1,585	-
2d.1.2.3	Fire Protection - Yard Structures (Y43)	-	86	-	-	-	-	-	13	99	-	-	99	-	-	-	-	-	-	2,089	-
2d.1.2.4	Fuel Pool Cooling (2G41)	-	332	26	35	248	231	-	186	1,059	1,059	-	-	1,829	940	-	-	-	134,429	7,157	-
2d.1.2.5	Reactor Spent Fuel HVAC	-	38	2	3	65	9	-	22	139	139	-	-	481	37	-	-	-	21,958	792	-
2d.1.2	Totals	-	2,284	65	129	3,030	240	-	1,097	6,844	6,675	-	169	22,337	978	-	-	-	969,702	45,007	-
Decontamination of Site Buildings																					
2d.1.3.1	Reactor (post fuel)	321	960	86	745	160	3,626	-	1,451	7,348	7,348	-	-	1,178	35,354	-	-	-	1,539,031	24,526	-
2d.1.3	Totals	321	960	86	745	160	3,626	-	1,451	7,348	7,348	-	-	1,178	35,354	-	-	-	1,539,031	24,526	-
2d.1.4	Scaffolding in support of decommissioning	-	712	10	3	63	9	-	191	989	989	-	-	420	37	-	-	-	21,229	9,192	-
2d.1	Subtotal Period 2d Activity Costs	871	4,006	328	1,188	3,253	6,530	-	3,754	19,929	19,760	-	169	23,935	47,252	-	-	-	3,221,293	80,014	-
Period 2d Additional Costs																					
2d.2.1	License Termination Survey Planning	-	-	-	-	-	-	1,129	339	1,468	1,468	-	-	-	-	-	-	-	-	-	6,240
2d.2.2	Remedial Action Surveys	-	-	-	-	-	-	653	196	849	849	-	-	-	-	-	-	-	-	11,447	-
2d.2.3	Soil Remediation	-	114	30	2,879	-	5,159	-	1,753	9,935	9,935	-	-	-	81,709	-	-	-	6,373,290	1,459	-
2d.2.4	Spare Low Pressure Turbine Rotor Disposal	-	-	240	395	-	2,154	-	622	3,410	3,410	-	-	-	6,816	-	-	-	1,704,000	3,072	-
2d.2.5	Solid Waste Landfill #2 Closure/Post-closure	-	-	-	-	-	-	2,761	414	3,175	-	-	3,175	-	-	-	-	-	-	-	-
2d.2.6	SFP non-fuel cleanout	-	-	-	-	-	-	4,900	1,470	6,370	6,370	-	-	-	-	-	-	-	-	-	-
2d.2	Subtotal Period 2d Additional Costs	-	114	269	3,273	-	7,313	9,443	4,794	25,207	22,031	-	3,175	-	88,525	-	-	-	8,077,290	15,978	6,240
Period 2d Collateral Costs																					
2d.3.1	Process decommissioning water waste	77	-	53	145	-	209	-	118	601	601	-	-	-	498	-	-	-	29,886	97	-
2d.3.2	Process decommissioning chemical flush waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-2
Hatch Nuclear Plant Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2018 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 2d Collateral Costs (Continued)																					
2d.3.3	Small tool allowance	-	67	-	-	-	-	-	10	77	77	-	-	-	-	-	-	-	-	-	-
2d.3.4	Decommissioning Equipment Disposition	-	-	148	50	902	129	-	190	1,418	1,418	-	-	6,000	529	-	-	-	303,608	147	-
2d.3.5	Spent Fuel Capital and Transfer	-	-	-	-	-	-	604	91	694	-	694	-	-	-	-	-	-	-	-	-
2d.3	Subtotal Period 2d Collateral Costs	77	67	200	195	902	338	604	408	2,791	2,097	694	-	6,000	1,027	-	-	-	333,494	244	-
Period 2d Period-Dependent Costs																					
2d.4.1	Decon supplies	88	-	-	-	-	-	-	22	110	110	-	-	-	-	-	-	-	-	-	-
2d.4.2	Insurance	-	-	-	-	-	-	219	22	240	240	-	-	-	-	-	-	-	-	-	-
2d.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2d.4.4	Health physics supplies	-	725	-	-	-	-	-	181	906	906	-	-	-	-	-	-	-	-	-	-
2d.4.5	Heavy equipment rental	-	1,209	-	-	-	-	-	181	1,390	1,390	-	-	-	-	-	-	-	-	-	-
2d.4.6	Disposal of DAW generated	-	-	57	12	-	229	-	65	364	364	-	-	-	2,521	-	-	-	50,418	82	-
2d.4.7	Plant energy budget	-	-	-	-	-	-	138	21	159	159	-	-	-	-	-	-	-	-	-	-
2d.4.8	NRC Fees	-	-	-	-	-	-	186	19	204	204	-	-	-	-	-	-	-	-	-	-
2d.4.9	Emergency Planning Fees	-	-	-	-	-	-	63	6	69	-	69	-	-	-	-	-	-	-	-	-
2d.4.10	Liquid Radwaste Processing Equipment/Services	-	-	-	-	-	-	225	34	258	258	-	-	-	-	-	-	-	-	-	-
2d.4.11	ISFSI Operating Costs	-	-	-	-	-	-	29	4	34	-	34	-	-	-	-	-	-	-	-	-
2d.4.12	Security Staff Cost	-	-	-	-	-	-	1,032	155	1,187	216	971	-	-	-	-	-	-	-	-	20,618
