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10CFR50.75/10CFR50.82

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Possession Only License No. DPR-73
Docket Nos. 50-320

Subject: Use of TMI-2 Decommissioning Trust Fund

Based on discussions with Ms. Kristina Banovac of your staff this letter is being provided to document GPU Nuclear's justification to use the TMI-2 Decommissioning Trust Fund for disposal of three Submerged Demineralizer System (SDS) CUNO-Filters presently stored at the Idaho National Laboratory.

The SDS CUNO- filters were utilized as pre-filters in the SDS. The SDS was used to process the highly contaminated water in the TMI-2 containment basement following the TMI-2 1979 accident. These filters were used with the initial batch of water in 1981 and were replaced by sand filters in later batches. Under a 1982 agreement with the Nuclear Regulatory Commission and the Department of Energy (DOE) GPU Nuclear was able to ship "abnormal" radioactive waste, that is waste not suitable for commercial disposal, from TMI-2 to the DOE for storage, research and ultimate disposal. GPU Nuclear however remained responsible for the disposal costs. With the exception of these three pre-filters all other TMI-2 "abnormal" waste under the GPU Nuclear contract with the DOE have been dispositioned. The DOE is currently completing clean-up of the site on which these filters are stored, and thus disposal of these filters at this time is appropriate.

GPU Nuclear in establishing the TMI-2 Decommissioning Trust Fund recognized that some of the cost of decommissioning TMI-2 is a result of the accident and therefore partially funded the trust fund from GPU, not ratepayer money. These filters were generated as a direct result of accident cleanup and thus are eligible for funding from this source.

The relevant NRC Regulation 10CFR50.82 (a)(8) with justification is provided below.

(8)(I) Decommissioning trust funds may be used by licensees if:

A) The withdrawals are for expenses for legitimate decommissioning activities consistent with the definition of decommissioning in Sec. 50.2;

   10 CFR 50.2 defines decommissioning to mean to remove a facility or site safely from service and reduce residual radioactivity to a level that permits-- (1) Release of the property for unrestricted use and termination of the license; or (2) Release of the property under restricted conditions and termination of the license. These filters needed to be removed from site in order to be able to

NMSS01

release the site and as they still need to be properly disposed. Therefore funding this disposal from the trust fund is appropriate.

B) The expenditure would not reduce the value of the decommissioning trust below an amount necessary to place and maintain the reactor in a safe storage condition if unforeseen conditions or expenses arise and;

TMI-2 is already in a safe storage condition and disposal of these filters is a specific line item in the latest Site Specific Decommissioning Cost Study for TMI-2. Therefore we satisfy this condition.

C) The withdrawals would not inhibit the ability of the licensee to complete funding of any shortfalls in the decommissioning trust needed to ensure the availability of funds to ultimately release the site and terminate the license.

As this item is a specific line item in the cost estimate and represents less than 1/10th of 1 % of the cost estimate withdrawal of these funds will not inhibit FirstEnergy's ability to fund any shortfalls.

(ii) Initially, 3 percent of the generic amount specified in Sec. 50.75 may be used for decommissioning planning. For licensees that have submitted the certifications required under Sec. 50.82(a)(1) and commencing 90 days after the NRC has received the PSDAR, an additional 20 percent may be used. A site-specific decommissioning cost estimate must be submitted to the NRC prior to the licensee using any funding in excess of these amounts.
(iii) Within 2 years following permanent cessation of operations, if not already submitted, the licensee shall submit a site-specific decommissioning cost estimate.
(iv) For decommissioning activities that delay completion of decommissioning by including a period of storage or surveillance, the licensee shall provide a means of adjusting cost estimates and associated funding levels over the storage or surveillance period.

TMI-2 was a permanently shutdown facility prior to issuance of the final decommissioning rule in July 1996 and was maintained in Post-Defueling Monitored Storage, a term specific to the unique conditions at TMI-2, in accordance with the TMI-2 License, Technical Specifications and Safety Analysis Report. As the TMI-2 Safety Analysis Report was an NRC approved document and was the basis for maintaining TMI-2 in Monitored Storage it is the equivalent of a approved decommissioning plan under the rule. Thus TMI-2 was considered grandfathered under the provisions of the rule. Additionally a 1995 TMI-2 site specific decommissioning cost estimate forms the basis for the annual certification to the NRC. This cost study was updated in 2004, a copy of which is attached, and includes specific provision for disposal of this waste. On this basis GPU Nuclear believes it has access to the decommissioning trust fund to fund these activities.

Additionally 10CFR50.75 (h)(1)(iv) states:

Except for withdrawals being made under 10 CFR 50.82(a)(8) or for payments of ordinary administrative costs (including taxes) and other incidental expenses of the fund (including legal, accounting, actuarial, and trustee expenses) in connection with the operation of the fund, no disbursement or payment may be made from the trust, escrow account, Government fund, or other account used to segregate and manage the funds until written notice of the intention to make a disbursement or payment has been given to the Director, Office of Nuclear Reactor Regulation, or the Director, Office of Nuclear Material Safety and Safeguards, as applicable, at least 30 working days before the date of the intended disbursement or payment. The disbursement or payment from the trust, escrow account, Government fund or other account may be made following the 30-working day notice period if the person responsible for managing the trust, escrow account, Government fund, or other account does not receive written notice of objection from the Director, Office of Nuclear Reactor Regulation, or the Director, Office of Nuclear Material Safety and Safeguards, as applicable, within the notice period. Disbursements or payments from the trust, escrow account, Government fund, or other account used to segregate and manage the funds, other than for payment of ordinary administrative costs (including taxes) and other incidental expenses of the fund (including legal, accounting, actuarial, and trustee expenses) in connection with the operation of the fund, are restricted to decommissioning expenses or transfer to another financial assurance method acceptable under paragraph (e) of this section until final decommissioning has been completed. After decommissioning has begun and withdrawals from the decommissioning fund are made under 10 CFR 50.82(a)(8), no further notification need be made to the NRC.

As this withdrawal is being made in compliance with 10CFR50.82(a)(8), as demonstrated above, no prior NRC notification is required. However as this is the first time the TMI-2 Decommissioning Trust Fund is being accessed for purposes other than decommissioning planning GPU Nuclear believes it is appropriate to provide the NRC with a notification of this activity under the provision of 10CFR50.75 (h)(1)(iv).

Sincerely,

James J. Byrne
Vice President, TMI-2

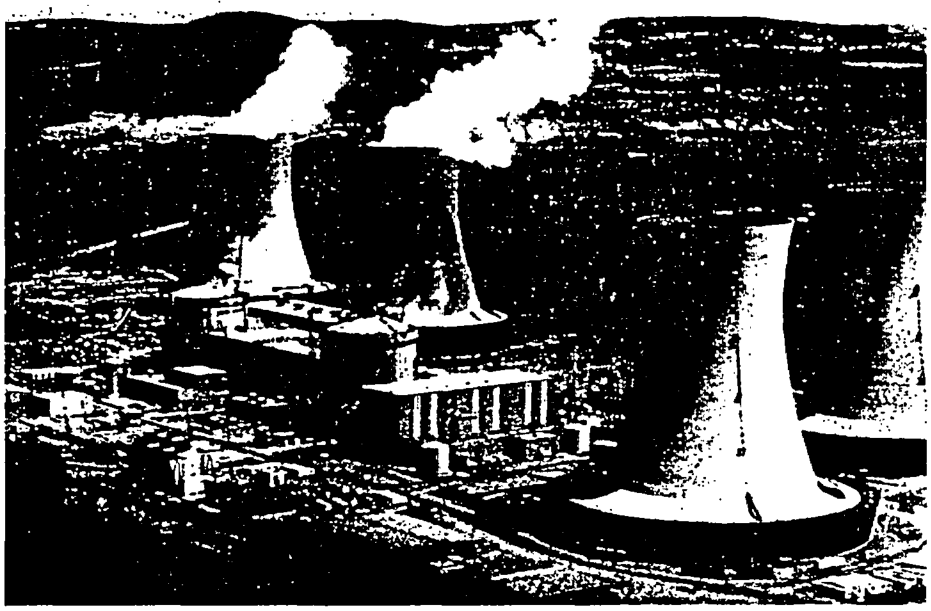
cc: USNRC Director, Office of Nuclear Material Safety and Safeguards
USNRC Director, Division of Waste Management and Environmental Protection
USNRC TMI-2 Senior Project Manager
USNRC TMI-2 Regional Inspector
File 05021

Document F07-1476-002, Rev. 0

DECOMMISSIONING COST ANALYSIS

for

THREE MILE ISLAND UNIT 2



prepared for

FirstEnergy Corporation

prepared by

TLG Services, Inc.
Bridgewater, Connecticut

September 2004

APPROVALS

President/ Quality Assurance Manager	Thomas S. LaGuardia	9/22/04 Date
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No.	CRA No.	Date	Item Revised	Reason for Revision
0		22 Sept 2004		Original Issue

EXECUTIVE SUMMARY

This report presents estimates of the cost to decommission the Three Mile Island, Unit 2 nuclear unit (TMI-2) for the selected decommissioning scenarios following the scheduled cessation of plant operations at the adjacent Unit 1 reactor. The analysis relies upon site-specific, technical information, originally developed in an evaluation for the GPU Nuclear Corporation in 1995-96,[1] updated to reflect current assumptions pertaining to the disposition of the nuclear unit and relevant industry experience in undertaking such projects. The updated estimates are designed to provide the FirstEnergy Corporation with sufficient information to assess its financial obligations, as they pertain to the eventual decommissioning of the nuclear unit.

The decommissioning of TMI-2 is a continuation of the decontamination efforts started in the 1980s, following its accident. The ultimate goal of the decommissioning is to remove the radioactive material from the site that would preclude its release for unrestricted use.

The estimates are based on numerous fundamental assumptions, including regulatory requirements, project contingencies, radioactive waste disposal options, and site remediation requirements. The estimates also include the dismantling of non-essential structures and limited restoration of the site.

Alternatives and Regulations

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

> DECON is defined as "the alternative in which the equipment, structures, and portions of a facility and site containing radioactive contaminants are removed or decontaminated to a level that permits the

1 "Decommissioning Cost Estimate for the Three Mile Island, Unit 2," Document No. G01-1196-003, TLG Services, Inc., February 1996.

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.

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 of the ENTOMB alternative at commercial reactors that generate significant amounts of long-lived radioactive material. In 1997, the Commission directed its staff to re-evaluate this alternative and identify the technical requirements and regulatory actions that would be necessary for entombment to become a viable option. The resulting evaluation provided several recommendations, however, rulemaking has been deferred pending the completion of additional research studies, e.g., on engineered barriers.

In 1996, the NRC published revisions to the general requirements for decommissioning nuclear power plants to clarify ambiguities and codify procedures and terminology as a means of enhancing efficiency and uniformity in the decommissioning process.[6] The amendments allow for greater public participation and better define the transition process from operations to decommissioning. Regulatory Guide 1.184, issued in July 2000, further described the methods and procedures acceptable to the NRC staff for implementing the requirements of the 1996 revised rule relating to the initial activities and major phases of the

3 Ibid. Page FR24022, Column 3.
4 Ibid.
5 Ibid. Page FR24023, Column 2.
6 U.S. Code of Federal Regulations, Title 10, Parts 2, 50, and 51, "Decommissioning of Nuclear Power Reactors," Nuclear Regulatory Commission, Federal Register Volume 61, (p 39278 et seq.), July 29, 1996.

decommissioning process. The costs and schedules presented in this analysis follow the general guidance and processes described in the amended regulations.

Decommissioning Scenarios

Three decommissioning scenarios were evaluated for the nuclear unit. In all cases, there was some consideration of the decommissioning activities planned at the adjacent unit. However, the scenarios selected are representative of alternatives available to the owner and are defined as follows:

1. Delayed DECON: One of the decommissioning alternatives for Unit 1 is to defer decommissioning until the spent fuel has been removed from the site.[7] This scenario assumes that the decontamination and dismantling activities at TMI-2 are synchronized with the adjacent unit such that the operating licenses for both units are terminated concurrently.

2. Custodial SAFSTOR: In the second scenario, TMI-1 is placed into long-term storage. TMI-2 remains in storage until such time that decommissioning activities can be coordinated with Unit 1. As with the first scenario, termination of the operating licenses is coordinated.

3. Hardened SAFSTOR: This scenario assumes that Unit 1 is promptly decommissioned when it ceases operations in 2014. In coordination with the Unit 1 activities, the TMI-2 reactor building is reconfigured for long-term, passive storage. Site structures and facilities, with the exception of the reactor building, are decontaminated and dismantled. The reactor building and its contents are secured and the site is reconfigured for monitored surveillance. Decontamination and final dismantling of the reactor building is deferred for approximately 100 years (from Unit 1 shutdown).

Methodology

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

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7 Timelines for the Unit 1 decommissioning scenarios are included in Section 4 of this report.

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

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.

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."[9] The cost elements in the estimates are based on ideal conditions; therefore, the types of unforeseeable events that are almost certain to occur in decommissioning, based on industry experience, are addressed through a percentage contingency applied on a line-item basis. This contingency factor is a nearly universal element in all large-scale construction and demolition projects. It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the time intervals identified for each scenario.

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

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

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

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

TMI-2 is currently able to access the disposal facility in Barnwell, South Carolina. However, in June 2000, South Carolina formally joined with Connecticut and New Jersey to form the Atlantic Compact. The legislation allows South Carolina to gradually limit access to the Barnwell facility, with only Atlantic Compact members having access to the facility after mid-year 2008. It is reasonable to assume that additional disposal capacity will be available to support reactor decommissioning, particularly for the isolation of the more highly radioactive material that is not suitable for disposal elsewhere. For estimating purposes, and as a proxy for future disposal facilities, waste disposal costs are generated using available pricing schedules for the currently operating facilities, i.e., at Barnwell and the Envirocare facility in Utah.

Fuel-Bearing Waste Management

There will be some wastes generated in the decommissioning of TMI-2 that are not suitable for shallow land burial and therefore cannot be shipped for disposal to either Barnwell or Envirocare. This material, primarily associated with systems and structures contaminated with fuel debris, requires greater isolation from the environment. For estimating purposes, a geologic waste repository, or some interim storage facility, is assumed to be available by 2015 for the disposal of this material. This timetable is consistent with the findings of an evaluation issued to Congress by the Government Accounting Office for the geologic repository at Yucca Mountain.[12]

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 will substantially damage power block structures, potentially weakening the footings and structural supports. Prompt demolition once the license is terminated 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 is more efficient and less costly than if the process were deferred. Experience at shutdown generating stations has shown that plant facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public and the demolition work force. Consequently, this analysis assumes that non-essential site structures within the restricted access area are removed. The site is then backfilled, graded and stabilized.

12 "Technical, Schedule, and Cost Uncertainties of the Yucca Mountain Repository Project," GAO-02-191, December 2001.

Summary

The costs to decommission TMI-2 are evaluated for three decommissioning scenarios. Regardless of the timing of the decommissioning activities, the estimates assume the eventual removal of all the contaminated and activated plant components and structural materials, such that the facility operator may then have unrestricted use of the site with no further requirement for an operating license.

The scenarios analyzed for the purpose of generating the estimates are described in Section 2. The assumptions are presented in Section 3, along with schedules of annual expenditures. The major cost contributors are identified in Section 6, with detailed activity costs, waste volumes, and associated manpower requirements delineated in Appendices C, D, and E. Cost summaries for the various scenarios are provided at the end of this section for the major cost components.

SUMMARY OF DECOMMISSIONING COST ELEMENTS
DELAYED DECON
(Thousands of 2003 Dollars)

Activity	Total [1]
Decontamination	32,555
Removal	111,729
Packaging	17,017
Transportation	8,725
Waste Disposal	179,451
Off-site Waste Processing	9,837
Program Management [2]	318,039
Insurance and Regulatory Fees	13,997
Energy	8,815
Characterization and Licensing Surveys	6,128
Property Taxes	-
Miscellaneous Equipment	19,576
Site O&M	3,157
Total [3]	729,026
NRC License Termination	705,400
Site Restoration	23,625

[1] Includes dormancy costs following TMI-1 shutdown in 2014
[2] Includes engineering and security
[3] Columns may not add due to rounding

SUMMARY OF DECOMMISSIONING COST ELEMENTS
CUSTODIAL SAFSTOR
(Thousands of 2003 Dollars)

Activity	Total [1]
Decontamination	32,518
Removal	116,450
Packaging	17,191
Transportation	8,714
Waste Disposal	179,716
Off-site Waste Processing	9,966
Program Management [2]	335,630
Insurance and Regulatory Fees	26,339
Energy	17,748
Characterization and Licensing Surveys	6,128
Property Taxes	-
Miscellaneous Equipment	26,209
Site O&M	3,157
Total [3]	779,764
NRC License Termination	756,139
Site Restoration	23,625

[1] Includes dormancy costs following TMI-1 shutdown in 2014
[2] Includes engineering and security
[3] Columns may not add due to rounding

SUMMARY OF DECOMMISSIONING COST ELEMENTS
HARDENED SAFSTOR
(Thousands of 2003 Dollars)

Activity	Total [1]
Decontamination	33,306
Removal	121,156
Packaging	17,052
Transportation	8,836
Waste Disposal	179,144
Off-site Waste Processing	10,655
Program Management [2]	407,918
Insurance and Regulatory Fees	40,155
Energy	10,432
Characterization and Licensing Surveys	6,660
Property Taxes	-
Miscellaneous Equipment	27,219
Site O&M	2,927
Off-site Monitoring & Security Services	45,965
Total [3]	911,425
NRC License Termination	877,525
Site Restoration	33,899

[1] Includes dormancy costs following TMI-1 shutdown in 2014
[2] Includes engineering and security
[3] Columns may not add due to rounding

1. INTRODUCTION

This report presents estimates of the cost to decommission the Three Mile Island Unit 2 nuclear unit (TMI-2) for the scenarios described in Section 2. The analysis is designed to provide the FirstEnergy Corporation with sufficient information to assess its financial obligations, as they pertain to the eventual decommissioning of the nuclear unit. It is not a detailed engineering document, but a financial analysis prepared in advance of the detailed engineering that will be required to carry out the decommissioning.

1.1 OBJECTIVES OF STUDY

The objective of this study was to prepare estimates of the cost, schedule, and waste volumes generated to decommission TMI-2, including all areas affected by the March 1979 accident.

Three scenarios were evaluated. Each scenario is coordinated with decommissioning activities at the adjacent operating unit (TMI-1 or Unit 1). The base scenario assumes that TMI-1 is decommissioned following the removal of spent fuel from the site. The decommissioning program for TMI-2 runs concurrently with the TMI-1 decommissioning effort and concludes with the termination of both operating licenses. This scenario is subsequently referred to as "Delayed DECON." The second scenario assumes that TMI-1 is placed into safe-storage with decommissioning deferred 60 years. TMI-2 remains in storage with decommissioning deferred until it can be sequenced with TMI-1. This scenario is subsequently referred to as "Custodial SAFSTOR." The final scenario assumes that TMI-1 is promptly decommissioned upon the scheduled cessation of operations in 2014. The reactor building at TMI-2 is modified for long-term, passive storage with all other Unit 2 facilities decontaminated and dismantled. Remediation of the reactor building is deferred for a period of approximately 100 years at which time it is decontaminated and dismantled. This scenario is subsequently referred to as "Hardened SAFSTOR."

1.2 SITE DESCRIPTION

TMI-2 is located on the northern-most section of Three Mile Island near the east shore of the Susquehanna River in Dauphin County, Pennsylvania. The station is comprised of two pressurized water reactors. This study specifically addresses the decommissioning requirements for Unit 2, although the timing of each scenario is dependent upon the associated activities at the adjacent unit.

The nuclear steam supply system (NSSS) consists of a pressurized water reactor rated at a core thermal power level of 2772 MWth with a corresponding turbine-generator gross output of 959 MWe. The NSSS consists of the reactor with two independent primary coolant loops, each containing two reactor coolant pumps and a steam generator. An electrically heated pressurizer and connecting piping complete the system. The system is housed within a steel-lined, post-tensioned concrete structure (reactor building) in the shape of a right, vertical cylinder with a hemispherical dome and a flat, reinforced concrete basemat. A welded steel liner plate, anchored to the inside face of the reactor building, serves as a leak-tight membrane.

Heat produced in the reactor was converted to electrical energy by the turbine generator system. This system converted the thermal energy of the steam into mechanical shaft power and then into electrical energy. The turbine-generator is a tandem-compound design, consisting of one double-flow, high pressure turbine and two double-flow, low-pressure turbines driving a directly coupled generator at 1800 rpm. The turbine operated in a closed feedwater cycle where steam was condensed; feedwater heated, and ultimately returned to the steam generators. Heat rejected in the main condensers was removed by the condenser circulating and river water systems.

The condenser circulating water was cooled in two hyperbolic natural draft cooling towers located to the east of the station. The towers provided the heat sink required for removal of waste heat in the power plant's thermal cycle. Cooling tower blowdown was discharged to the Susquehanna River.

TMI-2's operating license was issued on February 8, 1978, with commercial operation declared on December 30, 1978. On March 28, 1979, the unit experienced an accident initiated by interruption of secondary feedwater flow. The steam generator boiled dry, resulting in the reduction of primary-to-secondary heat exchange. This caused an increase in the primary coolant temperature, creating a surge into the pressurizer, and an increase in system pressure. The pilot operated relief valve (PORV) opened to relieve the pressure, but failed to close when the pressure decreased. The reactor coolant pumps were turned off and a core heat-up began as the water level decreased to uncover the top of the core. The melting temperature of the zircaloy fuel cladding was exceeded, resulting in relocation of the molten zircaloy and some liquefied fuel to the lower core regions, solidifying near the coolant interface. Based on the end-state core and core support assembly configuration and supporting analysis of the degraded core heat-up, it is believed that as the crust failed, molten core material migrated to the lower internals. The majority of the molten material flowed down through the region of the southeastern assemblies and into the core bypass region. A portion of the molten core material flowed around the bypass region and migrated down into the lower internals and lower head region. Limited damage to the core support assembly occurred as the core material flowed to the lower plenum. It is estimated that about 17 - 20 tons of material relocated to the lower internals and lower head region. Several in-core instrument guide tubes were melted but overall vessel integrity was maintained throughout the accident.

As a result of this accident, small quantities of core debris and fission products were transported through the RCS, and the reactor building as a result of the coolant flow through the PORV and the makeup and purification system (MU&P) during the accident. In addition, a small quantity of core debris was transported to the auxiliary and fuel handling buildings (AFHB) via the MU&P. Further spread of the debris also occurred as part of the post-accident water processing cleanup activities.

GPU Nuclear has since conducted a substantial program to defuel the reactor vessel and decontaminate the facility. As a result, TMI-2 has been placed in a safe, inherently stable condition suitable for long-term management, and any threat to the public health and safety has been eliminated. Fuel and core material removed in the defueling has been shipped off site. The current long-term management condition is termed Post-Defueling Monitored Storage (PDMS).

Substantial contaminated areas still exist under the PDMS, as well as trace quantities of spent nuclear fuel (SNF). Several cubicles in the auxiliary and fuel handling buildings remain locked, and the basement of the reactor building has been uninhabitable since the accident. The quantity of fuel remaining at TMI-2 is a small fraction of the initial fuel load; approximately 99% was successfully removed in the defueling. Additionally large quantities of radioactive fission products were released into various systems and structures. Most of this radioactivity was removed as part of the waste processing activities during the TMI-2 Clean-up Program which concluded with entry into Post-Defueling Monitored Storage in December 1993. Significant quantities of radioactive fission products were removed from the reactor coolant system in preparation for the PDMS. However, the remaining 1% of the fuel and the remaining fission products pose unique problems in completing the decommissioning of TMI-2. A summary of the quantity and suspected location of the remaining fuel debris is provided in Tables 1.1 through 1.3.

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.[1]* 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,"[2] 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, the option evaluated for this analysis, assumes that any contaminated or activated portion of the plant's systems, structures, and facilities are removed or decontaminated to levels that permit the site to be released for unrestricted use shortly after the cessation of plant operations. The rule also placed limits on the time allowed to complete the decommissioning process. For SAFSTOR, the process is restricted in overall duration to 60 years, unless it can be shown that a longer duration is necessary to protect public health and safety. The guidelines for ENTOMB are similar, providing the NRC with both sufficient leverage and flexibility to ensure that these deferred options are only used in situations where it is reasonable and consistent with the definition of decommissioning. At the conclusion of a 60-year dormancy period (or longer for ENTOMB if the NRC approves such a case), the site would still require significant remediation to meet the unrestricted release limits for license termination.

The ENTOMB alternative has not been viewed as a viable option for power reactors due to the significant time required to isolate the long-lived radionuclides for decay to permissible levels. However, with recent rulemaking permitting the controlled release of a site, the NRC has re-evaluated this alternative.[3] The resulting feasibility study, based upon an

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

assessment by Pacific Northwest National Laboratory, concluded that the method did have conditional merit for some, if not most, reactors.[4] However, the staff also found that additional rulemaking would be needed before this option could be treated as a generic alternative. Rulemaking has been deferred pending the completion of additional research studies, e.g., on engineered barriers. However, this study assumes that the ENTOMB alternative is a viable option for TMI-2 and that a storage period of 100 years would be acceptable.

The NRC published revisions to the general requirements for decommissioning nuclear power plants in 1996.[5] When the 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 new amendments allow for greater public participation and better define the transition process from operations to decommissioning.

1.3.1 Nuclear Waste Policy Act

Congress passed the Nuclear Waste Policy Act[6] (NWPA) in 1982, assigning the responsibility for disposal of the spent nuclear fuel created by the commercial nuclear generating plants to the U.S. Department of Energy (DOE). Two permanent disposal facilities and an interim storage facility were envisioned. To recover the cost, the legislation created a Nuclear Waste Fund through which money is collected from the sale of electricity generated by the power plants. The NWPA, along with the individual disposal contracts with the utilities, specified that the DOE was to begin accepting spent fuel by January 31, 1998.

After pursuing a national site selection process, the NWPA was amended in 1987 to designate Yucca Mountain, Nevada, as the only site to be evaluated for geologic disposal of high-level waste. For estimating purposes, this facility, or some interim storage facility, is assumed to be available by 2015 for the disposal of systems and structures contaminated with fuel debris that require greater isolation from the environment.

1.3.2 Low-Level Radioactive Waste Acts

The contaminated and activated material generated in the decontamination and dismantling of a commercial nuclear reactor is classified as low-level (radioactive) waste, although not all of the material is suitable for "shallow-land" disposal. Congress passed the "Low-Level Radioactive Waste Policy Act" in 1980,[7] declaring the states as being ultimately responsible for the disposition of low-level radioactive waste generated within their own borders. The federal law encouraged the formation of regional groups or compacts to implement this objective safely, efficiently, and economically, and set a target date of 1986 for implementation. After little progress, the "Low-Level Radioactive Waste Policy Amendments Act of 1985,"[8] extended the implementation schedule, with specific milestones and stiff sanctions for non-compliance. However, to date, no new compact facilities have been successfully sited, licensed, and constructed.

TMI-2 is currently able to access the disposal facility in Barnwell, South Carolina. However, in June 2000, South Carolina formally joined with Connecticut and New Jersey to form the Atlantic Compact. The legislation allows South Carolina to gradually limit access to the Barnwell facility, with only Atlantic Compact members having access to the facility after mid-year 2008. It is reasonable to assume that additional disposal capacity will be available to support reactor decommissioning, particularly for the isolation of the more highly radioactive material that is not suitable for disposal elsewhere. For estimating purposes, and as a proxy for future disposal facilities, waste disposal costs are generated using available pricing schedules for the currently operating facilities, i.e., at Barnwell and at Envirocare's facility in Utah.

1.3.3 Radiological Criteria for License Termination

In 1997, the NRC published Subpart E, "Radiological Criteria for License Termination,"[9] amending 10 CFR §20. This subpart provides radiological criteria for releasing a facility for unrestricted use. The regulation states that the site can be released for unrestricted use if radioactivity levels are such that the average member of a critical group would not receive a Total Effective Dose Equivalent (TEDE) in excess of 25 millirem per year, and provided that residual radioactivity has been reduced to levels that are As Low As Reasonably Achievable (ALARA). The decommissioning estimates for TMI-2 assume that the 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).[10] An additional limit of 4 millirem per year, as defined in 40 CFR §141.16, is applied to drinking water.[11]

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

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

2. DECOMMISSIONING ALTERNATIVES

Detailed cost estimates were developed to decommission TMI-2 for three scenarios. Although the alternatives differ with respect to technique, process, cost, and schedule, they attain the same result: the ultimate release of the site for unrestricted use.

Three decommissioning scenarios were evaluated for the nuclear unit. The scenarios are defined as follows:

1. Delayed DECON: One of the decommissioning alternatives for Unit 1 is to defer decommissioning until the spent fuel has been removed from the site. This scenario assumes that the decontamination and dismantling activities at TMI-2 are synchronized with the adjacent unit such that the operating licenses for both units are terminated concurrently.

2. Custodial SAFSTOR: In the second scenario, TMI-1 is placed into long-term storage. TMI-2 remains in storage until such time that decommissioning activities can be coordinated with Unit 1. As with the first scenario, termination of the operating licenses is coordinated.

3. Hardened SAFSTOR: This scenario assumes that Unit 1 is promptly decommissioned when it ceases operations in 2014. In coordination with the Unit 1 activities, the TMI-2 reactor building is reconfigured for long-term, passive storage. Site structures and facilities, with the exception of the reactor building, are decontaminated and dismantled. The reactor building and its contents are secured and the site is reconfigured for monitored surveillance. Decontamination and final dismantling of the reactor building is deferred for approximately 100 years (from Unit 1 shutdown).

For each of the three scenarios described above, dormancy costs are accrued from the cessation of TMI-1 operations. This means that the current PDMS costs are not included within the reported decommissioning costs.

The following sections describe the basic activities associated with each alternative. The first two scenarios are essentially identical. The technical assumptions are unchanged with the only difference in the second scenario being the delay in start of decommissioning expenditures and the additional storage cost during the delay period. The third scenario reduces the controlled area to the reactor building, similar to that envisioned for an entombment alternative, without the extensive engineered barriers.

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 addresses the transition of reactor operations (i.e., power production) to facility de-activation and closure. 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 TMI-2 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 DELAYED DECON

The TMI-2 plant has effectively been placed in a SAFSTOR condition since the completion of the spent fuel removal activities and beginning of the PDMS. However, the engineering and planning requirements for completing the decommissioning process are similar to those for a DECON alternative. Unit 2 decommissioning operations are integrated with Unit 1's spent fuel transfer campaign such that the operating (Part 50) licenses are terminated concurrently.

2.1.1 Period 2 - Dormancy

The dormancy costs included in this estimate are limited to monitoring activities only. Although TMI-2 has been in a dormant condition since entry into Post-Defueling Monitored Storage in December 1993, this estimate only includes those costs for maintaining the unit subsequent to the currently scheduled cessation of operations at Unit 1 in April of 2014, i.e., current costs are not included.

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

2.1.2 Period 3 - Preparations

Preparations include the planning for the removal of the remaining fuel-bearing components, decontamination of the structures and the dismantling of the remaining equipment and facilities. Typically, the process is described within a Post-Shutdown Decommissioning Activities Report (PSDAR) or a Decommissioning Plan (DP). Although the exact format and content of the decommissioning planning document has not been identified, as a minimum Technical Specification 3.2.1.1 requires NRC approval prior to removal of greater than 42 kilograms of fuel from the reactor vessel. Thus in addition to the planning document, changes may be required to the existing technical specifications prior to the start of major decommissioning activities.

Engineering and Planning

The decommissioning program outlined in the PSDAR or DP 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 decommissioning plan, activity specifications, cost-benefit and safety analyses, and work packages and procedures, would be assembled to support the proposed decontamination and dismantling activities.

The estimate assumes that FirstEnergy will provide project oversight. However, the majority of the professional, managerial, technical and administrative support staff will be provided by a decommissioning operations contractor (DOC).

Site Preparations

In preparation for active decommissioning, the following activities are initiated:

- Characterization of the site and surrounding environs. This includes radiation surveys of the reactor building including: the basement and elevator block wall area, areas surrounding major components (including the reactor vessel and its internals, steam generators), internal piping, and primary shield cores. Surveys of the auxiliary and fuel handling building with emphasis on areas with known and potential alpha contamination and know fission products. Surveys and sample analysis will also be performed on exterior buildings, land areas surrounding the facility, subsurface soil and groundwater.

- Specification of transport and disposal requirements for highly radioactive materials and/or hazardous materials, including shielding and waste stabilization.

- Development of procedures for occupational exposure control, control and release of liquid and gaseous effluent, processing of radwaste (including dry-active waste, resins, filter media, metallic and non-metallic components generated in decommissioning), site security and emergency programs, and industrial safety.

2.1.3 Period 4 - Decommissioning Operations

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

- Construction of temporary facilities and/or modification of existing facilities to support dismantling activities. This may include a centralized processing area to facilitate equipment removal and component preparations for off-site disposal.

- Refurbishment of the containment air control envelope building located outside the reactor building equipment hatch. A prefabricated metal containment building located on the 305' level of the reactor building will be required for the handling of highly contaminated material being removed from the basement or the operating deck elevations.

- Modification of the containment structure to facilitate handling of large equipment. This will include an evaluation to determine whether a temporary crane should be installed or whether the existing polar crane should be refurbished (the reactor vessel head will be the heaviest lift under the current removal scenario with the in-situ segmentation of the reactor vessel and steam generators).

- Reconfiguration and modification of site structures and facilities as needed to support decommissioning operations. This may include the upgrading of roads and rail facilities (on- and off-site) to facilitate hauling and transport. Modifications may also be required to the refueling area of the building to support the segmentation of the reactor vessel internals and component extraction.

- Design and fabrication of temporary and permanent shielding to support removal and transportation activities, construction of contamination control envelopes, and the procurement of specialty tooling.

- Procurement (lease or purchase) of shipping canisters, cask liners, and industrial packages.

- Decontamination of components and structures as required to control (minimize) worker exposure.

- Decontamination of the reactor building so as to reduce working area dose rates and improve working conditions. The reactor building basement is known to be highly contaminated and will require remote operations and tooling for the initial decontamination effort.

- Inventory, decontamination and removal of legacy equipment inventory left over from the defueling campaign.

- Installation of a water processing system to filter and treat water from the reactor coolant system and fuel handling pool.

- Removal of piping and components no longer essential to support decommissioning operations.

- Removal of control rod drive housings and the head service structure from reactor vessel head. Segmentation of the vessel closure head.

- Segmentation of the upper internals assemblies. The plenum is currently stored in the fuel transfer canal. Segmentation will maximize the loading of the shielded transport casks, i.e., by weight and activity. The operations are conducted under water using remotely operated tooling and contamination controls.

- Disassembly and segmentation of the remaining reactor internals, including the core former and lower core support assembly. All internals components below the top of the fuel are expected to exceed Class C disposal requirements due to fuel contamination. As such, the segments will be packaged in modified fuel storage canisters for geologic disposal.

- Segmentation of the reactor vessel. A shielded platform is installed for segmentation as cutting operations are performed in-air using remotely operated equipment within a contamination control envelope. The water level is maintained just below the cut to minimize the working area dose rates. Segments are transferred in-air to containers that are stored under water, for example, in an isolated area of the refueling canal.

- Removal of the steam generators and pressurizer for material recovery and controlled disposal. Due to the high internal and external radioactivity, these components can not serve as their own shipping containers. The steam generators are assumed to be segmented in-place. The pressurizer is assumed to be cut in half and shipped in a sealed and shielded shipping and burial container. Steel shielding will be added, as necessary, to those external areas of the package to meet transportation limits and regulations.

- Removal of free standing concrete structures in the reactor building.

- Removal of the remaining internal structures within the reactor building including: the polar crane, inner pools and wall liners, biological shield, D-rings, floors and walls.

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

- Removal of remaining plant systems and associated components as they become nonessential to the decommissioning program or worker health and safety (e.g., waste collection and treatment systems, electrical power and ventilation systems).

- Processing of the structural material in the reactor, auxiliary and fuel handling buildings. Approximately 90% of the concrete removed is assumed to meet free release criteria. The remainder is sent to a waste processor. The free-released concrete is available as fill. Excess concrete and scrap metals are disposed of in an industrial landfill.

- Removal of contaminated yard piping and any contaminated soil.

- Transfer of greater-than-Class C (GTCC) material to the DOE.

- Surveys of the decontaminated areas not designated for complete removal and disposal.

- Remediation and removal of the contaminated equipment and material from the auxiliary and fuel buildings and any other contaminated facility. Certain areas in the auxiliary and spent fuel handling buildings contain very high contamination and radiation levels and will require additional resource and increased radiological protection to complete the decontamination. Radiation and contamination controls will be utilized until residual levels indicate that the structures and equipment can be released for unrestricted access and conventional demolition. This activity may necessitate the dismantling and disposition of most of the systems and components (both clean and contaminated) located within these buildings. This activity facilitates surface decontamination and subsequent verification surveys required prior to obtaining release for demolition.

- Material that is designated as scrap or general disposal (survey and release) is transferred to a designed waste processing vendor for a confirmatory survey and, if permitted, released for unrestricted disposition. 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)."[13] This document incorporates the statistical approaches to survey design and data interpretation used by the EPA. It also identifies state-of-the-art, commercially available instrumentation and procedures for conducting radiological surveys. Use of this guidance ensures that the surveys are conducted in a manner that provides a high degree of confidence that applicable NRC criteria are satisfied. Once the survey is complete, the results are provided to the NRC in a format that can be verified. The NRC then reviews and evaluates the information, performs an independent confirmation of radiological site conditions, and makes a determination on final termination of the license.

The NRC will terminate the operating license if it determines that site remediation has been performed in accordance with the LTP, and that the terminal radiation survey and associated documentation demonstrate that the facility is suitable for release.

2.1.4 Period 5 – Site Restoration

Following completion of decommissioning operations, site restoration activities will begin. Efficient removal of the contaminated materials and verification that residual radionuclide concentrations are below the NRC limits will result in substantial damage to many of the remaining structures. Prompt dismantling of remaining site structures is clearly the most appropriate and cost-effective option. It is unreasonable to anticipate that these structures would be repaired and preserved after the radiological contamination is removed. The cost to dismantle site structures with a work force already mobilized on site is more efficient than if the process were deferred. Site facilities quickly degrade without maintenance, adding additional expense and creating potential hazards to the public as well as to future workers. Abandonment creates a breeding ground for vermin infestation as well as other biological hazards.

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

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 materials are trucked to an off-site area for disposal as construction debris.

2.2 CUSTODIAL SAFSTOR

The decontamination and dismantling activities in this scenario are identical to those described in Section 2.1 for Delayed DECON. However, the start of active decommissioning is deferred to coordinate with the timing of the Unit 1 SAFSTOR scenario. As such, the duration of the dormancy period is significantly longer and the storage costs correspondingly greater.

While it is expected that radiation dose levels will decrease by 80% to 90% over the duration of the longer dormancy period, the nature of radionuclides involved and the difficulties in working in plant areas contaminated with these radionuclides will require similar operational and radiological controls to those envisioned for earlier scenario. As such, there have been no changes incorporated into the costs to perform the field decommissioning activities identified in Section 2.1 for this scenario.

2.3 HARDENED SAFSTOR

This scenario is similar to what has been generally described as the ENTOMB option. The NRC has defined the ENTOMB option 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." As with the SAFSTOR alternative, decommissioning is currently required to be completed within 60 years. However, durations of up to 100 years may be considered where there are demonstrated benefits to the safety and health of the public.

This option reduces the long-term radiological footprint on the site by contracting the controlled area to the reactor building. Contamination outside this area is removed in the early stages of Hardened SAFSTOR decommissioning, concurrent with the decommissioning of Unit 1. Removal activities are performed in a similar fashion to their counterparts in the

Delayed DECON scenario. Upon completion of the process, the reactor building is sealed with appropriate security and monitoring measures installed.

As in the Delayed DECON and Custodial SAFSTOR dormancies, the purpose of the dormancy period is to isolate the contamination on site, and to protect the public from the consequences of their own actions. The difference between the Hardened SAFSTOR dormancy and the other two scenarios is that generally the site is uninhabited; security and radiation monitoring are performed remotely.

Following the end of the Hardened SAFSTOR dormancy period, the reactor building and its contents are removed and disposed of in a similar fashion as discussed in the Delayed DECON scenario. Following the termination of the license and the limited restoration of the affected area, the site is available for unrestricted, alternative use.

While it is expected that radiation dose levels will decrease by more than 90% over the duration of the longer dormancy period, the nature of radionuclides involved and the difficulties in working in plant areas contaminated with these radionuclides will require similar operational and radiological controls to those envisioned for earlier scenario. As such, there have been no changes incorporated into the costs to perform the field decommissioning activities identified in Section 2.1 for this scenario.

3. COST ESTIMATE

The cost estimates prepared for decommissioning TMI-2 consider the radiological status, unique conditions of the site, including the NSSS, power generation systems, support services, site buildings, and ancillary facilities. The basis of the estimates, including the sources of information relied upon, the estimating methodology employed, site-specific considerations, and other pertinent assumptions, is described in this section.

3.1 BASIS OF ESTIMATE

The estimates rely upon site-specific, technical information originally developed in an evaluation prepared for the GPU Nuclear Corporation in 1995-96.[14] The information was reviewed for the current analysis and updated as deemed appropriate. The site-specific considerations and assumptions used in the previous evaluation were also revisited. Modifications were incorporated where new information was available or experience from ongoing decommissioning programs provided viable alternatives or improved processes.

Some of the technical assumptions that were used are due to the unique nature and characteristics of the plant as a result of the March 1979 accident. Following the accident, TMI-2 was defueled and extensive decontamination activities were performed. This successfully removed approximately 99% of the original fuel and resulting fuel debris. Removal of the residual 1% was neither cost effective nor warranted due to the high radiation fields in the reactor building and adjoining auxiliary and fuel handling buildings. The remaining equipment and components containing spent nuclear fuel (SNF) will be removed, sealed and/or encapsulated in preparation for disposal during the decommissioning program.

3.2 METHODOLOGY

The methodology used to develop the estimates follows the basic approach originally presented in the AIF/NESP-036 study report, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates,"[15] and the DOE "Decommissioning Handbook."[16] These documents present a unit factor method for estimating decommissioning activity costs, which simplifies the estimating calculations. Unit factors for concrete removal ($/cubic yard), steel removal ($/ton), and cutting costs ($/inch) were developed using local labor rates. The activity-dependent costs were estimated with the item quantities (cubic yards and tons), developed from plant drawings and inventory documents. Removal rates and material costs for the conventional disposition of components and structures relied upon information available in the industry publication, "Building Construction Cost Data," published by R.S. Means.[17]

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

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

Work Difficulty Factors

TLG has historically applied work difficulty adjustment factors (WDFs) to account for the inefficiencies in working in a power plant environment and increase the time required to perform the activity. WDFs were assigned to each unique set of unit factors, commensurate with the inefficiencies associated with working in confined, hazardous environments. The WDF sets were developed considering the extremely difficult working conditions associated with working in high radiation areas and in areas with high alpha particle contamination. The same work difficulty factor sets were used for all three scenarios. This assumption was based upon the relatively high levels of long-lived radioactivity that exists today plus the high levels of alpha contamination.

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. Given the radiological status of some areas at TMI-2, the range of the WDF's was increased. The ranges used for the WDFs are identified in the following table.

Work Difficulty Factors

	Other Power Block	Fuel/Aux Buildings	Reactor Building	NSSS Components
Access	20%	40%	30%	40%
Respiratory Protection	0-25%	200%	50%	200%
Radiation/ALARA	10-25%	40%	40%	100%
Protective Clothing	0-30%	50%	50%	50%
Work Break	8.33%	8.33%	8.33%	8.33%

Scheduling Program Durations

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

As shown above, higher WDF's sets were assigned to systems located in the reactor building and to systems which contain SNF and/or high levels of radioactive materials. The resulting man-hours, or crew-hours, are used in the development of the decommissioning program schedule, using resource loading and event sequencing considerations. The scheduling of conventional removal and dismantling activities are based upon productivity information available from the "Building Construction Cost Data" publication.