2d.4.13	DOC Staff Cost	-	-	-	-	-	-	5,062	759	5,822	5,822	-	-	-	-	-	-	-	-	-	57,271
2d.4.14	Utility Staff Cost	-	-	-	-	-	-	9,184	1,378	10,562	10,055	507	-	-	-	-	-	-	-	-	109,388
2d.4	Subtotal Period 2d Period-Dependent Costs	88	1,934	57	12	-	229	16,138	2,847	21,305	19,724	1,581	-	-	2,521	-	-	-	50,418	82	187,277
2d.0	TOTAL PERIOD 2d COST	1,037	6,121	855	4,669	4,154	14,410	26,185	11,802	69,232	63,612	2,275	3,345	29,935	139,324	-	-	-	11,682,490	96,318	193,517
PERIOD 2f - License Termination																					
Period 2f Direct Decommissioning Activities																					
2f.1.1	ORISE confirmatory survey	-	-	-	-	-	-	165	50	215	215	-	-	-	-	-	-	-	-	-	-
2f.1.2	Terminate license	-	-	-	-	-	-	-	-	a	-	-	-	-	-	-	-	-	-	-	-
2f.1	Subtotal Period 2f Activity Costs	-	-	-	-	-	-	165	50	215	215	-	-	-	-	-	-	-	-	-	-
Period 2f Additional Costs																					
2f.2.1	License Termination Survey	-	-	-	-	-	-	7,392	2,218	9,609	9,609	-	-	-	-	-	-	-	-	151,256	3,120
2f.2	Subtotal Period 2f Additional Costs	-	-	-	-	-	-	7,392	2,218	9,609	9,609	-	-	-	-	-	-	-	-	151,256	3,120
Period 2f Collateral Costs																					
2f.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,494	224	1,718	1,718	-	-	-	-	-	-	-	-	-	-
2f.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	317	48	365	-	365	-	-	-	-	-	-	-	-	-
2f.3	Subtotal Period 2f Collateral Costs	-	-	-	-	-	-	1,812	272	2,083	1,718	365	-	-	-	-	-	-	-	-	-
Period 2f Period-Dependent Costs																					
2f.4.1	Insurance	-	-	-	-	-	-	299	30	329	329	-	-	-	-	-	-	-	-	-	-
2f.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2f.4.3	Health physics supplies	-	753	-	-	-	-	-	188	941	941	-	-	-	-	-	-	-	-	-	-
2f.4.4	Disposal of DAW generated	-	-	8	2	-	31	-	9	49	49	-	-	-	337	-	-	-	6,734	11	-
2f.4.5	Plant energy budget	-	-	-	-	-	-	94	14	109	109	-	-	-	-	-	-	-	-	-	-
2f.4.6	NRC Fees	-	-	-	-	-	-	281	28	309	309	-	-	-	-	-	-	-	-	-	-
2f.4.7	Emergency Planning Fees	-	-	-	-	-	-	86	9	95	-	95	-	-	-	-	-	-	-	-	-
2f.4.8	ISFSI Operating Costs	-	-	-	-	-	-	40	6	46	-	46	-	-	-	-	-	-	-	-	-
2f.4.9	Security Staff Cost	-	-	-	-	-	-	1,558	234	1,791	310	1,482	-	-	-	-	-	-	-	-	28,208
2f.4.10	DOC Staff Cost	-	-	-	-	-	-	4,154	623	4,777	4,777	-	-	-	-	-	-	-	-	-	46,622
2f.4.11	Utility Staff Cost	-	-	-	-	-	-	5,178	777	5,955	5,413	542	-	-	-	-	-	-	-	-	59,942
2f.4	Subtotal Period 2f Period-Dependent Costs	-	753	8	2	-	31	11,691	1,917	14,401	12,237	2,164	-	-	337	-	-	-	6,734	11	134,773
2f.0	TOTAL PERIOD 2f COST	-	753	8	2	-	31	21,059	4,456	26,308	23,779	2,529	-	-	337	-	-	-	6,734	151,267	137,893
PERIOD 2 TOTALS		11,662	73,298	21,031	16,276	65,730	80,096	289,433	122,597	680,123	633,274	40,153	6,696	464,419	292,467	2,275	1,066	-	39,147,930	1,269,363	3,176,145
PERIOD 3b - Site Restoration																					
Period 3b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
3b.1.1.1	Reactor	-	2,096	-	-	-	-	-	314	2,411	-	-	2,411	-	-	-	-	-	-	17,076	-
3b.1.1.2	Additional Structures_2018	-	402	-	-	-	-	-	60	463	-	-	463	-	-	-	-	-	-	3,640	-
3b.1.1.3	Condensate Storage Tank Enclosure	-	133	-	-	-	-	-	20	153	-	-	153	-	-	-	-	-	-	765	-
3b.1.1.4	Control Building	-	1,337	-	-	-	-	-	201	1,537	-	-	1,537	-	-	-	-	-	-	10,939	-
3b.1.1.5	Cooling Towers & Canal	-	1,882	-	-	-	-	-	282	2,164	-	-	2,164	-	-	-	-	-	-	21,199	-
3b.1.1.6	Diesel Generator Building	-	721	-	-	-	-	-	108	830	-	-	830	-	-	-	-	-	-	4,191	-
3b.1.1.7	Flow Loop Building	-	74	-	-	-	-	-	11	85	-	-	85	-	-	-	-	-	-	1,130	-
3b.1.1.8	Guard Houses	-	3	-	-	-	-	-	0	3	-	-	3	-	-	-	-	-	-	48	-
3b.1.1.9	Helper Cooling Tower	-	398	-	-	-	-	-	60	458	-	-	458	-	-	-	-	-	-	3,586	-