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

Inherent in any cost estimate that does not rely on historical data is the inability to specify the precise source of costs imposed by factors such as tool breakage, accidents, illnesses, weather delays, and labor stoppages. In the

DECCER cost model, contingency fulfills this role. Contingency is added to each line item to account for costs that are difficult or impossible to develop analytically. Such costs are historically inevitable over the duration of a job of this magnitude; therefore, this cost analysis includes funds to cover these types of expenses.

3.3.1 Contingency

The activity- and period-dependent costs are combined to develop the total decommissioning cost. A contingency is then applied on a line-item basis, using one or more of the contingency types listed in the AIF/NESP-036 study. "Contingencies" are defined in the American Association of Cost Engineers "Project and Cost Engineers' Handbook"[18] as "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this analysis are based upon ideal conditions and maximum efficiency; therefore, consistent with industry practice, a contingency factor has been applied. In the AIF/NESP-036 study, the types of unforeseeable events that are likely to occur in decommissioning are discussed and guidelines are provided for percentage contingency in each category. It should be noted that contingency, as used in this analysis, does not account for price escalation and inflation in the cost of decommissioning over the time intervals identified for each scenario.

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

For example, the most technologically challenging task in decommissioning a commercial nuclear station is the disposition of the reactor vessel and internal components, highly radioactive following the accident. The disposition of these components forms the basis of the critical path (schedule) for decommissioning operations. Cost and schedule are interdependent, and any deviation in schedule has a significant impact on cost for performing a specific activity.

Disposition of the reactor vessel internals involves the underwater cutting of complex components that are highly radioactive. Costs are based upon optimum segmentation, handling, and packaging scenarios. The schedule is primarily dependent upon the turnaround time for the heavily shielded shipping casks, including preparation, loading, and decontamination of the containers for transport. The number of casks required is a function of the pieces generated in the segmentation activity, a value calculated on optimum performance of the tooling employed in cutting the various subassemblies. The expected optimization, however, may not be achieved, resulting in delays and additional program costs. For this reason, contingency must be included to mitigate the consequences of the expected inefficiencies inherent in this complex activity, along with related concerns associated with the operation of highly specialized tooling, field conditions, and water clarity.

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

Decontamination	50%
Contaminated Component Removal	25%
Contaminated Component Packaging	10%
Contaminated Component Transport	15%
Low-Level Radioactive Waste Disposal	25%
Reactor Segmentation	75%
NSSS Component Removal	25%
Reactor Waste Packaging	25%
Reactor Waste Transport	25%
Reactor Vessel Component Disposal	50%
GTCC Disposal	15%
Non-Radioactive Component Removal	15%
Heavy Equipment and Tooling	15%
Supplies	25%

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

The contingency values are applied to the appropriate components of the estimates on a line item basis. A composite value is then reported at the end of each estimate. For example, the composite contingency value reported for the Delayed DECON alternative is 19.6%. Values for the other alternatives are delineated within the detailed cost tables in Appendix D and E.

3.3.2 Financial Risk

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

- 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, e.g., the start and rate of acceptance of spent fuel by the DOE.

- Pricing changes for basic inputs, such as labor, energy, materials, and burial. Some of these inputs may vary slightly, e.g. -10% to +20%; burial could vary from -50% to +200% or more.

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

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. Unless otherwise noted, these assumptions are applicable to all three scenarios.

3.4.1 Spent Fuel Management

The cost to dispose of spent fuel generated from plant operations is not reflected within the estimates to decommission the TMI-2 site. The majority of the spent fuel was removed during the TMI-2 Clean-up Program's reactor vessel defueling effort which concluded in January 1990. Title to the spent fuel that was removed was transferred to the DOE.

The remainder of the fuel (about 1%) is dispersed within the primary system and to a lesser extent in other systems and structures. This residual material will be removed as radioactive waste and is included in the waste disposal volumes discussed in Section 5.

Repository Availability

There will be some wastes generated in the decommissioning of TMI-2 that are not suitable for shallow land burial and therefore cannot be shipped for disposal to either Barnwell or Envirocare. This material, primarily associated with systems and structures contaminated with fuel debris, requires greater isolation from the environment. For estimating purposes, a high-level waste repository, or some interim storage facility, is assumed to be available by 2015 for the disposal of this material. This timetable is consistent with the findings of an evaluation recently issued to Congress by the Government Accounting Office for the geologic repository at Yucca Mountain.

3.4.2 Reactor Vessel and Internal Components

The majority of the reactor internal components have already been removed as a result of the accident recovery effort in the 1980's. These components are currently being stored within the reactor building. This estimate assumes that these components are segmented and shipped in shielded, reusable transportation casks commensurate with the start of major reactor vessel removal activities, e.g., Period 4A of the Delayed DECON scenario.

The reactor pressure vessel and remaining internal components (essentially the core barrel, core former, thermal shield, and flow distributor) are segmented and packaged for disposal in shielded, reusable transportation casks. Segmentation of the remaining internal components is performed in the refueling canal, where a turntable and remote cutter are installed. The vessel is segmented in place, using a mast-mounted cutter supported off the lower head and directed from a shielded work platform installed overhead in the reactor cavity. Transportation cask specifications and transportation regulations will dictate segmentation and packaging methodology.

It is anticipated that all neutron-activated components in the reactor vessel and internals would meet existing disposal requirements as delineated in 10 CFR §61, due to the short operating history. However, the fission products and transuranic material present on all surfaces in the vessel and internals are expected to exceed Class C limits, in particular for those components located below the top of the core. The reactor vessel and the upper portions of the internals are assumed to meet Class A limits following decontamination.

The dismantling of the reactor internals will generate radioactive waste considered unsuitable for shallow land disposal, i.e., GTCC. Although the material is not classified as high-level waste, the DOE has indicated it will accept this waste for disposal at the future high-level waste repository.[19] 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 as high-level waste, at a cost of $25,000 per cubic foot. It is also assumed that the DOE will accept the GTCC material in a timely manner so as not to affect the TMI-2 decommissioning schedule. No additional costs are included for the temporary storage of GTCC material.

Intact disposal of the reactor vessel and internal components can provide savings in cost and worker exposure by eliminating the complex segmentation requirements, isolation of the GTCC material, and transport/storage of the resulting waste packages. Portland General Electric (PGE) was able to dispose of the Trojan reactor as an intact package. 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 for TMI-2. Future viability of this option will depend upon the ultimate location of the disposal site, as well as the disposal site licensee's ability to accept highly radioactive packages and effectively isolate them from the environment. Consequently, the study assumes the reactor vessel will require segmentation, as a bounding condition.

3.4.3 Steam Generators

With the high levels of radioactivity and contamination both in the reactor building and within the steam generators, this estimate assumes that the steam generators will be segmented in place instead of one piece removal.

The removal sequence assumed for the estimate is as follows:

- Remove the upper steam generator channel head by wire sawing the shell and tubes immediately below the upper tube sheet.
- Segment and decontaminate the upper channel head in the fuel transfer pool.
- Install a steam generator work platform to allow in-place underwater segmentation of the steam generator internals.
- Remove the steam generator tubing and associated shroud and support plates.
- Remove the steam generator cylindrical shell.
- Remove the lower steam generator channel head.
- Segment and decontaminate the lower channel head in the fuel transfer pool.

The steam generator tubing is packaged and shipped and buried as Class B waste. Steam generator tube support plates, shrouds, and shell plates are transported and buried as Class A waste. The estimate assumes that the steam generator channel heads will be decontaminated using a combination of machining and ultra high pressure (UHP) water sprays such that the components can be shipped and buried as Class A waste.

Waste that is generated as a result of the machining and normal filtering of the water in the steam generators and the fuel transfer pool is assumed to be highly radioactive and is packaged and transferred to the DOE as GTCC waste.

3.4.4 Other Primary System Components

The following discussion deals with the decontamination, removal and disposition of the pressurizer, reactor coolant piping, reactor coolant pumps and motors, and the core flood tanks.

A combination of in-place decontamination, and remote decontamination of components in the fuel transfer pool was assumed in the estimate.

The pressurizer and the core flood tanks are decontaminated in-place using UHP. Once decontaminated, the pressurizer is cut in half, removed from the reactor building, grouted, and packaged in a shielded container for rail shipment and burial as Class A waste. The core flood tanks are assumed to be segmented, packaged and shipped as Class A waste.

Hot leg piping is accessed by cutting a hole in the core barrel. A combination of underwater remote retrieval and vacuuming is used to remove fuel and fission product material. Hot and cold leg piping and fittings are removed and placed in the fuel transfer pool for additional decontamination. Hydrolasing is used to remove radioactive materials. Removed material is collected using filters and demineralizers, packaged, and transferred to the DOE as GTCC material. Decontaminated piping is packaged, shipped and buried as Class A material.

The reactor coolant pump motors are removed intact and placed in shielded containers for rail transport and burial as Class A material.

Reactor coolant pumps are disassembled and placed in the fuel transfer pool for decontamination. Pump components are decontaminated using UHP to remove the majority of the radioactive material. Following decontamination, the components are packaged in shielded containers for rail transport and buried as Class A material. Material removed as a result of the decontamination process is collected using filters and shipped as GTCC material. The estimates also assume that process water used for reactor coolant system decontamination and in the fuel transfer pool is processed using cesium/strontium preferential cation demineralizers. The resin waste is processed and buried as Class C radioactive waste.

3.4.5 Other Systems Known to Contain High Levels of Radioactivity

Systems in the reactor building and portions of systems in the auxiliary and fuel handling buildings are known to contain high levels of radioactivity and potentially spent fuel material from the accident. The estimates recognize the difficulty in removing these components by increasing the work difficulty factors associated with removal of these systems. The estimates also assume that these components will be packaged for direct disposal (no recycling). The disposal costs of these waste streams were also adjusted, as appropriate, to include curie surcharges commensurate with the higher radioactivity levels.

These systems and components will be decontaminated with UHP sprays to removal fuel solids and sludge from fuel bearing components in the fuel and auxiliary buildings. Solids and sludge resulting from the UHP process will be transferred to the reactor building to be packaged in canisters used for NSSS decontamination.

3.4.6 Reactor Building Structures Decontamination

Significant radioactive contamination exists throughout the TMI-2 reactor building. This contamination is due to fission products (^{90}Sr and ^{137}Cs in particular) released from the failed fuel. The radiation levels are not expected to decrease significantly from current levels due to the long half lives of these elements. The dispersion of spent fuel within the reactor building includes alpha-decaying isotopes in addition to the beta and gamma radiation normally encountered during decommissioning. These unusual conditions require additional controls and more engineered decommissioning methods to perform the structure decontamination and demolition.

Based upon these conditions, the estimates assume that the entire interior structure of the reactor building is removed and disposed as potentially contaminated material.

The lower elevations of the reactor building are highly contaminated. This contamination is present on the lower level concrete and steel walls. Significant activity has been absorbed in the concrete block walls, in the four foot thick D-ring concrete walls, and on the lower level concrete floors. Initial decontamination of this area (Period 4A) is assumed to be performed using remotely-operated machines (BROKKS or equivalent). Surface material will be bulk removed from the concrete walls, packaged in shielded casks and buried as Class B waste.

Once the highly contaminated surfaces are decontaminated, free standing concrete walls will be removed (in Period 4B using more conventional means) and shipped to a waste processor as radioactive material.

The upper portion of the containment inner steel liner and the entire polar crane will be removed using conventional radioactive demolition techniques (in Period 4B) and packaged, shipped and buried as radioactive material. Following liner removal, the outer reactor building concrete walls will be removed using hydraulic excavation hammers. Reactor building structural material will be processed with 90% of the concrete volume assumed to meet free release criteria. The remaining 10% is sent to a waste processor. The free released concrete is acceptable for use as fill. Excess material and scrap metals will be sent to an industrial landfill.

3.4.7 Demolition of Other Contaminated Structures

Significant contamination exists within the auxiliary and fuel buildings. Similar to the reactor building, locations within these buildings will require special engineered methods to safely decontaminate and dispose of the structures.

The estimate assumes that the entire auxiliary and fuel building structures (all walls and floors down to the footings) will be removed and the resultant structural material monitored and processed with the same criteria as the reactor building.

Selected areas of the buildings will require remote operated machines and dedicated engineered ventilation systems and enclosures to allow decontamination and material removal.

3.4.8 Main Turbine and Condenser

The main turbine will be dismantled using conventional maintenance procedures. The remaining turbine internals will be removed to a laydown area. The lower turbine casings will be removed from their anchors by controlled demolition. This study recognizes that one of the low pressure turbine rotors has already been removed from the site. 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.

3.4.9 Transportation Methods

Contaminated piping, components, and structural material other than the highly contaminated reactor coolant system components and reactor building structures will qualify as LSA-I, II or III or Surface Contaminated Object, SCO-I or II, as described in Title 49.[20] The contaminated material will be packaged in Industrial Packages (IP-1, IP-2 or IP-3, as defined in subpart 173.411) for transport unless demonstrated to qualify as their own shipping containers. It is anticipated that the reactor, due to its limited operating lifetime, will qualify as LSA II or III. The reactor vessel internal components are expected to be transported to the DOE's geologic repository in spent fuel casks by rail.

Waste resulting from filtering and demineralization of the reactor coolant system, and processing the fuel transfer pool water is assumed to require shipment in shielded truck casks. Transport of other highly radioactive material such as reactor coolant system components, and waste from the decontamination of the reactor building basement are by shielded truck cask. Truck cask shipments may exceed 95,000 pounds, including payload, supplementary shielding, cask tie-downs, and tractor-trailer. The maximum level of activity per shipment assumed permissible was based upon the license limits of the available shielded transport casks. The segmentation scheme for the vessel and internal segments is designed to meet these limits.

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

Truck transportation costs are estimated using published tariffs from Tri-State Motor Transit.[21]

The low-level radioactive waste requiring controlled disposal will be sent to the Envirocare facility in Clive, Utah. Memphis, Tennessee, is used as the destination for off-site processing. Bulk material shipped off site to the waste processor or to Envirocare is primarily moved via gondola railcars.

3.4.10 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.

Very low-level radioactive material, e.g., structural steel and contaminated concrete, is sent to a waste processing facility. More highly contaminated and activated material is sent to Envirocare. Disposal fees are based upon current charges for operating waste. Since Envirocare does not currently have a license to handle and dispose of Class B and C wastes, Barnwell rates were used as a surrogate. Surcharges were added for the highly activated components, e.g., generated in the segmentation of the reactor vessel. A nominal fee of $25,000 per cubic foot was assumed for the disposal of GTCC material at a federal repository.

The Idaho National Engineering and Environmental Laboratory (INEEL) is currently storing waste from the TMI-2 defueling operation. Costs have been included in this estimate to pay INEEL for the final disposal of this waste; the timing of when this payment occurs will be dependent upon the DOE's schedule for cleanup of INEEL. This estimate assumes that the payment occurs during Period 4 of each cost scenario.

This study assumes that most of the concrete resulting from the demolition of the reactor, auxiliary and fuel handling buildings can be surveyed and released on site for fill of below grade voids, or shipped off site to a local construction debris landfill. Should there be restrictions to this approach; the cost impact on the decommissioning program could become quite large, potentially up to tens of millions of dollars.

3.4.11 Additional Decommissioning Facilities

Additional specialized facilities are required in support of the decommissioning. These include refurbishment of the containment air control envelope building located outside the reactor building equipment hatch, and the contamination control cubicle located outside the other personnel airlock, for reactor building radiological control and access. Construction of a prefabricated metal enclosure at 305 elevation within the reactor building for the handling of highly-contaminated material. A radioactive material packaging and processing facility will also be required (Note that such a facility already exists on site, but will require refurbishment.)

3.4.12 Remediation of Soil and Underground Piping

The estimates include the cost to remove certain underground piping. An allowance is also included for the removal, packaging, transportation and disposal of approximately 49,000 cubic feet of contaminated soil.

3.4.13 Site Conditions Following Decommissioning

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

Non-essential structures or buildings severely damaged in decontamination process are removed to a nominal depth of three feet below grade. Concrete rubble generated from demolition activities is processed and made available as clean fill. The excavations will be regraded such that the power block area will have a final contour consistent with adjacent surroundings.

This estimate assumes the reactor, auxiliary, fuel buildings will be removed completely, i.e., to their foundations and basemats. Concrete from these buildings will be surveyed on-site using conventional monitoring equipment; concrete which meets the release criteria will be disposed of either on site as fill, or in an off-site landfill.

3.5 ASSUMPTIONS

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

3.5.1 Estimating Basis

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

All costs are reported in 2003 dollars.

No costs have been included for the preparation of an environmental impact statement, should it be required.

3.5.2 Labor Costs

The craft labor required to decontaminate and dismantle the nuclear units will be 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 FirstEnergy or from comparable industry information.

FirstEnergy will provide limited oversight support staff in the areas of overall management, licensing, radiological and industrial safety and engineering. It will also hire a DOC to provide the balance of the professional, management, administrative and physical staff.

This study assumes that there is some sharing of administrative staffing positions with the adjacent Unit 1 (owned and operated by AmerGen Energy, LLC, a wholly-owned subsidiary of Exelon Generation, LLC). This has the effect of slightly lowering site utility and contractor staffing costs.

The staffing levels for the Hardened SAFSTOR scenario were adjusted (reduced) during decommissioning periods to reflect the two phase approach.

3.5.3 Design Conditions

Fuel cladding failure as a result of the accident will most likely prevent shipment of untreated major NSSS components under current transportation regulations and disposal requirements. Therefore, this estimate assumes that aggressive mechanical decontamination of reactor coolant system components is required prior to shipment.

The curie contents of the vessel and internals are activation products derived from those listed in NUREG/CR-3474.[22] Actual estimates are derived from the curie/gram values contained therein and adjusted for the different mass of the TMI-2 components, the 95 effective full-power days, and different periods of decay. Additional short-lived isotopes were derived from CR-0130[23] and CR-0672.[24] and benchmarked to the long-lived values from CR-3474. The activation products present in the reactor vessel base metal are assumed to be the controlling factor in their disposal, following surface decontamination of fuel debris.

Reactor vessel internals whose elevation in the reactor places them at or below the original top of the fuel assemblies are assumed to be both sufficiently geometrically complex to preclude effective decontamination and contaminated with spent fuel so as to require disposal as GTCC material.

Control elements and incore detector assemblies are assumed to have been removed with the damaged fuel.

Activation of the reactor building structure and the biological shield is considered minimal due to the short operating life of TMI-2.

3.5.4 General

Transition Activities

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

- Drain and collect lubricating oils for recycle and/or sale.

- Process defueling waste inventories, i.e., the estimates include costs for the removal of lead shielding and spent fuel handling equipment that has remains in the reactor building.

Scrap and Salvage

Material located within the radiation controlled area, and not shipped for direct disposal, is sent off-site for survey and release.

Furniture, tools, mobile equipment such as forklifts, trucks, bulldozers, and other property owned by FirstEnergy (and outside the radiation controlled area) is removed at no cost or credit to the decommissioning project. Disposition may include relocation to other facilities. Spare parts are also available for alternative use.

Energy

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

Insurance

Costs for continuing coverage (nuclear liability and property insurance) during dormancy and decommissioning are included and based upon current operating premiums. Reductions in premiums, throughout the decommissioning process, are based upon the guidance and the limits for coverage defined in the NRC's proposed rulemaking "Financial Protection Requirements for Permanently Shutdown Nuclear Power Reactors."[25] The NRC's financial protection requirements are based on various reactor configurations.

Taxes

Property taxes are not included.

Site Modifications

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

3.6 COST ESTIMATE SUMMARY

A schedule of expenditures for each scenario is provided in Tables 3.1 through 3.3. Decommissioning costs are reported in the year of projected expenditure; however, the values are provided in thousands of 2003 dollars. Costs are not inflated, escalated, or discounted over the period of expenditure. The annual expenditures are based upon the detailed activity costs reported in Appendices C through E, along with the schedule discussed in Section 4.

TABLE 3.1
SCHEDULE OF ANNUAL EXPENDITURES
DELAYED DECON
(thousands, 2003 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2014	319	88	162	14	344	928
2015	453	126	230	20	489	1,318
2016	454	126	230	20	491	1,322
2017	453	126	230	20	489	1,318
2018	453	126	230	20	489	1,318
2019	453	126	230	20	489	1,318
2020	454	126	230	20	491	1,322
2021	453	126	230	20	489	1,318
2022	453	126	230	20	489	1,318
2023	453	126	230	20	489	1,318
2024	21,433	475	464	20	8,039	30,430
2025	41,479	3,030	669	4,549	8,062	57,789
2026	35,070	10,330	669	13,708	9,668	69,445
2027	35,070	10,330	669	13,708	9,668	69,445
2028	35,166	10,358	671	13,746	9,694	69,635
2029	35,070	10,330	669	13,708	9,668	69,445
2030	35,070	10,330	669	13,708	9,668	69,445
2031	31,920	9,333	532	20,422	4,193	66,400
2032	31,245	9,117	501	22,104	2,878	65,845
2033	31,160	9,092	499	22,044	2,870	65,665
2034	24,456	6,774	402	15,346	4,386	51,364
2035	12,892	4,078	130	9	3,828	20,937
2036	7,280	2,832	41	0	230	10,384
	381,711	97,628	8,815	153,269	87,602	729,026

TABLE 3.2
SCHEDULE OF ANNUAL EXPENDITURES
CUSTODIAL SAFSTOR
(thousands, 2003 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2014	319	88	162	14	344	928
2015	453	126	230	20	489	1,318
2016	454	126	230	20	491	1,322
2017	453	126	230	20	489	1,318
2018	453	126	230	20	489	1,318
2019	453	126	230	20	489	1,318
2020 - 2060	18,597	5,151	9,430	825	20,072	54,076
2061	453	126	230	20	489	1,318
2062	453	126	230	20	489	1,318
2063	27,812	580	534	20	10,333	39,279
2064	40,790	4,601	671	6,788	7,276	60,126
2065	35,070	10,327	669	13,649	9,664	69,378
2066	35,070	10,327	669	13,649	9,664	69,378
2067	35,070	10,327	669	13,649	9,664	69,378
2068	35,166	10,355	671	13,687	9,690	69,569
2069	35,070	10,327	669	13,649	9,664	69,378
2070	31,277	9,121	505	21,769	3,067	65,740
2071	31,159	9,084	499	22,021	2,862	65,626
2072	31,245	9,109	501	22,082	2,870	65,806
2073	20,832	5,518	349	11,714	5,201	43,614
2074	14,025	4,860	115	6	2,621	21,626
2075	4,649	1,809	26	0	147	6,631
	399,325	102,464	17,748	153,663	106,565	779,764

TABLE 3.3
SCHEDULE OF ANNUAL EXPENDITURES
HARDENED SAFSTOR
(thousands, 2003 dollars)

Year	Labor	Equipment & Materials	Energy	Burial	Other	Total
2014	319	88	162	14	344	928
2015	453	126	230	20	489	1,318
2016	6,552	257	318	20	1,663	8,811
2017	30,224	1,558	669	1,301	5,450	39,202
2018	28,879	6,775	551	15,191	2,767	54,164
2019	29,556	7,710	499	19,072	3,179	60,016
2020	26,834	6,876	457	16,515	3,828	54,510
2021	11,269	3,280	144	12	6,216	20,922
2022	9,260	3,851	60	-	2,532	15,703
2023	241	-	11	-	875	1,127
2024	242	-	12	-	877	1,131
2025 - 2101	18,564	-	885	-	67,421	86,870
2102	14,758	345	301	9	6,906	22,319
2103	33,476	2,373	669	876	8,831	46,224
2104	29,339	9,503	671	9,402	8,535	57,449
2105	28,934	9,834	669	9,897	8,998	58,331
2106	28,934	9,834	669	9,897	8,998	58,331
2107	28,934	9,834	669	9,897	8,998	58,331
2108	29,013	9,861	671	9,924	9,022	58,491
2109	27,506	6,917	547	12,791	4,325	52,087
2110	26,945	5,770	499	13,929	2,488	49,632
2111	26,945	5,770	499	13,929	2,488	49,632
2112	23,168	4,604	429	10,842	2,314	41,357
2113	9,021	1,792	114	6	475	11,408
2114	2,459	648	25	-	-	3,132
	471,824	107,608	10,432	153,543	168,018	911,425

4. SCHEDULE ESTIMATE

The schedules for the decommissioning scenarios considered in this study follow the sequence presented in the AIF/NESP-036 study, with minor changes to reflect recent experience and site-specific constraints.