Table C-2
Hatch Nuclear Plant Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2018 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Demolition of Remaining Site Buildings (Continued)																					
3b.1.1.10	Hot Machine Shop & R.R. Airlock	-	195	-	-	-	-	-	29	224	-	-	224	-	-	-	-	-	-	1,675	-
3b.1.1.11	Intake	-	299	-	-	-	-	-	45	344	-	-	344	-	-	-	-	-	-	1,891	-
3b.1.1.12	Land-sea Container Pad	-	10	-	-	-	-	-	1	11	-	-	11	-	-	-	-	-	-	69	-
3b.1.1.13	Low Level Radwaste Storage	-	177	-	-	-	-	-	27	204	-	-	204	-	-	-	-	-	-	2,790	-
3b.1.1.14	Main Stack	-	302	-	-	-	-	-	45	347	-	-	347	-	-	-	-	-	-	1,746	-
3b.1.1.15	Maintenance Support	-	37	-	-	-	-	-	5	42	-	-	42	-	-	-	-	-	-	212	-
3b.1.1.16	Misc. Site Structures (Added in 2015)	-	86	-	-	-	-	-	13	99	-	-	99	-	-	-	-	-	-	1,198	-
3b.1.1.17	Miscellaneous Site Structures	-	3,840	-	-	-	-	-	576	4,416	-	-	4,416	-	-	-	-	-	-	40,237	-
3b.1.1.18	Off Gas Recombiner Building	-	483	-	-	-	-	-	72	555	-	-	555	-	-	-	-	-	-	3,155	-
3b.1.1.19	Radwaste Building	-	898	-	-	-	-	-	135	1,033	-	-	1,033	-	-	-	-	-	-	7,096	-
3b.1.1.20	Radwaste Solidification Pad	-	3	-	-	-	-	-	1	4	-	-	4	-	-	-	-	-	-	56	-
3b.1.1.21	Service Building	-	364	-	-	-	-	-	55	419	-	-	419	-	-	-	-	-	-	4,128	-
3b.1.1.22	Support Building	-	61	-	-	-	-	-	9	71	-	-	71	-	-	-	-	-	-	351	-
3b.1.1.23	Tank Pads & Foundations	-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	200	-
3b.1.1.24	Technical Support Center	-	31	-	-	-	-	-	5	36	-	-	36	-	-	-	-	-	-	447	-
3b.1.1.25	Turbine Building	-	2,004	-	-	-	-	-	301	2,304	-	-	2,304	-	-	-	-	-	-	15,042	-
3b.1.1.26	Turbine Pedestal	-	404	-	-	-	-	-	61	464	-	-	464	-	-	-	-	-	-	2,338	-
3b.1.1.27	Waste Gas Treatment Building	-	350	-	-	-	-	-	52	402	-	-	402	-	-	-	-	-	-	2,542	-
3b.1.1.28	Wastewater Discharge	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	66	-
3b.1.1.29	Water Treatment Plant	-	88	-	-	-	-	-	13	101	-	-	101	-	-	-	-	-	-	1,288	-
3b.1.1	Totals	-	16,720	-	-	-	-	-	2,508	19,228	-	-	19,228	-	-	-	-	-	-	149,101	-
Site Closeout Activities																					
3b.1.2	Remove Rubble	-	383	-	-	-	-	-	57	441	-	-	441	-	-	-	-	-	-	2,089	-
3b.1.3	Grade & landscape site	-	1,246	-	-	-	-	-	187	1,433	-	-	1,433	-	-	-	-	-	-	2,630	-
3b.1.4	Final report to NRC	-	-	-	-	-	-	79	12	90	90	-	-	-	-	-	-	-	-	-	654
3b.1	Subtotal Period 3b Activity Costs	-	18,350	-	-	-	-	79	2,764	21,192	90	-	21,102	-	-	-	-	-	-	153,819	654
Period 3b Additional Costs																					
3b.2.1	Concrete Crushing	-	1,106	-	-	-	-	8	167	1,281	-	-	1,281	-	-	-	-	-	-	5,463	-
3b.2.2	Cofferdam - Service Water Intake	-	249	-	-	-	-	-	37	287	-	-	287	-	-	-	-	-	-	1,936	-
3b.2.3	Vehicle Barrier Disposition	-	225	-	-	-	-	-	34	259	-	-	259	-	-	-	-	-	-	2,640	-
3b.2.4	Construction Debris	-	-	-	-	-	-	2,828	424	3,252	-	-	3,252	-	-	-	-	-	-	-	-
3b.2	Subtotal Period 3b Additional Costs	-	1,580	-	-	-	-	2,836	662	5,079	-	-	5,079	-	-	-	-	-	-	10,039	-
Period 3b Collateral Costs																					
3b.3.1	Small tool allowance	-	118	-	-	-	-	-	18	136	-	-	136	-	-	-	-	-	-	-	-
3b.3.2	Spent Fuel Capital and Transfer	-	-	-	-	-	-	799	120	919	-	919	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	-	118	-	-	-	-	799	138	1,055	-	919	136	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Insurance	-	-	-	-	-	-	409	41	450	450	-	-	-	-	-	-	-	-	-	-
3b.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3b.4.3	Heavy equipment rental	-	6,160	-	-	-	-	-	924	7,084	-	-	7,084	-	-	-	-	-	-	-	-
3b.4.4	Plant energy budget	-	-	-	-	-	-	129	19	148	-	148	-	-	-	-	-	-	-	-	-
3b.4.5	NRC ISFSI Fees	-	-	-	-	-	-	234	23	258	-	258	-	-	-	-	-	-	-	-	-
3b.4.6	Emergency Planning Fees	-	-	-	-	-	-	236	24	259	-	259	-	-	-	-	-	-	-	-	-
3b.4.7	ISFSI Operating Costs	-	-	-	-	-	-	109	16	126	-	126	-	-	-	-	-	-	-	-	-
3b.4.8	Security Staff Cost	-	-	-	-	-	-	4,218	633	4,850	-	4,050	800	-	-	-	-	-	-	-	77,137
3b.4.9	DOC Staff Cost	-	-	-	-	-	-	10,492	1,574	12,066	-	-	12,066	-	-	-	-	-	-	-	113,562
3b.4.10	Utility Staff Cost	-	-	-	-	-	-	6,380	957	7,337	-	1,482	5,855	-	-	-	-	-	-	-	72,316
3b.4	Subtotal Period 3b Period-Dependent Costs	-	6,160	-	-	-	-	22,207	4,211	32,578	450	6,323	25,806	-	-	-	-	-	-	-	263,015
3b.0	TOTAL PERIOD 3b COST	-	26,208	-	-	-	-	25,921	7,775	59,904	540	7,242	52,122	-	-	-	-	-	-	163,858	263,668
PERIOD 3c - Fuel Storage Operations/Shipping																					
Period 3c Direct Decommissioning Activities																					
No direct activities in this period																					
3c.1	Subtotal Period 3c Activity Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3c Additional Costs																					
No additional costs in this period																					
3c.2	Subtotal Period 3c Additional Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3c Collateral Costs																					
3c.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	11,087	1,663	12,750	-	12,750	-	-	-	-	-	-	-	-	-
3c.3	Subtotal Period 3c Collateral Costs	-	-	-	-	-	-	11,087	1,663	12,750	-	12,750	-	-	-	-	-	-	-	-	-

Table C-2
Hatch Nuclear Plant Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2018 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 3c Period-Dependent Costs																					
3c.4.1	Insurance	-	-	-	-	-	-	5,492	549	6,041	-	6,041	-	-	-	-	-	-	-	-	-
3c.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3c.4.4	NRC ISFSI Fees	-	-	-	-	-	-	4,639	464	5,103	-	5,103	-	-	-	-	-	-	-	-	-
3c.4.5	Emergency Planning Fees	-	-	-	-	-	-	3,164	316	3,480	-	3,480	-	-	-	-	-	-	-	-	-
3c.4.6	ISFSI Operating Costs	-	-	-	-	-	-	1,466	220	1,686	-	1,686	-	-	-	-	-	-	-	-	-
3c.4.7	Security Staff Cost	-	-	-	-	-	-	47,304	7,096	54,399	-	54,399	-	-	-	-	-	-	-	-	863,343
3c.4.8	Utility Staff Cost	-	-	-	-	-	-	17,287	2,593	19,880	-	19,880	-	-	-	-	-	-	-	-	194,252
3c.4	Subtotal Period 3c Period-Dependent Costs	-	-	-	-	-	-	79,351	11,238	90,589	-	90,589	-	-	-	-	-	-	-	-	1,057,595
3c.0	TOTAL PERIOD 3c COST	-	-	-	-	-	-	90,438	12,901	103,339	-	103,339	-	-	-	-	-	-	-	-	1,057,595
PERIOD 3d - GTCC shipping																					
Period 3d Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
3d.1.1.1	Vessel & Internals GTCC Disposal	-	-	422	-	-	4,948	-	848	6,218	6,218	-	-	-	-	-	-	1,225	244,357	-	-
3d.1.1	Totals	-	-	422	-	-	4,948	-	848	6,218	6,218	-	-	-	-	-	-	1,225	244,357	-	-
3d.1	Subtotal Period 3d Activity Costs	-	-	422	-	-	4,948	-	848	6,218	6,218	-	-	-	-	-	-	1,225	244,357	-	-
Period 3d Additional Costs																					
No additional costs in this period																					
3d.2	Subtotal Period 3d Additional Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3d Collateral Costs																					
3d.3.1	Spent Fuel Capital and Transfer	-	-	-	-	-	-	40	6	47	-	47	-	-	-	-	-	-	-	-	-
3d.3	Subtotal Period 3d Collateral Costs	-	-	-	-	-	-	40	6	47	-	47	-	-	-	-	-	-	-	-	-
Period 3d Period-Dependent Costs																					
3d.4.1	Insurance	-	-	-	-	-	-	8	1	8	8	-	-	-	-	-	-	-	-	-	-
3d.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3d.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3d.4.4	NRC ISFSI Fees	-	-	-	-	-	-	4	0	5	-	5	-	-	-	-	-	-	-	-	-
3d.4.5	Emergency Planning Fees	-	-	-	-	-	-	4	0	5	-	5	-	-	-	-	-	-	-	-	-
3d.4.6	ISFSI Operating Costs	-	-	-	-	-	-	2	0	2	-	2	-	-	-	-	-	-	-	-	-
3d.4.7	Security Staff Cost	-	-	-	-	-	-	74	11	85	85	-	-	-	-	-	-	-	-	-	1,197
3d.4.8	Utility Staff Cost	-	-	-	-	-	-	24	4	28	28	-	-	-	-	-	-	-	-	-	269
3d.4	Subtotal Period 3d Period-Dependent Costs	-	-	-	-	-	-	116	17	133	121	12	-	-	-	-	-	-	-	-	1,466
3d.0	TOTAL PERIOD 3d COST	-	-	422	-	-	4,948	157	870	6,397	6,339	59	-	-	-	-	-	1,225	244,357	-	1,466
PERIOD 3e - ISFSI Decontamination																					
Period 3e Direct Decommissioning Activities																					
No direct activities in this period																					
3e.1	Subtotal Period 3e Activity Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3e Additional Costs																					