A schedule or sequence of activities is presented in Figure 4.1 through 4.3 for the three decommissioning scenarios. The key activities listed in the schedule do not reflect a one-to-one correspondence with those activities in the cost tables, but reflect dividing some activities for clarity and combining others for convenience. The schedule was prepared using the "Microsoft Project 2002" computer software.[26]

4.1 SCHEDULE ESTIMATE ASSUMPTIONS

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

- The dormancy period for each scenario begins on the TMI-1 shutdown date of April 19, 2014. The decommissioning preparation period for each scenario begins on the TMI-1 operating license termination date.

- For the Custodial SAFSTOR scenario, onset of delayed decommissioning activities is commensurate with the termination of the TMI-1 operating license, following its 60 year SAFSTOR scenario. Therefore, the custodial dormancy period ends, and delayed decommissioning activities begin at TMI-2 in 2074.

- For the Hardened SAFSTOR scenario, final site restoration is completed 100 years after termination of the TMI-1 operating license.

- All work (except vessel and internals removal and some of the decontamination of NSSS components in the refueling canal) is performed during an 8-hour workday, 5 days per week, with no overtime. There are eleven paid holidays per year.

- Steam generator removal activities are performed on multiple shifts with limited parallel work on the A and B steam generators.

- Reactor and internals removal activities are performed by using separate crews for different activities working on different shifts, with a corresponding backshift charge for the second shift.

- Multiple crews work parallel activities to the maximum extent possible, consistent with optimum efficiency, adequate access for cutting, removal and laydown space, and with the stringent safety measures necessary during demolition of heavy components and structures.

- For all scenarios, reactor building basement decontamination using remote equipment will occur prior to the start of reactor coolant system component removal.

4.2 PROJECT SCHEDULE

The period-dependent costs presented in the detailed cost tables are based upon the durations developed in the schedule for decommissioning TMI-2. Durations are established between several milestones in each project period; these durations are used to establish a critical path for the entire project. In turn, the critical path duration for each period is used as the basis for determining the period-dependent costs.

Project timelines are provided in Figures 4.4 through 4.6.

FIGURE 4.1
DELAYED DECON
ACTIVITY SCHEDULE

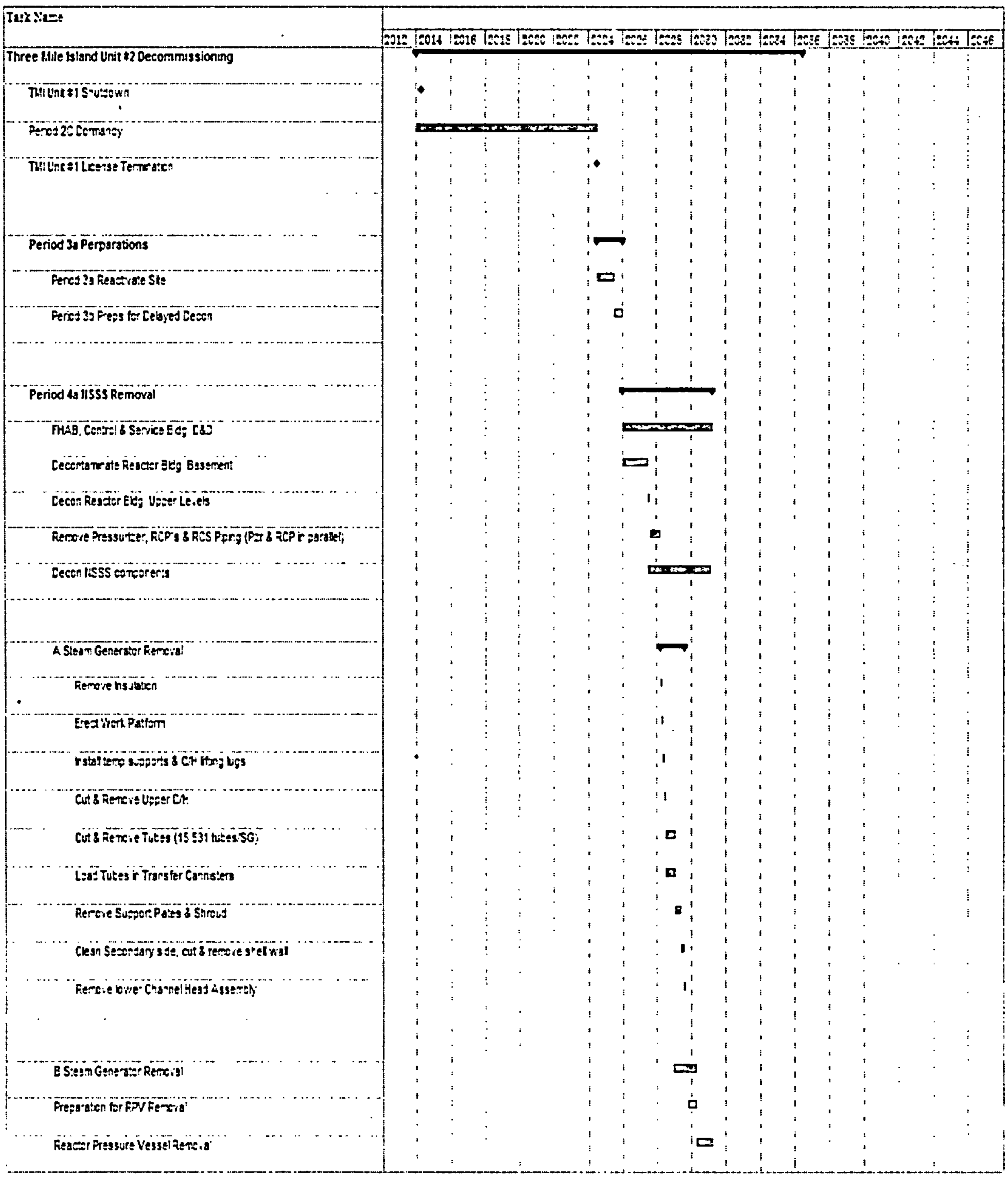


FIGURE 4.1
DELAYED DECON
ACTIVITY SCHEDULE
(continued)

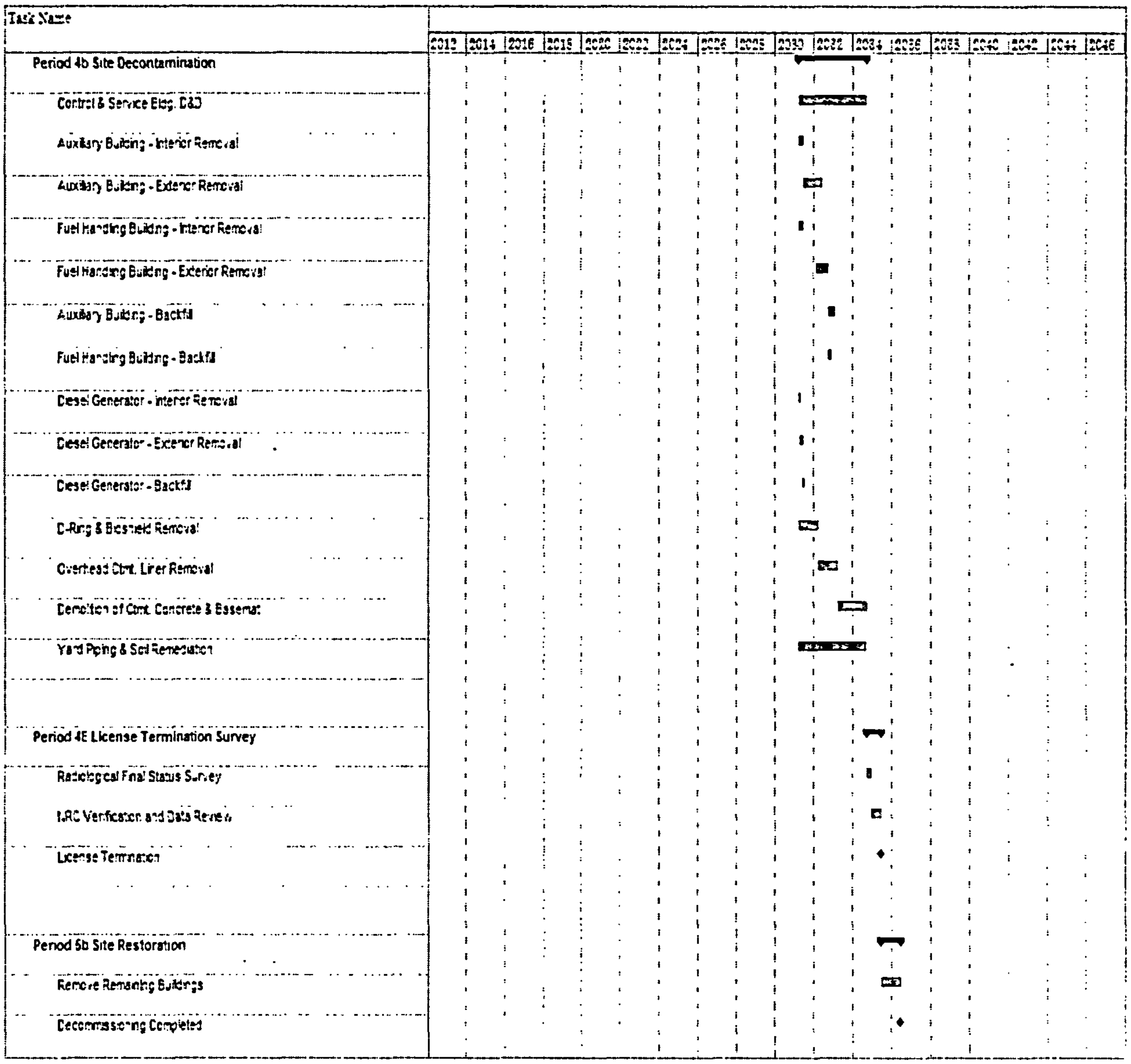


FIGURE 4.2
DECOMMISSIONING TIMELINE
DELAYED DECON
(not to scale)

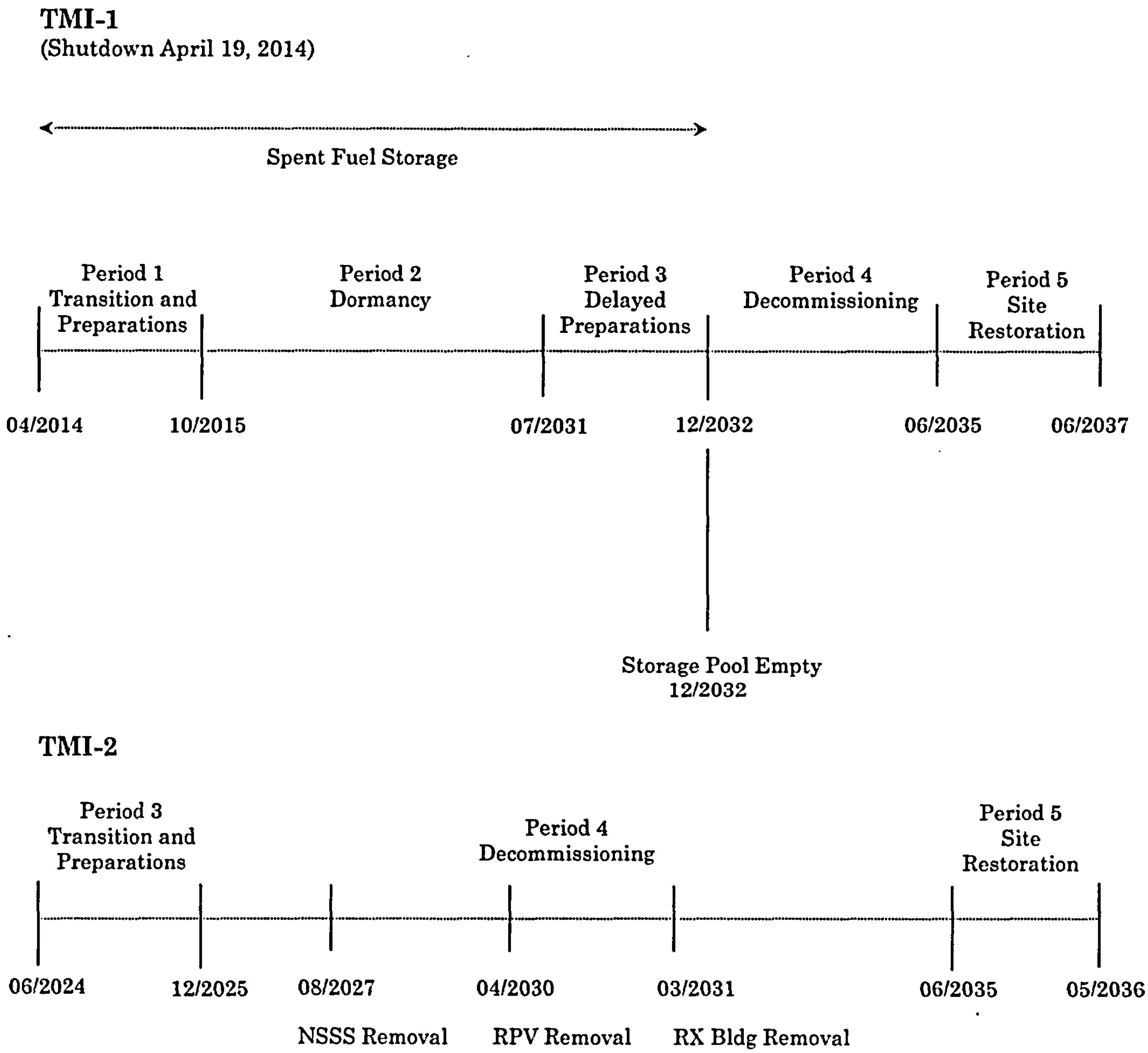
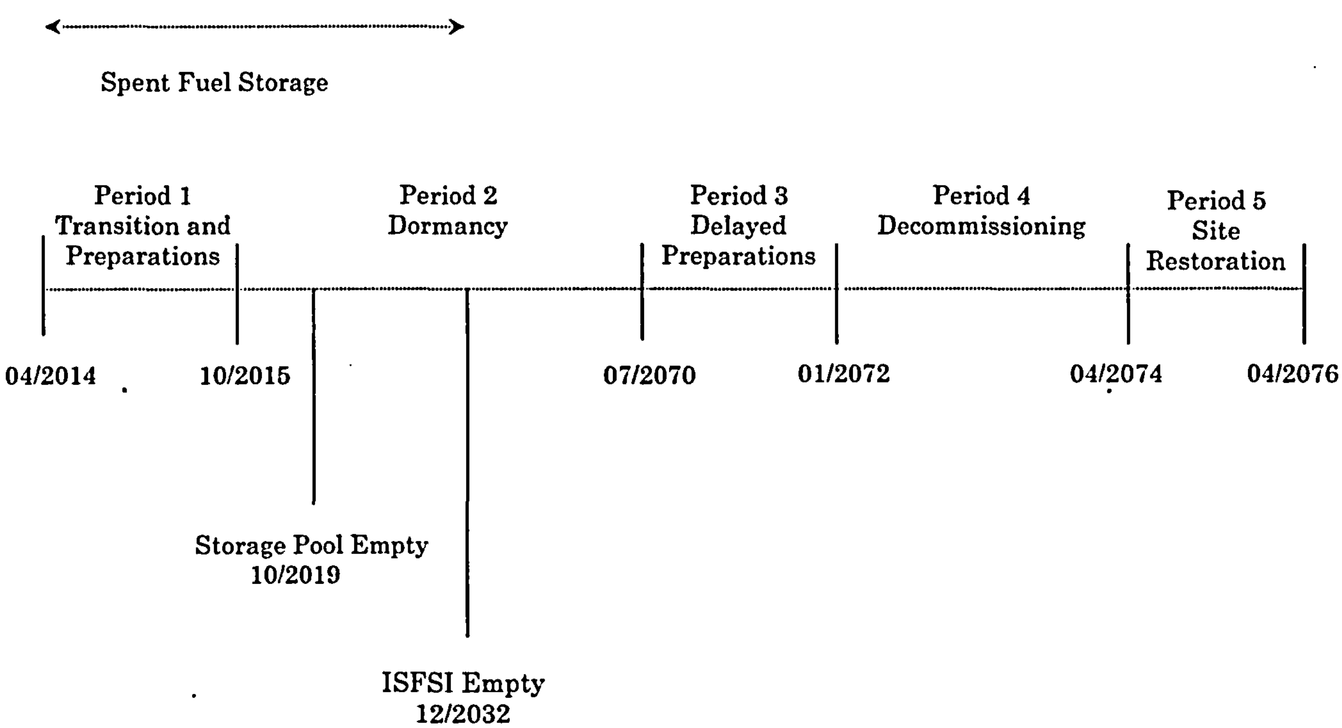


FIGURE 4.3
DECOMMISSIONING TIMELINE
CUSTODIAL SAFSTOR
(not to scale)

TMI-1
(Shutdown April 19, 2014)



TMI-2

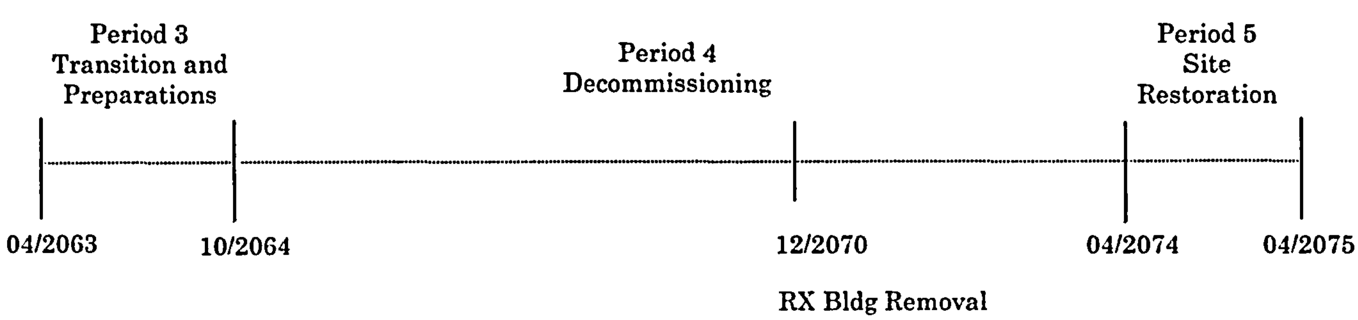
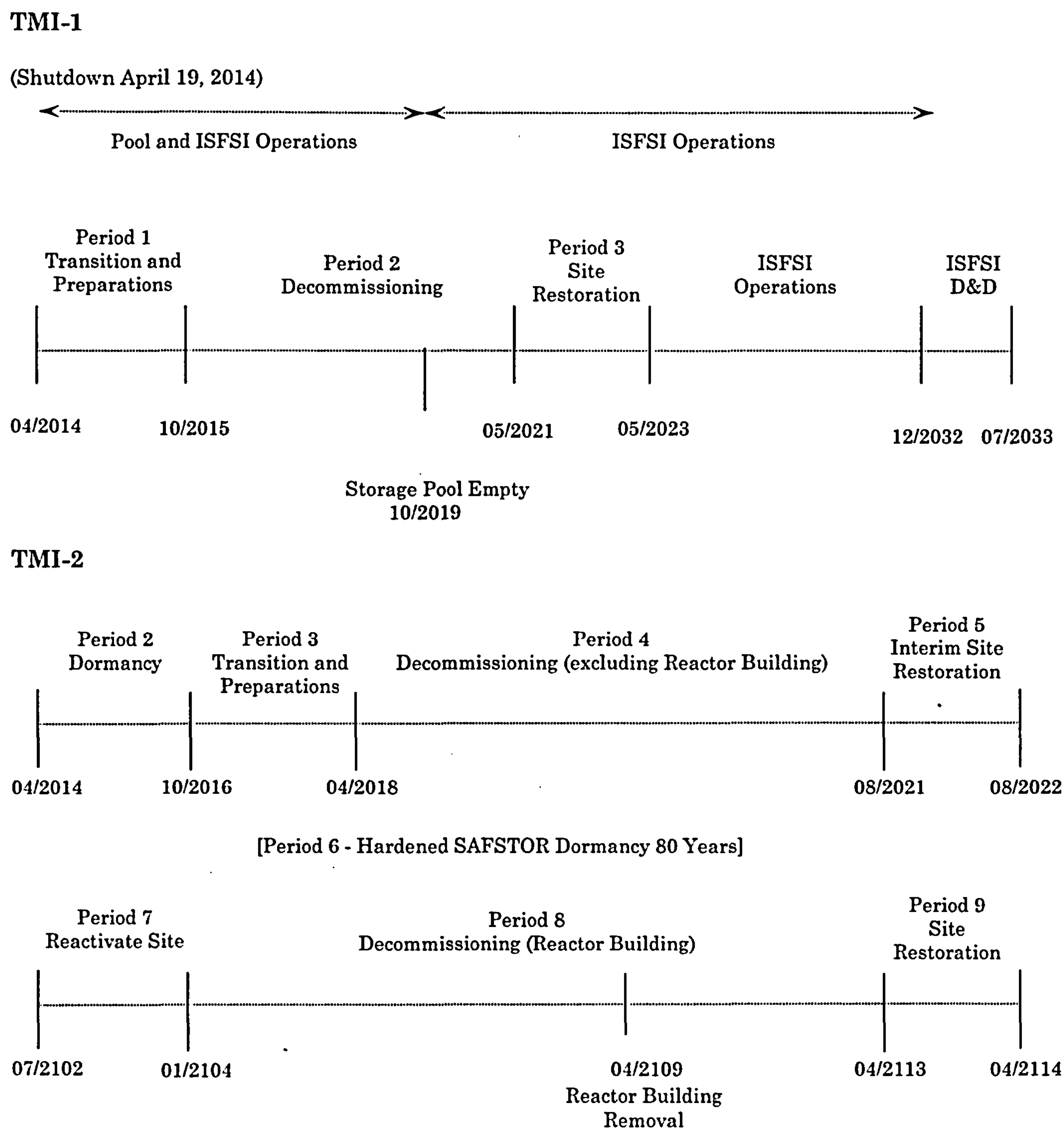


FIGURE 4.4
DECOMMISSIONING TIMELINE
HARDENED SAFSTOR
(not to scale)



5. RADIOACTIVE WASTES

The objectives of the decommissioning process are the removal of all radioactive material from the site that would restrict its future use and the termination of the NRC license. This currently requires the remediation of all radioactive material at the site in excess of applicable legal limits. Under the Atomic Energy Act,[27] the NRC is responsible for protecting the public from sources of ionizing radiation. Title 10 of the Code of Federal Regulations delineates the production, utilization, and disposal of radioactive materials and processes. In particular, §71 defines radioactive material as it pertains to packaging and transportation and §61 specifies its disposition.