3e.2.1	License Termination ISFSI	-	271	247	1,648	-	2,821	1,524	1,628	8,138	8,138	-	-	-	55,633	-	-	-	2,971,535	11,603	1,233
3e.2	Subtotal Period 3e Additional Costs	-	271	247	1,648	-	2,821	1,524	1,628	8,138	8,138	-	-	-	55,633	-	-	-	2,971,535	11,603	1,233
Period 3e Collateral Costs																					
3e.3	Subtotal Period 3e Collateral Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 3e Period-Dependent Costs																					
3e.4.1	Insurance	-	-	-	-	-	-	43	11	54	54	-	-	-	-	-	-	-	-	-	-
3e.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3e.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3e.4.4	Security Staff Cost	-	-	-	-	-	-	153	38	191	191	-	-	-	-	-	-	-	-	-	2,500
3e.4.5	Utility Staff Cost	-	-	-	-	-	-	170	42	212	212	-	-	-	-	-	-	-	-	-	1,896
3e.4	Subtotal Period 3e Period-Dependent Costs	-	-	-	-	-	-	366	91	457	457	-	-	-	-	-	-	-	-	-	4,396
3e.0	TOTAL PERIOD 3e COST	-	271	247	1,648	-	2,821	1,890	1,719	8,595	8,595	-	-	-	55,633	-	-	-	2,971,535	11,603	5,628
PERIOD 3f - ISFSI Site Restoration																					
Period 3f Direct Decommissioning Activities																					
No direct activities in this period																					
3f.1	Subtotal Period 3f Activity Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-2
Hatch Nuclear Plant Unit 2
DECON Decommissioning Cost Estimate
(Thousands of 2018 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes				Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
															Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet			
Period 3f Additional Costs																					
3f.2.1	Site Restoration ISFSI	-	2,792	-	-	-	-	440	485	3,717	-	-	3,717	-	-	-	-	-	-	34,821	80
3f.2	Subtotal Period 3f Additional Costs	-	2,792	-	-	-	-	440	485	3,717	-	-	3,717	-	-	-	-	-	-	34,821	80
Period 3f Collateral Costs																					
3f.3.1	Small tool allowance	-	40	-	-	-	-	-	6	46	-	-	46	-	-	-	-	-	-	-	-
3f.3	Subtotal Period 3f Collateral Costs	-	40	-	-	-	-	-	6	46	-	-	46	-	-	-	-	-	-	-	-
Period 3f Period-Dependent Costs																					
3f.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3f.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3f.4.3	Plant energy budget	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3f.4.4	Security Staff Cost	-	-	-	-	-	-	76	11	87	-	-	87	-	-	-	-	-	-	-	1,239
3f.4.5	Utility Staff Cost	-	-	-	-	-	-	73	11	84	-	-	84	-	-	-	-	-	-	-	769
3f.4	Subtotal Period 3f Period-Dependent Costs	-	-	-	-	-	-	149	22	171	-	-	171	-	-	-	-	-	-	-	2,009
3f.0	TOTAL PERIOD 3f COST	-	2,832	-	-	-	-	589	513	3,935	-	-	3,935	-	-	-	-	-	-	34,821	2,089
PERIOD 3 TOTALS		-	29,311	669	1,648	-	7,769	118,995	23,779	182,171	15,474	110,640	56,057	-	55,633	-	-	1,225	3,215,892	210,282	1,330,446
TOTAL COST TO DECOMMISSION		15,056	105,447	21,773	18,098	65,730	88,869	515,504	164,017	994,494	768,428	162,917	63,150	464,419	349,312	2,524	1,066	1,225	42,424,380	1,493,617	5,516,095