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

Table 5.1 summarizes the categories of radioactive waste streams, the disposal rate, and the conditions which applied to each category.

The volumes of radioactive waste generated during the various decommissioning activities at the site is shown on a line-item basis in Appendices C, D, and E and summarized in Tables 5.2 through 5.4. The quantified waste volume summaries shown in these tables are consistent with §61 classifications. The volumes are calculated based on the exterior dimensions for containerized material and on the displaced volume of components serving as their own waste containers.

The reactor vessel, internals, other reactor coolant system components, and certain structural materials are categorized as large quantity shipments and, accordingly, will be shipped in reusable, shielded truck casks with disposable liners or LSA boxes shipped within shielded vans. In calculating disposal costs, the burial fees are applied against the liner volume, as well as the special handling requirements of the payload.

No process system containing/handling radioactive substances at the time of decommissioning is presumed to meet material release criteria by decay alone, i.e., systems radioactive in 2003 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 TMI-2 is primarily generated during Period 4 of the defined alternatives.

For purposes of constructing the estimates, the rate schedule for the Barnwell facility was used as a proxy for Class B and Class C waste. This schedule was used to estimate the disposal fees for plant components and concrete which are considered highly radioactive (unsuitable for processing or recovery).

TABLE 5.1

TMI-2 WASTE STREAMS SUMMARY

CATEGORY	DELAYED DECON CUSTODIAL SAFSTOR HARDENED SAFSTOR
Greater Than Class C (GTCC), ($25,000/CF)	Selected RPV Internals and filters generated during RCS decon activities.
Primary Waste, Class C, ($5.17/LB) (Barnwell non-Atlantic compact rate) plus applicable administrative fees, millicurie surcharges and dose rate multipliers	Demineralizer resins generated during RCS decon activities, block wall from basement dose reduction.
Primary Waste, Class B, ($5.17/LB) (Barnwell non-Atlantic compact rate) plus applicable administrative fees, millicurie surcharges and dose rate multipliers	Systems in the reactor building, concrete and liner from basement dose reduction, segmented S/G tubing, process of liquid waste.
Primary Waste, Class A, ($5.17/LB) (Barnwell non-Atlantic compact rate) plus applicable administrative fees, millicurie surcharges and dose rate multipliers	All other systems components.
Secondary Waste, Class A, ($3.21/LB) Containerized (Envirocare)	Spent fuel racks, turbine, condenser, scaffolding, siding & roofing, cranes and structural steel.
Tertiary Waste, Class A, ($1.00/LB) Bulk sent for processing at Tennessee	Contaminated soil, concrete scabble & rubble, concrete block. (excluding RB basement).
Tertiary Waste, DAW ($1.99/LB)	All dry active waste (DAW)
Processed Waste (off-site) ($1.99/LB) sent to Tennessee	Systems designated for recycling.
Construction Debris ($50.00 /TON)	Exterior reactor, auxiliary and fuel handling building concrete and structural steel (not including scabble and drill & spall concrete rubble) not utilized for backfill.

TABLE 5.2
DECOMMISSIONING WASTE SUMMARY
DELAYED DECON

	Class	Volume (cubic feet)	Weight (pounds)
Geologic Repository	GTCC	1,252	166,120
Primary Waste Stream[1]			
	C	3,364	269,715
	B	19,578	1,860,997
	A	87,837	7,781,924
Secondary Waste Stream[2]			
	A	58,836	4,399,190
Tertiary Waste Stream[3]			
Concrete	A	341,878	35,969,146
Soil	A	48,992	3,723,414
DAW	A	18,352	367,755
Survey & Release[4]			850,136
Total		580,088	55,388,397
Processed Waste (Off-Site)		71,277	4,298,378
Scrap Metal			59,388,000

[1] Primary waste buried at E-Care with Barnwell price structure
[2] Secondary waste buried at E-Care with containerized rates
[3] Tertiary waste sent to LLRW processor
[4] Systems scrap sent to E-Care for survey and release

TABLE 5.3
DECOMMISSIONING WASTE SUMMARY
CUSTODIAL SAFSTOR

		Class	Volume (cubic feet)	Weight (pounds)
Geologic Repository		GTCC	1,252	166,120
Primary Waste Stream[1]				
		C	3,364	269,715
		B	19,422	1,841,367
		A	87,195	7,721,561
Secondary Waste Stream[2]				
		A	58,836	4,399,190
Tertiary Waste Stream[3]				
	Concrete	A	341,878	35,969,146
	Soil	A	48,992	3,723,414
	DAW	A	34,066	682,662
	Survey & Release[4]			850,136
Total			595,005	55,623,311
Processed Waste (Off-Site)			71,919	4,354,639
Scrap Metal				59,388,000

[1] Primary waste buried at E-Care with Barnwell price structure
[2] Secondary waste buried E-Care with containerized rates
[3] Tertiary waste sent to LLRW processor
[4] Systems scrap sent to E-Care for survey and release

TABLE 5.4
DECOMMISSIONING WASTE SUMMARY
HARDENED SAFSTOR

		Class	Volume (cubic feet)	Weight (pounds)
Geologic Repository		GTCC	1,252	166,120
Primary Waste Stream[1]				
		C	3,364	269,715
		B	19,518	1,853,394
		A	86,845	7,688,252
Secondary Waste Stream[2]				
		A	59,210	4,432,697
Tertiary Waste Stream[3]				
	Concrete	A	341,878	35,969,146
	Soil	A	48,992	3,723,414
	DAW	A	16,455	329,754
	Survey & Release[4]			850,136
Total			577,513	55,282,628
Processed Waste (Off-Site)			78,268	4,655,897
Scrap Metal				59,388,000

[1] Primary waste buried at E-Care with Barnwell price structure
[2] Secondary waste buried at E-Care with containerized rates
[3] Tertiary waste sent to LLRW processor
[4] Systems scrap sent to E-Care for survey and release

6. RESULTS

The analysis to estimate the costs to decommission TMI-2 relied upon the site-specific, technical information developed for a previous analysis prepared in 1995-96. While not an engineering study, the estimates provide FirstEnergy with sufficient information to assess its financial obligations, as they pertain to the eventual decommissioning of the nuclear station.

The estimates described in this report are based on numerous fundamental assumptions, including regulatory requirements, project contingencies, radioactive waste disposal options, and site remediation requirements. The decommissioning scenarios assume that the remainder of the spent fuel (less than 1%), which is dispersed throughout the reactor coolant and support systems, is packaged, shipped and buried as radioactive waste. Some of the waste that is generated is assumed to be GTCC. This waste is assumed to be transferred to the DOE at the time that it is processed and collected during the decommissioning. No costs have been included for the temporary storage of GTCC material.

The cost projected to decommission TMI-2, i.e., by the Delayed DECON alternative, is estimated to be $729.0 million. The majority of this cost (approximately 97%) is associated with the physical decontamination and dismantling of the nuclear unit so that the license can be terminated. The remaining 3% is for the demolition of the designated structures and limited restoration of the site. The costs for the deferred decommission alternatives, Custodial SAFSTOR and Hardened SAFSTOR, are estimated at $779.8 million and $911.4 million, respectively.

The primary cost contributors, identified in Tables 6.1 through 6.3, are either labor-related or associated with the management and disposition of the radioactive waste. Program management is the largest single contributor to the overall cost. The magnitude of the expense is a function of both the size of the organization required to manage the decommissioning, as well as the duration of the program. It is assumed, for purposes of this analysis, that FirstEnergy will oversee the decommissioning program, using a DOC to manage the decommissioning labor force and the associated subcontractors. The size and composition of the management organization varies with the decommissioning phase and associated site activities. However, once the operating license is terminated, the staff is substantially reduced for the conventional demolition and restoration of the site.

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 material, including concrete and structural steel, is at the Envirocare facility. The more highly radioactive material is sent to the Envirocare facility but using surrogate Barnwell waste burial rates. Highly contaminated components, requiring additional isolation from the environment, are packaged for geologic disposal. The cost of geologic disposal is assumed to be $25,000 per cubic foot.

Removal costs reflect the labor-intensive nature of the decommissioning process, as well as the management controls required to ensure a safe and successful program. Decontamination and packaging costs also have a large labor component that is based upon prevailing union wages. Non-radiological demolition is a natural extension of the decommissioning process. The methods employed in decontamination and dismantling are generally destructive and indiscriminate in inflicting collateral damage. With a work force mobilized to support decommissioning operations, non-radiological demolition can be an integrated activity and a logical expansion of the work being performed in the process of terminating the operating license.

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

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

The remaining costs include allocations for heavy equipment and temporary services, as well as for other expenses such as regulatory fees and the premiums for nuclear insurance.

TABLE 6.1
SUMMARY OF DECOMMISSIONING COST ELEMENTS
DELAYED DECON
(thousands of 2003 dollars)

Work Category	Cost [1]	%
Decontamination	32,555	4.5%
Removal	111,729	15.3%
Packaging	17,017	2.3%
Transportation	8,725	1.2%
Waste Disposal	179,451	24.6%
Off-site Waste Processing	9,837	1.3%
Program Management [2]	318,039	43.6%
Insurance and Regulatory Fees	13,997	1.9%
Energy	8,815	1.2%
Characterization and Licensing Surveys	6,128	0.8%
Property Taxes	-	0.0%
Miscellaneous Equipment	19,576	2.7%
Site O&M	3,157	0.4%
Total [3]	729,026	100.0%
NRC License Termination	705,400	96.8%
Site Restoration	23,625	3.2%

[1] Includes dormancy costs following TMI-1 shutdown in 2014
[2] Includes engineering and security
[3] Columns may not add due to rounding

TABLE 6.2
SUMMARY OF DECOMMISSIONING COST ELEMENTS
CUSTODIAL SAFSTOR
(thousands of 2003 dollars)

Work Category	Cost [1]	%
Decontamination	32,518	4.2%
Removal	116,450	14.9%
Packaging	17,191	2.2%
Transportation	8,714	1.1%
Waste Disposal	179,716	23.0%
Off-site Waste Processing	9,966	1.3%
Program Management [2]	335,630	43.0%
Insurance and Regulatory Fees	26,339	3.4%
Energy	17,748	2.3%
Characterization and Licensing Surveys	6,128	0.8%
Property Taxes	-	0.0%
Miscellaneous Equipment	26,209	3.4%
Site O&M	3,157	0.4%
Total [3]	779,764	100.0%
NRC License Termination	756,139	97.0%
Site Restoration	23,625	3.0%

[1] Includes dormancy costs following TMI-1 shutdown in 2014
[2] Includes engineering and security
[3] Columns may not add due to rounding

TABLE 6.3
SUMMARY OF DECOMMISSIONING COST ELEMENTS
HARDENED SAFSTOR
(thousands of 2003 dollars)

Work Category	Cost [1]	%
Decontamination	33,306	3.7%
Removal	121,156	13.3%
Packaging	17,052	1.9%
Transportation	8,836	1.0%
Waste Disposal	179,144	19.7%
Off-site Waste Processing	10,655	1.2%
Program Management [2]	407,918	44.8%
Insurance and Regulatory Fees	40,155	4.4%
Energy	10,432	1.1%
Characterization and Licensing Surveys	6,660	0.7%
Property Taxes	-	0.0%
Miscellaneous Equipment	27,219	3.0%
Site O&M	2,927	0.3%
Off-site Monitoring & Security Services	45,965	5.0%
Total [3]	911,425	100.0%
NRC License Termination	877,525	96.3%
Site Restoration	33,899	3.7%

[1] Includes dormancy costs following TMI-1 shutdown in 2014
[2] Includes engineering and security
[3] Columns may not add due to rounding

7. REFERENCES

1. 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.

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

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

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

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

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

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

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

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

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

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

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

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

14. "Decommissioning Cost Estimate for the Three Mile Island, Unit 2," Document No. G01-1196-003, TLG Services, Inc., February 1996.

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

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

17. "Building Construction Cost Data 2003," Robert Snow Means Company, Inc., Kingston, Massachusetts.

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

19. "Strategy for Management and Disposal of Greater-Than-Class C Low-Level Radioactive Waste," Federal Register Volume 60, Number 48 (p 13424 et seq.), March 1995.

20. U.S. Department of Transportation, Title 49 of the Code of Federal Regulations, "Transportation," Parts 173 through 178, 1996.

21. Tri-State Motor Transit Company, published tariffs, Interstate Commerce Commission (ICC), Docket No. MC-109397 and Supplements, 2000.

22. 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.

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23. 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.

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

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

26. "Microsoft Project 2002," Microsoft Corporation, Redmond, WA, 2002.

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

APPENDIX A

UNIT COST FACTOR DEVELOPMENT

APPENDIX A
UNIT COST FACTOR DEVELOPMENT

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

1. SCOPE

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

2. CALCULATIONS

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

Duration adjustment(s):	
+ Respiratory protection adjustment (25% of critical duration)	64
+ Radiation/ALARA adjustment (25% of critical duration)	64
Adjusted work duration	383
+ Protective clothing adjustment (30% of adjusted duration)	115
Productive work duration	498
+ Work break adjustment (8.33 % of productive duration)	42
Total work duration (minutes)	540

***** Total duration = 9.0 hr *****

* alpha designators indicate activities that can be performed in parallel

APPENDIX A
(continued)

3. LABOR REQUIRED

Crew	Number	Duration (hours)	Rate ($/hr)	Cost
Laborers	3.00	9.00	$22.16	$598.32
Craftsmen	2.00	9.00	$37.95	$683.10
Foreman	1.00	9.00	$38.31	$344.79
General Foreman	0.25	9.00	$39.39	$88.63
Fire Watch	0.05	9.00	$22.16	$9.97
Health Physics Technician	1.00	9.00	$36.12	$325.08
Total labor cost				$2,049.89

4. EQUIPMENT & CONSUMABLES COSTS

Equipment Costs	none
Consumables/Materials Costs	
-Absorbent sheets 50 @ $0.37 sq ft {2}	$18.50
-Plastic sheets/bags 50 @ $0.09/sq ft {3}	$4.50
-Gas torch consumables 1 @ $3.66/hr x 1 hr {1}	$3.66
Subtotal cost of equipment and materials	$26.66
Overhead & profit on equipment and materials @ 16.00 %	$4.27
Total costs, equipment & material	$30.93

TOTAL COST:

Removal of contaminated heat exchanger <3000 pounds: $2,080.82

Total labor cost:	$2,049.89
Total equipment/material costs:	$30.93
Total craft labor man-hours required per unit:	65.700

5. NOTES AND REFERENCES

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

- References for equipment & consumables costs:

  1. www.mcmaster.com online catalog, item 7193785
  2. R.S. Means (2003) Section 01540-800-0200, page 17
  3. R.S. Means (2003) Section 01590-400-6360, page 25

- Material and consumable costs were adjusted using the regional indices for Harrisburg, Pennsylvania.

APPENDIX B

UNIT COST FACTOR LISTING
(SAFSTOR: 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	0.44
Removal of clean pipe 0.25 to 2 inches diameter, $/linear foot	3.79
Removal of clean pipe >2 to 4 inches diameter, $/linear foot	5.42
Removal of clean pipe >4 to 8 inches diameter, $/linear foot	11.99
Removal of clean pipe >8 to 14 inches diameter, $/linear foot	21.58
Removal of clean pipe >14 to 20 inches diameter, $/linear foot	28.00
Removal of clean pipe >20 to 36 inches diameter, $/linear foot	41.03
Removal of clean pipe >36 inches diameter, $/linear foot	49.04
Removal of clean valves >2 to 4 inches	80.25
Removal of clean valves >4 to 8 inches	119.89
Removal of clean valves >8 to 14 inches	215.80
Removal of clean valves >14 to 20 inches	280.01
Removal of clean valves >20 to 36 inches	410.30
Removal of clean valves >36 inches	490.35
Removal of clean pipe hangers for small bore piping	25.99
Removal of clean pipe hangers for large bore piping	82.71
Removal of clean pumps, <300 pound	200.32
Removal of clean pumps, 300-1000 pound	544.34
Removal of clean pumps, 1000-10,000 pound	1,933.01
Removal of clean pumps, >10,000 pound	3,731.22
Removal of clean pump motors, 300-1000 pound	234.55
Removal of clean pump motors, 1000-10,000 pound	807.83
Removal of clean pump motors, >10,000 pound	1,816.10
Removal of clean heat exchanger <3000 pound	1,090.00
Removal of clean heat exchanger >3000 pound	2,731.25

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of clean tanks, <300 gallons	258.11
Removal of clean tanks, 300-3000 gallon	813.01
Removal of clean tanks, >3000 gallons, $/square foot surface area	6.51
Removal of clean electrical equipment, <300 pound	113.98
Removal of clean electrical equipment, 300-1000 pound	378.88
Removal of clean electrical equipment, 1000-10,000 pound	751.81
Removal of clean electrical equipment, >10,000 pound	1,727.99
Removal of clean electrical transformers < 30 tons	1,220.25
Removal of clean electrical transformers > 30 tons	3,456.01
Removal of clean standby diesel-generator, <100 kW	1,226.98
Removal of clean standby diesel-generator, 100 kW to 1 MW	2,736.78
Removal of clean standby diesel-generator, >1 MW	5,664.58
Removal of clean electrical cable tray, $/linear foot	10.17
Removal of clean electrical conduit, $/linear foot	4.34
Removal of clean mechanical equipment, <300 pound	113.98
Removal of clean mechanical equipment, 300-1000 pound	378.88
Removal of clean mechanical equipment, 1000-10,000 pound	751.81
Removal of clean mechanical equipment, >10,000 pound	1,727.99
Removal of clean HVAC equipment, <300 pound	113.98
Removal of clean HVAC equipment, 300-1000 pound	378.88
Removal of clean HVAC equipment, 1000-10,000 pound	751.81
Removal of clean HVAC equipment, >10,000 pound	1,727.99
Removal of clean HVAC ductwork, $/pound	0.47
Removal of contaminated instrument and sampling tubing, $/linear foot	0.74
Removal of contaminated pipe 0.25 to 2 inches diameter, $/linear foot	10.23

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated pipe >2 to 4 inches diameter, $/linear foot	17.14
Removal of contaminated pipe >4 to 8 inches diameter, $/linear foot	28.56
Removal of contaminated pipe >8 to 14 inches diameter, $/linear foot	55.09
Removal of contaminated pipe >14 to 20 inches diameter, $/linear foot	66.22
Removal of contaminated pipe >20 to 36 inches diameter, $/linear foot	91.11
Removal of contaminated pipe >36 inches diameter, $/linear foot	108.23
Removal of contaminated valves >2 to 4 inches	216.80
Removal of contaminated valves >4 to 8 inches	262.46
Removal of contaminated valves >8 to 14 inches	524.24
Removal of contaminated valves >14 to 20 inches	665.85
Removal of contaminated valves >20 to 36 inches	884.46
Removal of contaminated valves >36 inches	1,055.67
Removal of contaminated pipe hangers for small bore piping	57.86
Removal of contaminated pipe hangers for large bore piping	178.72
Removal of contaminated pumps, <300 pound	456.75
Removal of contaminated pumps, 300-1000 pound	1,078.72
Removal of contaminated pumps, 1000-10,000 pound	3,502.62
Removal of contaminated pumps, >10,000 pound	8,509.97
Removal of contaminated pump motors, 300-1000 pound	465.25
Removal of contaminated pump motors, 1000-10,000 pound	1,424.97
Removal of contaminated pump motors, >10,000 pound	3,217.15
Removal of contaminated heat exchanger <3000 pound	2,080.82
Removal of contaminated heat exchanger >3000 pound	6,026.77
Removal of contaminated feedwater heater/deaerator	15,056.14
Removal of contaminated moisture separator/reheater	26,111.62

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated tanks, <300 gallons	763.75
Removal of contaminated tanks, >300 gallons, $/square foot	15.47
Removal of contaminated electrical equipment, <300 pound	358.79
Removal of contaminated electrical equipment, 300-1000 pound	870.49
Removal of contaminated electrical equipment, 1000-10,000 pound	1,671.71
Removal of contaminated electrical equipment, >10,000 pound	3,354.84
Removal of contaminated electrical cable tray, $/linear foot	17.45
Removal of contaminated electrical conduit, $/linear foot	7.98
Removal of contaminated mechanical equipment, <300 pound	403.95
Removal of contaminated mechanical equipment, 300-1000 pound	984.71
Removal of contaminated mechanical equipment, 1000-10,000 pound	1,894.16
Removal of contaminated mechanical equipment, >10,000 pound	3,354.84
Removal of contaminated HVAC equipment, <300 pound	403.95
Removal of contaminated HVAC equipment, 300-1000 pound	984.71
Removal of contaminated HVAC equipment, 1000-10,000 pound	1,894.16
Removal of contaminated HVAC equipment, >10,000 pound	3,354.84
Removal of contaminated HVAC ductwork, $/pound	1.66
Removal/plasma arc cut of contaminated thin metal components, $/linear in.	1.96
Additional decontamination of surface by washing, $/square foot	3.82
Additional decontamination of surfaces by hydrolasing, $/square foot	19.04
Decontamination rig hook-up and flush	3,412.11
Chemical flush of components/systems, $/gallon	9.35
Removal of clean standard reinforced concrete, $/cubic yard	64.56
Removal of grade slab concrete, $/cubic yard	153.84
Removal of clean concrete floors, $/cubic yard	245.31

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of contaminated standard rein concrete floors, $/cubic yard	742.72
Removal of clean heavily rein concrete w/#9 rebar, $/cubic yard	165.67
Removal of contaminated heavily rein concrete w/#9 rebar, $/cubic yard	1,020.68
Removal of clean heavily rein concrete w/#18 rebar, $/cubic yard	209.75
Removal of contaminated heavily rein concrete w/#18 rebar, $/cubic yard	1,346.38
Removal heavily rein concrete w/#18 rebar & steel embedments, $/cu yd	317.36
Removal of below-grade suspended floors, $/cubic yard	245.31
Removal of clean monolithic concrete structures, $/cubic yard	607.24
Removal of contaminated monolithic concrete structures, $/cubic yard	1,019.30
Removal of clean foundation concrete, $/cubic yard	482.21
Removal of contaminated foundation concrete, $/cubic yard	948.21
Explosive demolition of bulk concrete, $/cubic yard	22.42
Removal of clean hollow masonry block wall, $/cubic yard	74.53
Removal of contaminated hollow masonry block wall, $/cubic yard	132.12
Removal of clean solid masonry block wall, $/cubic yard	74.53
Removal of contaminated solid masonry block wall, $/cubic yard	132.12
Backfill of below-grade voids, $/cubic yard	13.58
Removal of subterranean tunnels/voids, $/linear foot	112.56
Placement of concrete for below-grade voids, $/cubic yard	79.53
Excavation of clean material, $/cubic yard	2.32
Excavation of contaminated material, $/cubic yard	20.19
Excavation of submerged concrete rubble, $/cubic yard	10.75
Removal of clean concrete rubble (tipping fee included), $/cubic yard	74.99
Removal of contaminated concrete rubble, $/cubic yard	16.10
Removal of building by volume, $/cubic foot	0.20

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Removal of clean building metal siding, $/square foot	1.27
Removal of contaminated building metal siding, $/square foot	2.25
Removal of standard asphalt roofing, $/square foot	1.71
Removal of transite panels, $/square foot	1.94
Scarifying contaminated concrete surfaces (drill & spall)	7.23
Scabbling contaminated concrete floors, $/square foot	3.89
Scabbling contaminated concrete walls, $/square foot	4.36
Scabbling contaminated ceilings, $/square foot	39.25
Scabbling structural steel, $/square foot	3.46
Removal of clean overhead cranes/monorails < 10 ton capacity	556.60
Removal of contaminated overhead cranes/monorails < 10 ton capacity	952.25
Removal of clean overhead cranes/monorails >10-50 ton capacity	1,337.28
Removal of contaminated overhead cranes/monorails >10-50 ton capacity	2,773.71
Removal of polar cranes > 50 ton capacity, each	4,857.02
Removal of gantry cranes > 50 ton capacity, each	19,694.14
Removal of clean structural steel, $/pound	0.27
Removal of clean steel floor grating, $/square foot	2.83
Removal of contaminated steel floor grating, $/square foot	5.01
Removal of clean free-standing steel liner, $/square foot	9.88
Removal of contaminated free-standing steel liner, $/square foot	17.96
Removal of clean concrete-anchored steel liner, $/square foot	4.88
Removal of contaminated concrete-anchored steel liner, $/square foot	20.87
Placement of scaffolding in clean areas, $/square foot	10.80
Placement of scaffolding in contaminated areas, $/square foot	13.70
Landscaping with topsoil, $/acre	13,678.47

APPENDIX B
(continued)

Unit Cost Factor	Cost/Unit($)
Cost of CPC B-88 LSA box & preparation for use	935.30
Cost of CPC B-25 LSA box & preparation for use	747.84
Cost of CPC B-12V 12 gauge LSA box & preparation for use	644.26
Cost of CPC B-144 LSA box & preparation for use	3,529.49
Cost of LSA drum & preparation for use	111.66
Cost of cask liner for CNSI 14-195 cask	7,258.27
Cost of cask liner for CNSI 8-120A cask (resins)	5,078.59
Cost of cask liner for CNSI 8-120A cask (filters)	5,078.59
Decontamination of surfaces with vacuuming, $/square foot	0.59

APPENDIX C

DETAILED COST ANALYSIS

DELAYED DECON

Appendix C
Three Mile Island Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 2c - SAFSTOR Dormancy during TMI-1 Decommissioning																					
Period 2c Direct Decommissioning Activities																					
2c.1.1	Quarterly inspection									a											
2c.1.2	Semi-annual environmental survey									a											
2c.1.3	Prepare reports									a											
2c.1.4	Bituminous roof replacement	-	-	-	-	-	-	231	35	266	266	-	-	-	-	-	-	-	-	-	-
2c.1.5	Maintenance supplies	-	-	-	-	-	-	1,280	192	1,472	1,472	-	-	-	-	-	-	-	-	-	-
2c.1	Subtotal Period 2c Activity Costs	-	-	-	-	-	-	1,511	227	1,738	1,738	-	-	-	-	-	-	-	-	-	-
Period 2c Period-Dependent Costs																					
2c.4.1	Insurance	-	-	-	-	-	-	2,622	262	2,884	2,884	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	989	-	-	-	-	-	247	1,237	1,237	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	43	9	-	164	-	47	262	262	-	-	-	4,117	-	-	-	82,495	1,011	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	2,035	305	2,340	2,340	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	317	32	349	349	-	-	-	-	-	-	-	-	-	-
2c.4.7	Security Staff Cost	-	-	-	-	-	-	1,874	281	2,155	2,155	-	-	-	-	-	-	-	-	-	111,480
2c.4.8	Utility Staff Cost	-	-	-	-	-	-	2,133	320	2,453	2,453	-	-	-	-	-	-	-	-	-	21,234
2c.4	Subtotal Period 2c Period-Dependent Costs	-	989	43	9	-	164	8,981	1,494	11,680	11,680	-	-	-	4,117	-	-	-	82,495	1,011	132,714
2c.0	TOTAL PERIOD 2c COST	-	989	43	9	-	164	10,492	1,721	13,418	13,418	-	-	-	4,117	-	-	-	82,495	1,011	132,714
PERIOD 2 TOTALS		-	989	43	9	-	164	10,492	1,721	13,418	13,418	-	-	-	4,117	-	-	-	82,495	1,011	132,714
PERIOD 3a - Reactivate Site Following SAFSTOR Dormancy																					
Period 3a Direct Decommissioning Activities																					
3a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	180	27	208	208	-	-	-	-	-	-	-	-	-	1,950
3a.1.2	Prepare and submit PSDAR	-	-	-	-	-	-	740	111	851	851	-	-	-	-	-	-	-	-	-	8,000
3a.1.3	Review plant dwgs & specs.	-	-	-	-	-	-	851	128	979	979	-	-	-	-	-	-	-	-	-	9,200
3a.1.4	Perform detailed rad survey									a											
3a.1.5	Estimate by-product inventory	-	-	-	-	-	-	926	139	1,064	1,064	-	-	-	-	-	-	-	-	-	10,000
3a.1.6	End product description	-	-	-	-	-	-	185	28	213	213	-	-	-	-	-	-	-	-	-	2,000
3a.1.7	Detailed by-product inventory	-	-	-	-	-	-	481	72	553	553	-	-	-	-	-	-	-	-	-	5,200
3a.1.8	Define major work sequence	-	-	-	-	-	-	1,388	208	1,596	1,596	-	-	-	-	-	-	-	-	-	15,000
3a.1.9	Perform SER and EA	-	-	-	-	-	-	5,775	866	6,641	6,641	-	-	-	-	-	-	-	-	-	62,400
3a.1.10	Perform Site-Specific Cost Study	-	-	-	-	-	-	926	139	1,064	1,064	-	-	-	-	-	-	-	-	-	10,000
3a.1.11	Prepare/submit License Termination Plan	-	-	-	-	-	-	1,516	227	1,744	1,744	-	-	-	-	-	-	-	-	-	16,384
3a.1.12	Receive NRC approval of termination plan									a											
Activity Specifications																					
3a.1.13.1	Re-activate plant & temporary facilities	-	-	-	-	-	-	1,023	153	1,177	1,059	-	118	-	-	-	-	-	-	-	11,055
3a.1.13.2	Plant systems	-	-	-	-	-	-	771	116	887	798	-	89	-	-	-	-	-	-	-	8,333
3a.1.13.3	Reactor internals	-	-	-	-	-	-	1,314	197	1,511	1,511	-	-	-	-	-	-	-	-	-	14,200
3a.1.13.4	Reactor vessel	-	-	-	-	-	-	902	135	1,038	1,038	-	-	-	-	-	-	-	-	-	9,750
3a.1.13.5	Biological shield	-	-	-	-	-	-	46	7	53	53	-	-	-	-	-	-	-	-	-	500
3a.1.13.6	Steam generators	-	-	-	-	-	-	1,155	173	1,328	1,328	-	-	-	-	-	-	-	-	-	12,480
3a.1.13.7	Reinforced concrete	-	-	-	-	-	-	296	44	341	170	-	170	-	-	-	-	-	-	-	3,200
3a.1.13.8	Turbine & condenser	-	-	-	-	-	-	74	11	85	-	-	85	-	-	-	-	-	-	-	800
3a.1.13.9	Plant structures & buildings	-	-	-	-	-	-	289	43	332	166	-	166	-	-	-	-	-	-	-	3,120
3a.1.13.10	Waste management	-	-	-	-	-	-	1,703	255	1,958	1,958	-	-	-	-	-	-	-	-	-	18,400
3a.1.13.11	Facility & site closeout	-	-	-	-	-	-	83	12	96	48	-	48	-	-	-	-	-	-	-	900
3a.1.13	Total	-	-	-	-	-	-	7,657	1,149	8,806	8,130	-	676	-	-	-	-	-	-	-	82,738
Planning & Site Preparations																					
3a.1.14	Prepare dismantling sequence	-	-	-	-	-	-	444	67	511	511	-	-	-	-	-	-	-	-	-	4,800
3a.1.15	Plant prep. & temp. svces	-	-	-	-	-	-	2,419	363	2,782	2,782	-	-	-	-	-	-	-	-	-	-
3a.1.16	Design water clean-up system	-	-	-	-	-	-	518	78	596	596	-	-	-	-	-	-	-	-	-	5,600

Appendix C
Three Mile Island Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
3a.1.17	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,048	307	2,355	2,355	-	-	-	-	-	-	-	-	-	-
3a.1.18	Procure casks/liners & containers	-	-	-	-	-	-	228	34	262	262	-	-	-	-	-	-	-	-	-	2,460
3a.1	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	26,284	3,943	30,226	29,551	-	676	-	-	-	-	-	-	-	235,732
	Period 3a Additional Costs																				
3a.2.1	Railroad Track Refurbishment	-	-	-	-	-	-	250	38	288	288	-	-	-	-	-	-	-	-	-	-
3a.2.2	Equipment Airlock Refurbishment	-	-	-	-	-	-	1,000	150	1,150	1,150	-	-	-	-	-	-	-	-	-	-
3a.2.3	RB Polar Crane Refurbishment	-	-	-	-	-	-	5,000	750	5,750	5,750	-	-	-	-	-	-	-	-	-	-
3a.2.4	RB Cask Handling System	-	-	-	-	-	-	1,000	150	1,150	1,150	-	-	-	-	-	-	-	-	-	-
3a.2	Subtotal Period 3a Additional Costs	-	-	-	-	-	-	7,250	1,088	8,338	8,338	-	-	-	-	-	-	-	-	-	-
	Period 3a Period-Dependent Costs																				
3a.4.1	Insurance	-	-	-	-	-	-	258	26	283	283	-	-	-	-	-	-	-	-	-	-
3a.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3a.4.3	Health physics supplies	-	389	-	-	-	-	-	97	486	486	-	-	-	-	-	-	-	-	-	-
3a.4.4	Heavy equipment rental	-	254	-	-	-	-	-	38	292	292	-	-	-	-	-	-	-	-	-	-
3a.4.5	Disposal of DAW generated	-	-	4	1	-	16	-	5	26	26	-	-	-	404	-	-	-	8,103	99	-
3a.4.6	Plant energy budget	-	-	-	-	-	-	582	87	669	669	-	-	-	-	-	-	-	-	-	-
3a.4.7	NRC Fees	-	-	-	-	-	-	586	59	645	645	-	-	-	-	-	-	-	-	-	-
3a.4.8	Site O&M Cost	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	-
3a.4.9	Security Staff Cost	-	-	-	-	-	-	228	34	262	262	-	-	-	-	-	-	-	-	-	13,557
3a.4.10	DOC Staff Cost	-	-	-	-	-	-	10,211	1,532	11,743	11,743	-	-	-	-	-	-	-	-	-	198,143
3a.4.11	Utility Staff Cost	-	-	-	-	-	-	2,459	369	2,828	2,828	-	-	-	-	-	-	-	-	-	26,071
3a.4	Subtotal Period 3a Period-Dependent Costs	-	642	4	1	-	16	14,573	2,284	17,520	17,520	-	-	-	404	-	-	-	8,103	99	237,771
3a.0	TOTAL PERIOD 3a COST	-	642	4	1	-	16	48,107	7,314	56,084	55,409	-	676	-	404	-	-	-	8,103	99	473,504
	PERIOD 3b - Decommissioning Preparations																				
	Period 3b Direct Decommissioning Activities																				
	Detailed Work Procedures																				
3b.1.1.1	Plant systems	-	-	-	-	-	-	876	131	1,007	907	-	101	-	-	-	-	-	-	-	9,466
3b.1.1.2	Reactor internals	-	-	-	-	-	-	463	69	532	532	-	-	-	-	-	-	-	-	-	5,000
3b.1.1.3	Remaining buildings	-	-	-	-	-	-	125	19	144	36	-	108	-	-	-	-	-	-	-	1,350
3b.1.1.4	CRD cooling assembly	-	-	-	-	-	-	139	21	160	160	-	-	-	-	-	-	-	-	-	1,500
3b.1.1.5	Reactor vessel	-	-	-	-	-	-	504	76	580	580	-	-	-	-	-	-	-	-	-	5,445
3b.1.1.6	Facility closeout	-	-	-	-	-	-	111	17	128	64	-	64	-	-	-	-	-	-	-	1,200
3b.1.1.7	Missile shields	-	-	-	-	-	-	42	6	48	48	-	-	-	-	-	-	-	-	-	450
3b.1.1.8	Biological shield	-	-	-	-	-	-	111	17	128	128	-	-	-	-	-	-	-	-	-	1,200
3b.1.1.9	Steam generators	-	-	-	-	-	-	1,703	255	1,958	1,958	-	-	-	-	-	-	-	-	-	18,400
3b.1.1.10	Reinforced concrete	-	-	-	-	-	-	185	28	213	106	-	106	-	-	-	-	-	-	-	2,000
3b.1.1.11	Turbine & condensers	-	-	-	-	-	-	289	43	332	-	-	332	-	-	-	-	-	-	-	3,120
3b.1.1.12	Auxiliary building	-	-	-	-	-	-	505	76	581	523	-	58	-	-	-	-	-	-	-	5,460
3b.1.1.13	Reactor building	-	-	-	-	-	-	505	76	581	523	-	58	-	-	-	-	-	-	-	5,460
3b.1.1	Total	-	-	-	-	-	-	5,558	834	6,391	5,564	-	827	-	-	-	-	-	-	-	60,051
3b.1	Subtotal Period 3b Activity Costs	-	-	-	-	-	-	5,558	834	6,391	5,564	-	827	-	-	-	-	-	-	-	60,051
	Period 3b Additional Costs																				
3b.2.1	Lead Shielding Disposal	-	476	106	74	2,822	-	-	564	4,043	4,043	-	-	2,511	-	-	-	-	1,418,084	14,333	-
3b.2.2	RB Defueling Equipment Disposition	-	215	22	28	-	786	-	257	1,307	1,307	-	-	-	2,577	-	-	-	245,011	6,870	-
3b.2	Subtotal Period 3b Additional Costs	-	691	128	102	2,822	786	-	821	5,350	5,350	-	-	2,511	2,577	-	-	-	1,663,095	21,203	-
	Period 3b Collateral Costs																				
3b.3.1	Decon equipment	553	-	-	-	-	-	-	83	636	636	-	-	-	-	-	-	-	-	-	-
3b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,046	157	1,203	1,203	-	-	-	-	-	-	-	-	-	-
3b.3.3	Small tool allowance	-	10	-	-	-	-	-	1	11	11	-	-	-	-	-	-	-	-	-	-
3b.3.4	Pipe cutting equipment	-	957	-	-	-	-	-	143	1,100	1,100	-	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	553	966	-	-	-	-	1,046	385	2,950	2,950	-	-	-	-	-	-	-	-	-	-

Appendix C
Three Mile Island Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 3b Period-Dependent Costs																					
3b.4.1	Decon supplies	17	-	-	-	-	-	-	4	22	22	-	-	-	-	-	-	-	-	-	-
3b.4.2	Insurance	-	-	-	-	-	-	341	34	376	376	-	-	-	-	-	-	-	-	-	-
3b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3b.4.4	Health physics supplies	-	311	-	-	-	-	-	78	389	389	-	-	-	-	-	-	-	-	-	-
3b.4.5	Heavy equipment rental	-	129	-	-	-	-	-	19	149	149	-	-	-	-	-	-	-	-	-	-
3b.4.6	Disposal of DAW generated	-	-	2	0	-	8	-	2	13	13	-	-	-	206	-	-	-	4,129	51	-
3b.4.7	Plant energy budget	-	-	-	-	-	-	296	44	341	341	-	-	-	-	-	-	-	-	-	-
3b.4.8	NRC Fees	-	-	-	-	-	-	299	30	329	329	-	-	-	-	-	-	-	-	-	-
3b.4.9	Site O&M Cost	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	-
3b.4.10	Security Staff Cost	-	-	-	-	-	-	116	17	134	134	-	-	-	-	-	-	-	-	-	6,909
3b.4.11	DOC Staff Cost	-	-	-	-	-	-	10,402	1,560	11,962	11,962	-	-	-	-	-	-	-	-	-	172,289
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	1,253	188	1,441	1,441	-	-	-	-	-	-	-	-	-	13,286
3b.4	Subtotal Period 3b Period-Dependent Costs	17	440	2	0	-	8	12,835	1,997	15,300	15,300	-	-	-	206	-	-	-	4,129	51	192,483
3b.0	TOTAL PERIOD 3b COST	570	2,097	130	102	2,822	795	19,439	4,036	29,991	29,164	-	827	2,511	2,783	-	-	-	1,667,224	21,254	252,534
PERIOD 3 TOTALS		570	2,740	134	103	2,822	811	67,546	11,350	86,076	84,573	-	1,503	2,511	3,187	-	-	-	1,675,327	21,353	726,038
PERIOD 4a - Large Component Removal																					
Period 4a Direct Decommissioning Activities																					
Nuclear Steam Supply System Removal																					
4a.1.1.1	Reactor Coolant Piping	40	160	9	11	-	516	-	192	928	928	-	-	-	1,096	-	-	-	99,877	6,773	-
4a.1.1.2	Pressurizer Relief Tank	5	23	2	2	-	108	-	36	176	176	-	-	-	188	-	-	-	20,849	732	-
4a.1.1.3	Reactor Coolant Pumps & Motors	-	846	649	149	-	6,818	-	2,003	10,466	10,466	-	-	-	10,761	-	-	-	1,105,267	31,433	-
4a.1.1.4	Pressurizer	-	1,226	842	172	-	1,860	-	881	4,981	4,981	-	-	-	3,456	-	-	-	497,982	4,082	-
4a.1.1.5	Steam Generators	-	3,084	546	1,213	-	12,750	-	4,195	21,788	21,788	-	-	-	25,098	6,883	-	-	2,386,205	98,461	-
4a.1.1.6	CRDMs/ICIs/Service Structure Removal	22	36	72	17	-	247	-	92	486	486	-	-	-	1,454	-	-	-	47,869	1,830	-
4a.1.1.7	Reactor Vessel Internals	32	2,956	4,185	98	-	765	223	3,719	11,977	11,977	-	-	-	1,740	-	-	-	177,455	29,697	1,417
4a.1.1.8	Vessel & Internals GTCC Disposal	-	-	-	-	-	20,777	-	3,117	23,893	23,893	-	-	-	-	-	-	831	142,496	-	-
4a.1.1.9	Reactor Vessel	-	7,566	1,125	288	-	4,273	223	8,197	21,671	21,671	-	-	-	9,722	-	-	-	986,490	29,697	1,417
4a.1.1	Totals	99	15,897	7,428	1,950	-	48,114	445	22,432	96,366	96,366	-	-	-	53,515	6,883	-	831	5,464,490	202,704	2,833
Removal of Major Equipment																					
4a.1.2	Main Turbine/Generator	-	198	51	12	547	-	-	138	946	946	-	-	6,106	-	-	-	-	274,750	5,956	-
4a.1.3	Main Condensers	-	816	49	12	525	-	-	289	1,691	1,691	-	-	5,860	-	-	-	-	263,690	25,162	-
Disposal of Plant Systems																					
4a.1.4.1	Decay Heat Closed Cooling Water	-	178	14	21	538	446	-	241	1,438	1,438	-	-	6,656	963	-	-	-	356,612	5,628	-
4a.1.4.2	Decay Heat Removal (RCA)	-	127	20	21	203	850	-	280	1,499	1,499	-	-	2,511	1,833	-	-	-	266,361	4,171	-
4a.1.4.3	Decay Heat Removal (Yard)	-	91	-	-	-	-	-	14	104	-	-	104	-	-	-	-	-	-	2,863	-
4a.1.4.4	Demineralized Water (RCA)	-	88	3	3	44	118	-	59	316	316	-	-	547	255	-	-	-	45,089	2,746	-
4a.1.4.5	Domestic Water (Clean)	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	148	-
4a.1.4.6	Domestic Water (RCA)	-	13	1	0	5	18	-	9	45	45	-	-	63	38	-	-	-	5,993	396	-
4a.1.4.7	Electrical (Clean)	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	191	-
4a.1.4.8	Emergency Feedwater (RCA)	-	41	2	2	33	65	-	32	175	175	-	-	407	140	-	-	-	29,058	1,280	-
4a.1.4.9	Fire Protection (Clean)	-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	1,167	-
4a.1.4.10	Fire Protection (RCA)	-	29	1	1	12	40	-	19	103	103	-	-	146	86	-	-	-	13,657	933	-
4a.1.4.11	Gaseous Waste Disposal System (RCA)	-	121	3	3	46	109	-	65	347	347	-	-	568	255	-	-	-	44,078	3,949	-
4a.1.4.12	HVAC - Auxiliary Building	-	474	6	8	139	251	-	204	1,081	1,081	-	-	1,725	540	-	-	-	118,524	14,278	-
4a.1.4.13	HVAC - Control Building	-	51	2	4	144	22	-	41	263	263	-	-	1,780	47	-	-	-	76,530	1,433	-
4a.1.4.14	HVAC - Miscellaneous	-	21	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	666	-
4a.1.4.15	HVAC - Service Building	-	76	1	2	83	14	-	35	211	211	-	-	1,029	29	-	-	-	44,397	2,055	-
4a.1.4.16	Hydrogen Purge - Rad Monitoring	-	12	-	-	0	3	-	4	19	19	-	-	4	6	-	-	-	644	413	-
4a.1.4.17	Industrial Waste Treatment System	-	144	-	-	-	-	-	22	166	-	-	166	-	-	-	-	-	-	4,899	-
4a.1.4.18	Instrument Air (RCA)	-	73	3	2	22	96	-	46	242	242	-	-	271	207	-	-	-	29,566	2,251	-
4a.1.4.19	Intermediate Closed Cooling Water (RCA)	-	60	5	6	46	243	-	84	444	444	-	-	568	524	-	-	-	70,092	1,887	-
4a.1.4.20	Main Condensate (RCA)	-	132	5	8	331	51	-	97	624	624	-	-	4,101	149	-	-	-	176,316	4,075	-