TOTAL COST TO DECOMMISSION WITH 19.75% CONTINGENCY:	\$994,494	thousands of 2018	dollars
TOTAL NRC LICENSE TERMINATION COST IS 77.27% OR:	\$768,428	thousands of 2018	dollars
SPENT FUEL MANAGEMENT COST IS 16.38% OR:	\$162,917	thousands of 2018	dollars
NON-NUCLEAR DEMOLITION COST IS 6.35% OR:	\$63,150	thousands of 2018	dollars
TOTAL PRIMARY SITE RADWASTE VOLUME BURIED:	153,034	Cubic Feet	
TOTAL PRIMARY SITE RADWASTE WEIGHT BURIED:	10,789,024	Pounds	
TOTAL SECONDARY SITE RADWASTE VOLUME BURIED:	199,868	Cubic Feet	
TOTAL SECONDARY SITE RADWASTE WEIGHT BURIED:	11,711,351	Pounds	
TOTAL TERTIARY SITE RADWASTE VOLUME BURIED:	0	Cubic Feet	
TOTAL TERTIARY SITE RADWASTE WEIGHT BURIED:	0	Pounds	
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,225	Cubic Feet	
TOTAL SCRAP METAL REMOVED:	40,837	Tons	
TOTAL CRAFT LABOR REQUIREMENTS:	1,493,617	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
REQUIRED INFORMATION