Appendix C
Three Mile Island Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes: Class A Cu. Feet	Burial Volumes: Class B Cu. Feet	Burial Volumes: Class C Cu. Feet	Burial Volumes: GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	Disposal of Plant Systems (continued)																				
4a.1.4.21	Main Reheat & Steam (RCA)	-	39	2	3	52	76	-	37	209	209	-	-	643	164	-	-	-	40,843	1,216	-
4a.1.4.22	Nuclear Services Closed Cycle Cooling	-	546	61	66	1,041	2,226	-	865	4,804	4,804	-	-	12,877	5,304	-	-	-	953,442	17,227	-
4a.1.4.23	Nuclear Services River Water (Clean)	-	51	-	-	-	-	-	8	59	-	-	59	-	-	-	-	-	-	1,764	-
4a.1.4.24	Nuclear Services River Water (RCA)	-	746	29	33	355	1,295	-	571	3,028	3,028	-	-	4,392	2,792	-	-	-	428,769	24,880	-
4a.1.4.25	Reactor Building Normal Cooling (Clean)	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	298	-
4a.1.4.26	Reactor Building Normal Cooling (RCA)	-	173	13	15	140	629	-	225	1,196	1,196	-	-	1,739	1,356	-	-	-	192,214	5,711	-
4a.1.4.27	SG Secondary Side Vents & Drains	-	43	2	1	-	71	-	29	147	147	-	-	-	154	-	-	-	13,769	1,413	-
4a.1.4.28	Sampling Nuclear System	-	139	6	4	-	226	-	93	468	468	-	-	-	530	-	-	-	43,764	4,528	-
4a.1.4.29	Sewage Treatment Plant (RCA)	-	3	-	-	3	1	-	1	8	8	-	-	35	3	-	-	-	1,651	82	-
4a.1.4.30	Station Service Air	-	142	3	3	11	122	-	68	350	350	-	-	139	263	-	-	-	29,187	4,806	-
4a.1.4.31	Sump Systems (RCA)	-	83	2	2	13	70	-	41	211	211	-	-	161	152	-	-	-	20,117	2,753	-
4a.1.4.32	Turbine Plant Sample (RCA)	-	11	0	0	5	10	-	6	33	33	-	-	61	22	-	-	-	4,489	328	-
4a.1.4	Totals	-	3,762	182	208	3,267	7,050	-	3,206	17,674	17,259	-	416	40,423	15,811	-	-	-	3,005,161	120,434	-
4a.1.5	Scaffolding in support of decommissioning	-	663	7	2	72	14	-	181	940	940	-	-	804	50	-	-	-	40,658	24,135	-
4a.1	Subtotal Period 4a Activity Costs	99	21,336	7,716	2,184	4,410	55,178	445	26,247	117,617	117,201	-	416	53,192	69,377	6,883	-	831	9,048,750	378,391	2,833
	Period 4a Additional Costs																				
4a.2.1	Reactor Building Basement Dose Reduction	-	110	353	2,053	-	10,880	-	3,091	16,488	16,488	-	-	-	-	7,380	2,017	-	1,173,681	42,364	-
4a.2.2	Reactor Building Basement Liner Removal	-	80	77	194	-	943	-	293	1,586	1,586	-	-	-	-	1,502	-	-	115,368	2,286	-
4a.2.3	Reactor Building SNF & HOT Systems Removal	-	-	41	186	-	555	-	171	952	952	-	-	-	-	1,002	-	-	76,912	250	-
4a.2.4	Fuel Handling / Auxiliary SNF & HOT Systems Removal	1,324	1,153	70	203	-	4,443	-	1,849	9,042	9,042	-	-	-	8,864	-	-	40	666,018	72,761	-
4a.2.5	NSSS Component Surface Decontamination	11,775	-	1,200	50	-	9,525	-	5,887	28,438	28,438	-	-	-	-	-	-	381	22,861	46,920	-
4a.2.6	Core Flood Tanks Removal	45	300	35	42	-	642	-	268	1,332	1,332	-	-	-	1,716	-	-	-	124,165	10,059	-
4a.2.7	FHAB AX-004 Room Decontamination	-	115	106	457	-	884	101	344	2,007	2,007	-	-	-	-	2,504	-	-	162,951	5,075	-
4a.2.8	Legacy waste stored at INEEL	-	-	-	-	-	-	500	50	550	550	-	-	-	-	-	-	-	-	-	-
4a.2	Subtotal Period 4a Additional Costs	13,144	1,758	1,881	3,186	-	27,873	601	11,952	60,395	60,395	-	-	-	10,580	12,388	2,017	421	2,341,956	179,715	-
	Period 4a Collateral Costs																				
4a.3.1	Process liquid waste	12	-	4	26	-	124	-	41	207	207	-	-	-	-	105	-	-	13,191	27	-
4a.3.2	Small tool allowance	-	238	-	-	-	-	-	36	274	246	-	27	-	-	-	-	-	-	-	-
4a.3	Subtotal Period 4a Collateral Costs	12	238	4	26	-	124	-	77	481	454	-	27	-	-	105	-	-	13,191	27	-
	Period 4a Period-Dependent Costs																				
4a.4.1	Decon supplies	177	-	-	-	-	-	-	44	221	221	-	-	-	-	-	-	-	-	-	-
4a.4.2	Insurance	-	-	-	-	-	-	3,498	350	3,847	3,847	-	-	-	-	-	-	-	-	-	-
4a.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4a.4.4	Health physics supplies	-	5,001	-	-	-	-	-	1,250	6,251	6,251	-	-	-	-	-	-	-	-	-	-
4a.4.5	Heavy equipment rental	-	7,707	-	-	-	-	-	1,156	8,863	8,863	-	-	-	-	-	-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	79	16	-	299	-	85	479	479	-	-	-	7,523	-	-	-	150,762	1,847	-
4a.4.7	Plant energy budget	-	-	-	-	-	-	3,036	455	3,491	3,491	-	-	-	-	-	-	-	-	-	-
4a.4.8	NRC Fees	-	-	-	-	-	-	1,465	146	1,611	1,611	-	-	-	-	-	-	-	-	-	-
4a.4.9	Site O&M Cost	-	-	-	-	-	-	1,304	196	1,499	1,499	-	-	-	-	-	-	-	-	-	-
4a.4.10	Radwaste Processing Equipment/Services	-	-	-	-	-	-	1,878	282	2,159	2,159	-	-	-	-	-	-	-	-	-	-
4a.4.11	Security Staff Cost	-	-	-	-	-	-	2,745	412	3,157	3,157	-	-	-	-	-	-	-	-	-	163,286
4a.4.12	DOC Staff Cost	-	-	-	-	-	-	119,666	17,950	137,616	137,616	-	-	-	-	-	-	-	-	-	2,020,389
4a.4.13	Utility Staff Cost	-	-	-	-	-	-	12,832	1,925	14,757	14,757	-	-	-	-	-	-	-	-	-	136,071
4a.4	Subtotal Period 4a Period-Dependent Costs	177	12,708	79	16	-	299	146,423	24,251	183,952	183,952	-	-	-	7,523	-	-	-	150,762	1,847	2,319,746
4a.0	TOTAL PERIOD 4a COST	13,431	36,040	9,681	5,412	4,410	83,475	147,469	62,527	362,445	362,002	-	443	53,192	87,480	19,376	2,017	1,252	11,554,660	559,981	2,322,579
	PERIOD 4b - Site Decontamination																				
	Disposal of Plant Systems																				
4b.1.2.1	Decay Heat Removal (RB)	-	150	11	10	-	514	-	168	853	853	-	-	-	1,108	-	-	-	99,380	4,941	-
4b.1.2.2	Electrical (Contaminated - RB)	-	28	1	1	-	54	-	21	105	105	-	-	-	116	-	-	-	10,435	893	-
4b.1.2.3	Electrical (Contaminated - RCA)	-	185	5	11	440	67	-	131	841	841	-	-	5,443	145	-	-	-	234,039	5,741	-
4b.1.2.4	Feedwater (RB)	-	24	3	3	-	158	-	46	234	234	-	-	-	341	-	-	-	30,612	804	-

Appendix C
Three Mile Island Unit 2
Delayed DECON Decommissioning Cost Estimate
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Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	Disposal of Plant Systems (continued)																				
4b.1.2.5	Fire Protection (RB)	-	12	1	1	-	27	-	10	50	50	-	-	-	58	-	-	-	5,171	407	-
4b.1.2.6	Fuel Handling (RB)	-	3	0	0	-	9	-	3	15	15	-	-	-	19	-	-	-	1,669	86	-
4b.1.2.7	Fuel Handling (RCA)	-	200	7	8	-	423	-	158	796	796	-	-	-	912	-	-	-	81,790	6,260	-
4b.1.2.8	Gaseous Waste Disposal System (RB)	-	2	0	-	-	4	-	2	8	8	-	-	-	9	-	-	-	790	76	-
4b.1.2.9	HVAC - Fuel Handling Building	-	234	2	4	89	86	-	94	509	509	-	-	1,097	185	-	-	-	61,125	6,871	-
4b.1.2.10	HVAC - Reactor Building	-	637	25	26	-	1,364	-	507	2,559	2,559	-	-	-	2,941	-	-	-	263,784	19,351	-
4b.1.2.11	Instrument Air (RB)	-	17	1	0	-	26	-	11	55	55	-	-	-	55	-	-	-	4,966	545	-
4b.1.2.12	Intermediate Closed Cooling Water (RB)	-	49	3	2	-	122	-	43	220	220	-	-	-	263	-	-	-	23,572	1,604	-
4b.1.2.13	Nitrogen for Nuclear Radwaste Sys (RB)	-	5	0	0	-	23	-	7	36	36	-	-	-	49	-	-	-	4,378	170	-
4b.1.2.14	Nuclear Services River Water (RB)	-	55	5	5	-	263	-	81	409	409	-	-	-	568	-	-	-	50,919	1,826	-
4b.1.2.15	OTSG Chemical Cleaning System	-	11	1	1	-	32	-	11	56	56	-	-	-	70	-	-	-	6,260	372	-
4b.1.2.16	Sewage Treatment Plant (Clean)	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	180	-
4b.1.2.17	Spent Fuel Cooling	-	248	9	9	36	421	-	175	898	898	-	-	452	907	-	-	-	99,713	8,156	-
4b.1.2.18	Spent Fuel Cooling (RB)	-	15	1	1	-	36	-	13	65	65	-	-	-	77	-	-	-	6,934	482	-
4b.1.2.19	Sump Systems (RB)	-	22	1	1	-	50	-	18	93	93	-	-	-	108	-	-	-	9,645	744	-
4b.1.2	Totals	-	1,905	77	83	565	3,677	-	1,500	7,807	7,800	-	6	6,991	7,930	-	-	-	995,182	59,509	-
4b.1.3	Scaffolding in support of decommissioning	-	994	11	3	108	22	-	272	1,409	1,409	-	-	1,206	75	-	-	-	60,988	36,203	-
	Decontamination of Site Buildings																				
4b.1.4.1	Reactor	6,361	3,227	569	371	-	12,090	-	7,122	29,739	29,739	-	-	-	42,223	-	-	-	3,766,363	277,801	-
4b.1.4.2	Auxiliary	308	355	41	25	26	531	-	387	1,674	1,674	-	-	323	4,989	-	-	-	485,601	19,268	-
4b.1.4.3	BWST & CST Tank Pads	-	70	206	123	-	2,483	-	677	3,559	3,559	-	-	-	24,827	-	-	-	2,482,650	2,976	-
4b.1.4.4	Control & Service	14	4	1	0	0	10	-	11	41	41	-	-	2	97	-	-	-	9,763	566	-
4b.1.4.5	Control Building Area	56	29	5	3	20	56	-	53	221	221	-	-	249	545	-	-	-	64,320	2,530	-
4b.1.4.6	Fuel Handling	432	502	35	23	65	567	-	500	2,124	2,124	-	-	803	3,575	-	-	-	361,010	27,042	-
4b.1.4.7	Turbine	42	1	0	0	-	3	-	22	69	69	-	-	-	25	-	-	-	2,532	1,421	-
4b.1.4	Totals	7,213	4,188	857	546	111	15,739	-	8,773	37,426	37,426	-	-	1,377	76,281	-	-	-	7,172,239	331,602	-
4b.1	Subtotal Period 4b Activity Costs	7,213	7,087	945	632	784	19,438	-	10,544	46,642	46,636	-	6	9,574	84,286	-	-	-	8,228,408	427,313	-
	Period 4b Additional Costs																				
4b.2.1	Bioshield & D-Ring Removal	-	3,767	982	186	-	15,491	-	4,941	25,367	25,367	-	-	-	137,100	-	-	-	15,491,430	62,557	-
4b.2.2	RB Exterior Concrete & Basemat Removal	-	2,816	305	58	-	4,251	-	1,524	8,954	8,954	-	-	-	42,506	-	-	-	4,250,566	49,359	-
4b.2.3	Underground Piping & Yard Soil	-	455	1,320	199	-	3,723	250	1,244	7,191	7,191	-	-	-	48,992	-	-	-	3,723,414	9,759	-
4b.2.4	Process NSSS decon & segmentation liquid inventory	-	-	65	222	-	3,471	555	991	5,304	5,304	-	-	-	-	-	1,347	-	158,780	-	779
4b.2.5	Auxiliary Building Total Removal	-	6,360	539	103	-	7,522	-	2,904	17,428	17,428	-	-	-	75,217	-	-	-	7,521,660	132,549	-
4b.2.6	Fuel Handling Building Total Removal	-	4,324	395	75	-	5,491	-	2,072	12,358	12,358	-	-	-	54,907	-	-	-	5,490,720	87,034	-
4b.2.7	On-site survey & release of concrete	-	1,614	-	508	1,049	-	-	242	3,413	3,413	-	-	-	-	-	-	-	-	25,415	-
4b.2.8	Defueling fuel canister racks	16	14	91	22	-	667	-	191	1,001	1,001	-	-	-	11,628	-	-	-	207,896	1,462	-
4b.2	Subtotal Period 4b Additional Costs	16	19,351	3,697	1,373	1,049	40,616	805	14,108	81,016	81,016	-	-	-	370,350	-	1,347	-	36,844,470	368,135	779
	Period 4b Collateral Costs																				
4b.3.1	Process liquid waste	21	-	9	50	-	188	-	66	333	333	-	-	-	-	202	-	-	25,511	53	-
4b.3.2	Small tool allowance	-	322	-	-	-	-	-	48	370	370	-	-	-	-	-	-	-	-	-	-
4b.3.3	Decommissioning Equipment Disposition	-	-	53	18	537	108	-	116	832	832	-	-	6,000	373	-	-	-	303,507	739	-
4b.3	Subtotal Period 4b Collateral Costs	21	322	62	68	537	295	-	229	1,535	1,535	-	-	6,000	373	202	-	-	329,018	792	-
	Period 4b Period-Dependent Costs																				
4b.4.1	Decon supplies	736	-	-	-	-	-	-	184	920	920	-	-	-	-	-	-	-	-	-	-
4b.4.2	Insurance	-	-	-	-	-	-	2,348	235	2,583	2,583	-	-	-	-	-	-	-	-	-	-
4b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4b.4.4	Health physics supplies	-	5,602	-	-	-	-	-	1,401	7,003	7,003	-	-	-	-	-	-	-	-	-	-
4b.4.5	Heavy equipment rental	-	4,834	-	-	-	-	-	725	5,559	5,559	-	-	-	-	-	-	-	-	-	-
4b.4.6	Disposal of DAW generated	-	-	61	12	-	231	-	66	369	369	-	-	-	5,795	-	-	-	116,139	1,423	-
4b.4.7	Plant energy budget	-	-	-	-	-	-	1,522	228	1,750	1,750	-	-	-	-	-	-	-	-	-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	656	66	721	721	-	-	-	-	-	-	-	-	-	-
4b.4.9	Site O&M Cost	-	-	-	-	-	-	875	131	1,007	1,007	-	-	-	-	-	-	-	-	-	-
4b.4.10	Radwaste Processing Equipment/Services	-	-	-	-	-	-	1,261	189	1,450	1,450	-	-	-	-	-	-	-	-	-	-