APPENDIX D REQUIRED INFORMATION

In accordance with Title 10 of the Code of Federal Regulations (10CFR), §50.75(g), reporting and recordkeeping for decommissioning planning, each licensee will maintain records of information “important to the safe and effective decommissioning of the facility.” Information considered important includes “records of spill or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site. These records may be limited to instances when significant contamination remains after any cleanup procedures or when there is reasonable likelihood that contaminants may have spread to inaccessible areas as in the case of possible seepage into porous materials such as concrete.” SNC maintains drawings of structures that may be affected by these occurrences. A list of structures that are considered contaminated and may require decontamination is provided in Tables C-1 and C-2, Periods 2b and 2c (“Decontamination of Site Buildings”). In accordance with this requirement SNC has identified the following information:

1. In 1978 an 8-inch Off-gas Line between the Turbine Building and Recombiner Building cracked due to Turbine Building settlement resulting in the release of off-gas vapor. The line was abandoned in place and a second off-gas line run.
2. In 1979 radioactive water leaked outside the Turbine Building from an abandoned buried nitrogen inerting line.
3. In 1979 a Unit 1 Condensate Transfer Pump seal failure resulted in the release of 1,000 gallons of radioactive water to the surrounding soil.
4. In 1986 loss of the Spent Fuel Pool inventory resulted in the contamination of an estimated quarter square mile area of the on-site swamp.
5. Seven pieces of concrete rubble originated from demolition performed in 1997 during remodeling of the Plant Hatch Unit 1 radwaste building. Surveys were performed prior to its release. A check was performed at the site landfill and found this concrete rubble to contain about 1,000 to 1,200 dpm/probe area using similar survey techniques used when the material was released. The seven pieces of contaminated concrete rubble were retrieved from the landfill, and disposed of as radioactive waste. Management halted the disposal of concrete from the radwaste building demolition project in the owner-controlled landfill.
6. In 1987 a Unit 2 Condensate Storage Tank leak resulted in the release of 276,000 gallons of radioactive water, which was initially confined within the

concrete walls surrounding the tank. The walls were not able to retain the water due to penetrations in the wall, which resulted in the contamination of soil surrounding the tank.

7. In 1998, it was discovered that the Unit 2 Circulation H₂O blowdown check valve 2N71-F008 was internally contaminated. This valve is located in the yard in a valve pit and was previously considered to be uncontaminated. It is believed that this was caused by discharge of Unit 2 liquid radwaste tanks into the Unit 2 dilution water line upstream of the mixing sump while Unit 2 dilution flow was secured for maintenance. (Unit 1 dilution flow was providing dilution in the mixing sump for mixing with the Unit 2 liquid radwaste discharge.) This allowed liquid radwaste to back up in the Unit 2 dilution line to the check valve and contaminate it. This mode of discharge was implemented due to the Unit 2 dual division service water outage, during which no source of dilution water was available on Unit 2.
8. In 2002, soil from the east side of the reactor buildings was found to be contaminated while preparing the road for transportation of spent fuel casks. The contaminated soil was found in spots extending from the reactor buildings to the waste gas treatment building. The soil and building debris was boxed and shipped offsite to a radwaste processor. The source of the contamination is unknown and there is a potential that additional contamination could exist in the same area.
9. In 2003, tritium levels spiked from ground water sampling from a well located on the southwest side of the Unit 1 CST moat. The source of the increased levels are not definitively known, but may be from a continuous small leak or sporadic leak associated with the Unit 1 CST or piping, or residual contamination from a SFP spill in the mid-1980's that has gradually seeped down to the well over the years. There is the potential that soil in the vicinity of the CST is contaminated and will require removal and disposal.
10. In 2004, a demineralizer water line failed in the Unit 1 radwaste processing Building and overfilled the moat inside the building. Approximately 5,610 gallons of slightly radioactive water spilled from the moat. Some of the water was absorbed into the ground and pavement surrounding the Processing Building. The affected contaminated dirt from the abnormal release was excavated and disposed of as Dry Activated Waste.
11. Southern Nuclear informed the Nuclear Regulatory Commission (NRC) by letter NL-06-2307, dated October 10, 2006, that it completed reconciliation of the Hatch physical inventory of spent nuclear fuel with the corresponding special nuclear material inventory records. The notification concluded an extensive inventory conducted as a follow-up to a November, 2005, initial notification to the NRC of a discrepancy between the amount of spent fuel in

inventory versus the amount on record. The results concluded that fuel material equivalent to approximately 18 inches remains unaccounted for. While small portions of the 18 inches may have been inadvertently shipped to a licensed waste disposal facility, Southern Nuclear believes that the balance of the unaccounted for material remains in the spent fuel pools in areas that are either unobservable by camera or otherwise inaccessible. Future plant activities and preparations for low-level waste shipments will take into account the possibility of the material's presence in the pools, and any residual amount will be retrieved when the plant is decommissioned.

12. In the mid-2005 – 2006 timeframe a U-1 CST transfer pump recirculation line leak and weld crack resulted in an unknown volume of seepage of CST water to the surrounding soil. The leaks were repaired and the tritium levels have decreased.
13. In April 2007 sampling in vicinity of west side of U2 CST showed a tritium increase. Adjacent monitoring wells results indicate previous background levels. Increase in tritium activity is possibly due to water in pump moat seeping through to the ground under the slab.
14. In December 2007 it was determined that approximately 3,600 gallons of water had been release to the soil near the discharge structure. Only tritium was detected.
15. In March 2008 it was determined that there was excess tritium concentrations in pullboxes near the U2 CST. Highest concentrations occurred in the pullbox nearest the U2 CST transfer pump moat (all pullboxes were connected with various cable conduits). Source of water is believed to be from the pump moat which resulted from a transfer pump seal leak. In April 2010 tritium results from pullbox monitoring yielded 316,780 pCi/L (previously reading 2,390 pCi/L). Pump/valve leaks inside Unit 2 CST pump moat found to be leaking and entering concrete cracks that lead to conduit routed to PB2-AU. Leaks repaired, moat structurally repaired, and monitoring continues on pullboxes. ^[39]
16. In May 2008, the subsurface outfall underground collection tank (next to discharge structure) overflowed onto surrounding soil due to pump failure.
17. Radioactive material has been stored on the entire east side of the Waste Gas Treatment Building (WGBT) extending out from the building in an eastward direction equal to the most eastern side of the Main Stack. There have been no leaks or spills identified in this area however, there is the potential that the transfer of radioactive material from RAM containers stored in the area may have been transferred to the soil (identified in May 2012).

18. In April of 2009 elevated tritium activity was discovered in well T3 with a concentration of 36,500 pCi/L. Sample frequency at this sample point was increased to monitor trends in order to evaluate further corrective actions.
19. In April of 2010 tritium results from pullbox PB2-AU were found to be 316,870 pCi/L. The water was pumped from PB2-AU and processed in Radwaste.
20. In December of 2012 routine sampling of groundwater well T11 and T12 discovered tritium levels at 4.8E6 and 5.7E6, respectively. Wells T11 and T12 and other wells around U1 CST were pumped for weeks and the tritiated groundwater was collected and processed through the plant radwaste system.
21. In February of 2013 collection tank 1Y22N008A overflowed due to permanent pump malfunction. Total tritium activity was approximately 6,000 pCi/L. The water soaked into the surrounding soil.
22. In January of 2016 routine sampling of groundwater test well, near U1 CST, discovered tritium levels of 5.059E5. Wells in the area are being sampled on an increased frequency until activity returns to pre-event levels or lower.

Events 1-5 are not expected to impact decontamination and dismantling activities at the time of decommissioning. The period prior to the cessation of plant operations should provide sufficient time for the radionuclides involved to decay to levels below those currently envisioned for remediation.

The concrete walls surrounding the Unit 2 Condensate Storage Tank will require remediation prior to dismantling as a result of Event 6. Decontamination costs for the base slab and wall surface area up to the elevation of the confined water are included in the decommissioning cost study.

The circumstances involved in Event 7 could affect both units, so the potential for contamination of this component exists on Units 1 and 2. For this reason, valve 1/2N71-F008 and piping downstream to the liquid radwaste discharge line tee should be considered potentially contaminated.

An allowance is included in the estimate for additional soil removal and disposal associated with Event 8 (approximately 1,670 cubic yards of impacted material). The soil underneath and around the Unit 1 Condensate Storage Tank may be considered potentially contaminated. An allowance is included in the estimate for additional soil removal and disposal associated with Event 9 (approximately 850 cubic yards of impacted material). The affected ground caused by the spill from Event 10 was excavated and disposed of as radioactive waste. Therefore,

remediation costs have not been included in the decommissioning study as a result of this event.

An allowance is included in the estimate for fuel inspections and containerization due to Event 11. An allowance is included in the estimate for additional soil removal and disposal contaminated soil associated with Events 12 through 16 (approximately 850 cubic yards of impacted material). Item (event) 17 is a statement of a potential contamination source. Since no leaks or spills have been identified and since the stored materials are solids, it is unlikely a leak or spill would impact a substantial volume of soil. Therefore no remediation costs have been included in the decommissioning cost study as a result of this circumstance.

Events 18-22 are not expected to impact decontamination and dismantling activities at the time of decommissioning. The period prior to the cessation of plant operations should provide sufficient time for the radionuclides involved to decay to levels below those currently envisioned for remediation.

APPENDIX E
ISFSI DECOMMISSIONING

<u>Tables</u>	<u>Page</u>
ISFSI Decommissioning Cost Estimate	E-2

Table E
Hatch Nuclear Station
ISFSI Decommissioning Cost Estimate
(thousands of 2018 dollars)

Activity Description	Removal Costs	Packaging Costs	Transport Costs	LLRW Disposal Costs	Other Costs	Total Costs	Burial Volume Class A (cubic feet)	Craft Manhours	Oversight and Contractor Manhours
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	471	471	-	-	1,312
Decontamination (activated disposition)	542	493	3,295	5,641	35	10,008	111,265	6,684	-
License Termination (radiological surveys)	-	-	-	-	2,043	2,043	-	16,522	-
Subtotal	542	493	3,295	5,641	2,549	12,521	111,265	23,206	1,312
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	499	499	-	-	1,153
Insurance	-	-	-	-	87	87	-	-	-
Property taxes	-	-	-	-	-	-	-	-	-
Plant energy budget	-	-	-	-	-	-	-	-	-
Security Staff Cost	-	-	-	-	306	306	-	-	2,500
Utility Staff Cost	-	-	-	-	339	339	-	-	1,896
Subtotal	-	-	-	-	1,231	1,231	-	-	5,549
Total (w/o contingency)	542	493	3,295	5,641	3,780	13,752	111,265	23,206	6,861
Total (w/25% contingency)	678	617	4,119	7,052	4,725	17,190	-	-	-

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