Appendix C
Three Mile Island Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 4b Period-Dependent Costs (continued)																				
4b.4.11	Security Staff Cost	-	-	-	-	-	-	1,352	203	1,554	1,554	-	-	-	-	-	-	-	-	-	80,394
4b.4.12	DOC Staff Cost	-	-	-	-	-	-	59,778	8,967	68,745	68,745	-	-	-	-	-	-	-	-	-	1,110,903
4b.4.13	Utility Staff Cost	-	-	-	-	-	-	8,037	1,206	9,243	9,243	-	-	-	-	-	-	-	-	-	91,357
4b.4	Subtotal Period 4b Period-Dependent Costs	736	10,437	61	12	-	231	75,828	13,599	100,904	100,904	-	-	-	5,795	-	-	-	116,139	1,423	1,282,654
4b.0	TOTAL PERIOD 4b COST	7,986	37,197	4,764	2,085	2,371	60,579	76,633	38,481	230,097	230,091	-	6	15,574	460,805	202	1,347	-	45,518,030	797,664	1,283,433
	PERIOD 4e - License Termination																				
	Period 4e Direct Decommissioning Activities																				
4e.1.1	ORISE confirmatory survey	-	-	-	-	-	-	116	35	150	150	-	-	-	-	-	-	-	-	-	-
4e.1.2	Terminate license									a											
4e.1	Subtotal Period 4e Activity Costs	-	-	-	-	-	-	116	35	150	150	-	-	-	-	-	-	-	-	-	-
	Period 4e Additional Costs																				
4e.2.1	License Termination Survey	-	-	-	-	-	-	4,001	1,200	5,202	5,202	-	-	-	-	-	-	-	-	111,562	-
4e.2	Subtotal Period 4e Additional Costs	-	-	-	-	-	-	4,001	1,200	5,202	5,202	-	-	-	-	-	-	-	-	111,562	-
	Period 4e Collateral Costs																				
4e.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,046	157	1,203	1,203	-	-	-	-	-	-	-	-	-	-
4e.3	Subtotal Period 4e Collateral Costs	-	-	-	-	-	-	1,046	157	1,203	1,203	-	-	-	-	-	-	-	-	-	-
	Period 4e Period-Dependent Costs																				
4e.4.1	Insurance	-	-	-	-	-	-	195	19	214	214	-	-	-	-	-	-	-	-	-	-
4e.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4e.4.3	Health physics supplies	-	888	-	-	-	-	-	222	1,110	1,110	-	-	-	-	-	-	-	-	-	-
4e.4.4	Disposal of DAW generated	-	-	3	1	-	12	-	3	19	19	-	-	-	306	-	-	-	6,127	75	-
4e.4.5	Plant energy budget	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	-
4e.4.6	NRC Fees	-	-	-	-	-	-	141	14	156	156	-	-	-	-	-	-	-	-	-	-
4e.4.7	Site O&M Cost	-	-	-	-	-	-	189	28	217	217	-	-	-	-	-	-	-	-	-	-
4e.4.8	Security Staff Cost	-	-	-	-	-	-	80	12	91	91	-	-	-	-	-	-	-	-	-	4,731
4e.4.9	DOC Staff Cost	-	-	-	-	-	-	3,589	538	4,128	4,128	-	-	-	-	-	-	-	-	-	61,903
4e.4.10	Utility Staff Cost	-	-	-	-	-	-	1,278	192	1,470	1,470	-	-	-	-	-	-	-	-	-	14,983
4e.4	Subtotal Period 4e Period-Dependent Costs	-	888	3	1	-	12	5,589	1,047	7,541	7,541	-	-	-	306	-	-	-	6,127	75	81,617
4e.0	TOTAL PERIOD 4e COST	-	888	3	1	-	12	10,753	2,439	14,096	14,096	-	-	-	306	-	-	-	6,127	111,637	81,617
	PERIOD 4 TOTALS	21,417	74,124	14,448	7,498	6,781	144,066	234,855	103,447	606,638	606,188	-	449	68,766	548,590	19,578	3,364	1,252	57,078,820	1,469,282	3,687,629
	PERIOD 5b - Site Restoration																				
	Period 5b Direct Decommissioning Activities																				
	Demolition of Remaining Site Buildings																				
5b.1.1.1	Air Intake Tunnel	-	100	-	-	-	-	-	15	115	-	-	115	-	-	-	-	-	-	2,757	-
5b.1.1.2	Circulating Water Chlorinator	-	37	-	-	-	-	-	6	43	-	-	43	-	-	-	-	-	-	950	-
5b.1.1.3	Circulating Water Intake Flume	-	30	-	-	-	-	-	5	35	-	-	35	-	-	-	-	-	-	736	-
5b.1.1.4	Circulating Water Pumphouse	-	118	-	-	-	-	-	18	136	-	-	136	-	-	-	-	-	-	3,112	-
5b.1.1.5	Coagulator	-	39	-	-	-	-	-	6	45	-	-	45	-	-	-	-	-	-	955	-
5b.1.1.6	Control & Service	-	2,317	-	-	-	-	-	348	2,664	133	-	2,531	-	-	-	-	-	-	46,913	-
5b.1.1.7	Control Building Area	-	618	-	-	-	-	-	93	710	-	-	710	-	-	-	-	-	-	11,471	-
5b.1.1.8	Cooling Towers	-	522	-	-	-	-	-	78	600	-	-	600	-	-	-	-	-	-	11,550	-
5b.1.1.9	Emergency Diesel Generator	-	880	-	-	-	-	-	132	1,011	-	-	1,011	-	-	-	-	-	-	16,744	-
5b.1.1.10	Main & Aux Transformer Foundations	-	66	-	-	-	-	-	10	75	-	-	75	-	-	-	-	-	-	1,387	-
5b.1.1.11	Mechanical Draft Cooling Towers	-	52	-	-	-	-	-	8	60	-	-	60	-	-	-	-	-	-	997	-
5b.1.1.12	Miscellaneous Yard Foundations	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	210	-
5b.1.1.13	River Water Pumphouse	-	1,235	-	-	-	-	-	185	1,420	-	-	1,420	-	-	-	-	-	-	21,553	-
5b.1.1.14	Turbine	-	1,212	-	-	-	-	-	182	1,393	-	-	1,393	-	-	-	-	-	-	35,605	-
5b.1.1.15	Turbine Generator Pedestal	-	493	-	-	-	-	-	74	567	-	-	567	-	-	-	-	-	-	8,458	-

Appendix C
Three Mile Island Unit 2
Delayed DECON Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
5b.1.1	Totals	-	7,726	-	-	-	-	-	1,159	8,884	133	-	8,751	-	-	-	-	-	-	163,399	-
Site Closeout Activities																					
5b.1.2	Grade & landscape site	-	105	-	-	-	-	-	16	121	-	-	121	-	-	-	-	-	-	957	-
5b.1.3	Final report to NRC	-	-	-	-	-	-	289	43	332	332	-	-	-	-	-	-	-	-	-	3,120
5b.1	Subtotal Period 5b Activity Costs	-	7,831	-	-	-	-	289	1,218	9,338	465	-	8,872	-	-	-	-	-	-	164,356	3,120
Period 5b Additional Costs																					
5b.2.1	River Water Pump House Cofferdam	-	144	-	-	-	-	-	22	166	-	-	166	-	-	-	-	-	-	2,116	-
5b.2.2	Concrete Processing	-	221	-	4	-	-	-	34	259	-	-	259	-	-	-	-	-	-	1,785	-
5b.2.3	Survey & Release of scrap materials	-	-	230	13	-	-	425	89	756	756	-	-	-	-	-	-	-	850,136	1,700	-
5b.2.4	Backfill site	-	399	-	-	-	-	-	60	459	-	-	459	-	-	-	-	-	-	5,554	-
5b.2	Subtotal Period 5b Additional Costs	-	765	230	17	-	-	425	204	1,640	756	-	885	-	-	-	-	-	850,136	11,155	-
Period 5b Collateral Costs																					
5b.3.1	Small tool allowance	-	75	-	-	-	-	-	11	86	-	-	86	-	-	-	-	-	-	-	-
5b.3	Subtotal Period 5b Collateral Costs	-	75	-	-	-	-	-	11	86	-	-	86	-	-	-	-	-	-	-	-
Period 5b Period-Dependent Costs																					
5b.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5b.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	1,889	-	-	-	-	-	283	2,173	-	-	2,173	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	78	12	89	-	-	89	-	-	-	-	-	-	-	-
5b.4.5	Security Staff Cost	-	-	-	-	-	-	105	16	121	-	-	121	-	-	-	-	-	-	-	6,274
5b.4.6	DOC Staff Cost	-	-	-	-	-	-	6,986	1,048	8,034	-	-	8,034	-	-	-	-	-	-	-	117,120
5b.4.7	Utility Staff Cost	-	-	-	-	-	-	1,228	184	1,413	-	-	1,413	-	-	-	-	-	-	-	20,391
5b.4	Subtotal Period 5b Period-Dependent Costs	-	1,889	-	-	-	-	8,398	1,543	11,830	-	-	11,830	-	-	-	-	-	-	-	143,786
5b.0	TOTAL PERIOD 5b COST	-	10,560	230	17	-	-	9,112	2,976	22,894	1,221	-	21,673	-	-	-	-	-	850,136	175,511	146,906
PERIOD 5 TOTALS		-	10,560	230	17	-	-	9,112	2,976	22,894	1,221	-	21,673	-	-	-	-	-	850,136	175,511	146,906
TOTAL COST TO DECOMMISSION		21,987	88,414	14,855	7,626	9,603	145,041	322,005	119,494	729,026	705,400	-	23,625	71,277	555,894	19,578	3,364	1,252	59,686,780	1,667,156	4,693,288

TOTAL COST TO DECOMMISSION WITH 19.6% CONTINGENCY:	$729,026	thousands of 2003 dollars
TOTAL NRC LICENSE TERMINATION COST IS 96.76% OR	$705,400	thousands of 2003 dollars
NON-NUCLEAR DEMOLITION COST IS 3.24% OR:	$23,625	thousands of 2003 dollars
TOTAL CLASS A THROUGH CLASS C RADWASTE VOLUME BURIED:	578,836	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,252	cubic feet
TOTAL SCRAP METAL REMOVED:	29,694	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,667,156	man-hours

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

APPENDIX D

DETAILED COST ANALYSIS

CUSTODIAL SAFSTOR

Appendix D
Three Mile Island Unit 2
Custodial SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 2c - SAFSTOR Dormancy during TMI-1 Decommissioning																					
Period 2c Direct Decommissioning Activities																					
2c.1.1	Quarterly Inspection									a											
2c.1.2	Semi-annual environmental survey									a											
2c.1.3	Prepare reports									a											
2c.1.4	Bituminous roof replacement	-	-	-	-	-	-	1,114	167	1,281	1,281	-	-	-	-	-	-	-	-	-	-
2c.1.5	Maintenance supplies	-	-	-	-	-	-	6,165	925	7,090	7,090	-	-	-	-	-	-	-	-	-	-
2c.1	Subtotal Period 2c Activity Costs	-	-	-	-	-	-	7,279	1,092	8,371	8,371	-	-	-	-	-	-	-	-	-	-
Period 2c Period-Dependent Costs																					
2c.4.1	Insurance	-	-	-	-	-	-	12,629	1,263	13,892	13,892	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	4,766	-	-	-	-	-	1,192	5,958	5,958	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	208	41	-	789	-	224	1,263	1,263	-	-	-	19,831	-	-	-	397,402	4,869	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	9,802	1,470	11,272	11,272	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	1,529	153	1,682	1,682	-	-	-	-	-	-	-	-	-	-
2c.4.7	Security Staff Cost	-	-	-	-	-	-	9,029	1,354	10,383	10,383	-	-	-	-	-	-	-	-	-	537,030
2c.4.8	Utility Staff Cost	-	-	-	-	-	-	10,275	1,541	11,816	11,816	-	-	-	-	-	-	-	-	-	102,291
2c.4	Subtotal Period 2c Period-Dependent Costs	-	4,766	208	41	-	789	43,264	7,198	56,267	56,267	-	-	-	19,831	-	-	-	397,402	4,869	639,321
2c.0	TOTAL PERIOD 2c COST	-	4,766	208	41	-	789	50,543	8,289	64,637	64,637	-	-	-	19,831	-	-	-	397,402	4,869	639,321
PERIOD 2 TOTALS		-	4,766	208	41	-	789	50,543	8,289	64,637	64,637	-	-	-	19,831	-	-	-	397,402	4,869	639,321
PERIOD 3a - Reactivate Site Following SAFSTOR Dormancy																					
Period 3a Direct Decommissioning Activities																					
3a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	180	27	208	208	-	-	-	-	-	-	-	-	-	1,950
3a.1.2	Prepare and submit PSDAR	-	-	-	-	-	-	740	111	851	851	-	-	-	-	-	-	-	-	-	8,000
3a.1.3	Review plant dwgs & specs.	-	-	-	-	-	-	851	128	979	979	-	-	-	-	-	-	-	-	-	9,200
3a.1.4	Perform detailed rad survey									a											
3a.1.5	Estimate by-product inventory	-	-	-	-	-	-	926	139	1,064	1,064	-	-	-	-	-	-	-	-	-	10,000
3a.1.6	End product description	-	-	-	-	-	-	185	28	213	213	-	-	-	-	-	-	-	-	-	2,000
3a.1.7	Detailed by-product inventory	-	-	-	-	-	-	481	72	553	553	-	-	-	-	-	-	-	-	-	5,200
3a.1.8	Define major work sequence	-	-	-	-	-	-	1,388	208	1,596	1,596	-	-	-	-	-	-	-	-	-	15,000
3a.1.9	Perform SER and EA	-	-	-	-	-	-	5,775	866	6,641	6,641	-	-	-	-	-	-	-	-	-	62,400
3a.1.10	Perform Site-Specific Cost Study	-	-	-	-	-	-	926	139	1,064	1,064	-	-	-	-	-	-	-	-	-	10,000
3a.1.11	Prepare/submit License Termination Plan	-	-	-	-	-	-	1,516	227	1,744	1,744	-	-	-	-	-	-	-	-	-	16,384
3a.1.12	Receive NRC approval of termination plan									a											
Activity Specifications																					
3a.1.13.1	Re-activate plant & temporary facilities	-	-	-	-	-	-	1,023	153	1,177	1,059	-	118	-	-	-	-	-	-	-	11,055
3a.1.13.2	Plant systems	-	-	-	-	-	-	771	116	887	798	-	89	-	-	-	-	-	-	-	8,333
3a.1.13.3	Reactor internals	-	-	-	-	-	-	1,314	197	1,511	1,511	-	-	-	-	-	-	-	-	-	14,200
3a.1.13.4	Reactor vessel	-	-	-	-	-	-	902	135	1,038	1,038	-	-	-	-	-	-	-	-	-	9,750
3a.1.13.5	Biological shield	-	-	-	-	-	-	46	7	53	53	-	-	-	-	-	-	-	-	-	500
3a.1.13.6	Steam generators	-	-	-	-	-	-	1,155	173	1,328	1,328	-	-	-	-	-	-	-	-	-	12,480
3a.1.13.7	Reinforced concrete	-	-	-	-	-	-	296	44	341	170	-	170	-	-	-	-	-	-	-	3,200
3a.1.13.8	Turbine & condenser	-	-	-	-	-	-	74	11	85	-	-	85	-	-	-	-	-	-	-	800
3a.1.13.9	Plant structures & buildings	-	-	-	-	-	-	289	43	332	166	-	166	-	-	-	-	-	-	-	3,120
3a.1.13.10	Waste management	-	-	-	-	-	-	1,703	255	1,958	1,958	-	-	-	-	-	-	-	-	-	18,400
3a.1.13.11	Facility & site closeout	-	-	-	-	-	-	83	12	96	48	-	48	-	-	-	-	-	-	-	900
3a.1.13	Total	-	-	-	-	-	-	7,657	1,149	8,806	8,130	-	676	-	-	-	-	-	-	-	82,738
Planning & Site Preparations																					
3a.1.14	Prepare dismantling sequence	-	-	-	-	-	-	444	67	511	511	-	-	-	-	-	-	-	-	-	4,800
3a.1.15	Plant prep. & temp. svces	-	-	-	-	-	-	2,419	363	2,782	2,782	-	-	-	-	-	-	-	-	-	-

Appendix D
Three Mile Island Unit 2
Custodial SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
3a.1.16	Design water clean-up system	-	-	-	-	-	-	518	78	596	596	-	-	-	-	-	-	-	-	-	5,600
3a.1.17	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,048	307	2,355	2,355	-	-	-	-	-	-	-	-	-	-
3a.1.18	Procure casks/liners & containers	-	-	-	-	-	-	228	34	262	262	-	-	-	-	-	-	-	-	-	2,460
3a.1	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	26,284	3,943	30,226	29,551	-	676	-	-	-	-	-	-	-	235,732
Period 3a Additional Costs																					
3a.2.1	Railroad Track Refurbishment	-	-	-	-	-	-	250	38	288	288	-	-	-	-	-	-	-	-	-	-
3a.2.2	Equipment Airlock Refurbishment	-	-	-	-	-	-	1,000	150	1,150	1,150	-	-	-	-	-	-	-	-	-	-
3a.2.3	RB Polar Crane Refurbishment	-	-	-	-	-	-	5,000	750	5,750	5,750	-	-	-	-	-	-	-	-	-	-
3a.2.4	RB Cask Handling System	-	-	-	-	-	-	1,000	150	1,150	1,150	-	-	-	-	-	-	-	-	-	-
3a.2	Subtotal Period 3a Additional Costs	-	-	-	-	-	-	7,250	1,088	8,338	8,338	-	-	-	-	-	-	-	-	-	-
Period 3a Period-Dependent Costs																					
3a.4.1	Insurance	-	-	-	-	-	-	258	26	283	283	-	-	-	-	-	-	-	-	-	-
3a.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3a.4.3	Health physics supplies	-	389	-	-	-	-	-	97	486	486	-	-	-	-	-	-	-	-	-	-
3a.4.4	Heavy equipment rental	-	254	-	-	-	-	-	38	292	292	-	-	-	-	-	-	-	-	-	-
3a.4.5	Disposal of DAW generated	-	-	4	1	-	16	-	5	26	26	-	-	-	404	-	-	-	8,103	99	-
3a.4.6	Plant energy budget	-	-	-	-	-	-	582	87	669	669	-	-	-	-	-	-	-	-	-	-
3a.4.7	NRC Fees	-	-	-	-	-	-	586	59	645	645	-	-	-	-	-	-	-	-	-	-
3a.4.8	Site O&M Cost	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	-
3a.4.9	Security Staff Cost	-	-	-	-	-	-	228	34	262	262	-	-	-	-	-	-	-	-	-	13,557
3a.4.10	DOC Staff Cost	-	-	-	-	-	-	10,211	1,532	11,743	11,743	-	-	-	-	-	-	-	-	-	198,143
3a.4.11	Utility Staff Cost	-	-	-	-	-	-	2,459	369	2,828	2,828	-	-	-	-	-	-	-	-	-	26,071
3a.4	Subtotal Period 3a Period-Dependent Costs	-	642	4	1	-	16	14,573	2,284	17,520	17,520	-	-	-	404	-	-	-	8,103	99	237,771
3a.0	TOTAL PERIOD 3a COST	-	642	4	1	-	16	48,107	7,314	56,084	55,409	-	676	-	404	-	-	-	8,103	99	473,504
PERIOD 3b - Decommissioning Preparations																					
Period 3b Direct Decommissioning Activities																					
Detailed Work Procedures																					
3b.1.1.1	Plant systems	-	-	-	-	-	-	876	131	1,007	907	-	101	-	-	-	-	-	-	-	9,466
3b.1.1.2	Reactor internals	-	-	-	-	-	-	463	69	532	532	-	-	-	-	-	-	-	-	-	5,000
3b.1.1.3	Remaining buildings	-	-	-	-	-	-	125	19	144	36	-	108	-	-	-	-	-	-	-	1,350
3b.1.1.4	CRD cooling assembly	-	-	-	-	-	-	139	21	160	160	-	-	-	-	-	-	-	-	-	1,500
3b.1.1.5	Reactor vessel	-	-	-	-	-	-	504	76	580	580	-	-	-	-	-	-	-	-	-	5,445
3b.1.1.6	Facility closeout	-	-	-	-	-	-	111	17	128	64	-	64	-	-	-	-	-	-	-	1,200
3b.1.1.7	Missile shields	-	-	-	-	-	-	42	6	48	48	-	-	-	-	-	-	-	-	-	450
3b.1.1.8	Biological shield	-	-	-	-	-	-	111	17	128	128	-	-	-	-	-	-	-	-	-	1,200
3b.1.1.9	Steam generators	-	-	-	-	-	-	1,703	255	1,958	1,958	-	-	-	-	-	-	-	-	-	18,400
3b.1.1.10	Reinforced concrete	-	-	-	-	-	-	185	28	213	106	-	106	-	-	-	-	-	-	-	2,000
3b.1.1.11	Turbine & condensers	-	-	-	-	-	-	289	43	332	-	-	332	-	-	-	-	-	-	-	3,120
3b.1.1.12	Auxiliary building	-	-	-	-	-	-	505	76	581	523	-	58	-	-	-	-	-	-	-	5,460
3b.1.1.13	Reactor building	-	-	-	-	-	-	505	76	581	523	-	58	-	-	-	-	-	-	-	5,460
3b.1.1	Total	-	-	-	-	-	-	5,558	834	6,391	5,564	-	827	-	-	-	-	-	-	-	60,051
3b.1	Subtotal Period 3b Activity Costs	-	-	-	-	-	-	5,558	834	6,391	5,564	-	827	-	-	-	-	-	-	-	60,051
Period 3b Additional Costs																					
3b.2.1	Lead Shielding Disposal	-	476	106	74	2,822	-	-	564	4,043	4,043	-	-	2,511	-	-	-	-	1,418,084	14,333	-
3b.2.2	RB Defueling Equipment Disposition	-	215	22	28	-	786	-	257	1,307	1,307	-	-	-	2,577	-	-	-	245,011	6,870	-
3b.2	Subtotal Period 3b Additional Costs	-	691	128	102	2,822	786	-	821	5,350	5,350	-	-	2,511	2,577	-	-	-	1,663,095	21,203	-
Period 3b Collateral Costs																					
3b.3.1	Decon equipment	553	-	-	-	-	-	-	83	636	636	-	-	-	-	-	-	-	-	-	-
3b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,046	157	1,203	1,203	-	-	-	-	-	-	-	-	-	-
3b.3.3	Small tool allowance	-	10	-	-	-	-	-	1	11	11	-	-	-	-	-	-	-	-	-	-

Appendix D
Three Mile Island Unit 2
Custodial SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 3b Collateral Costs (continued)																				
3b.3.4	Pipe cutting equipment	-	957	-	-	-	-	-	143	1,100	1,100	-	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	553	966	-	-	-	-	1,046	385	2,950	2,950	-	-	-	-	-	-	-	-	-	-
	Period 3b Period-Dependent Costs																				
3b.4.1	Decon supplies	17	-	-	-	-	-	-	4	22	22	-	-	-	-	-	-	-	-	-	-
3b.4.2	Insurance	-	-	-	-	-	-	341	34	376	376	-	-	-	-	-	-	-	-	-	-
3b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3b.4.4	Health physics supplies	-	311	-	-	-	-	-	78	389	389	-	-	-	-	-	-	-	-	-	-
3b.4.5	Heavy equipment rental	-	129	-	-	-	-	-	19	149	149	-	-	-	-	-	-	-	-	-	-
3b.4.6	Disposal of DAW generated	-	-	2	0	-	8	-	2	13	13	-	-	-	206	-	-	-	4,129	51	-
3b.4.7	Plant energy budget	-	-	-	-	-	-	296	44	341	341	-	-	-	-	-	-	-	-	-	-
3b.4.8	NRC Fees	-	-	-	-	-	-	299	30	329	329	-	-	-	-	-	-	-	-	-	-
3b.4.9	Site O&M Cost	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	-
3b.4.10	Security Staff Cost	-	-	-	-	-	-	116	17	134	134	-	-	-	-	-	-	-	-	-	6,909
3b.4.11	DOC Staff Cost	-	-	-	-	-	-	10,402	1,560	11,962	11,962	-	-	-	-	-	-	-	-	-	172,289
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	1,253	188	1,441	1,441	-	-	-	-	-	-	-	-	-	13,286
3b.4	Subtotal Period 3b Period-Dependent Costs	17	440	2	0	-	8	12,835	1,997	15,300	15,300	-	-	-	206	-	-	-	4,129	51	192,483
3b.0	TOTAL PERIOD 3b COST	570	2,097	130	102	2,822	795	19,439	4,036	29,991	29,164	-	827	2,511	2,783	-	-	-	1,667,224	21,254	252,534
	PERIOD 3 TOTALS	570	2,740	134	103	2,822	811	67,546	11,350	86,076	84,573	-	1,503	2,511	3,187	-	-	-	1,675,327	21,353	726,038
	PERIOD 4a - Large Component Removal																				
	Period 4a Direct Decommissioning Activities																				
	Nuclear Steam Supply System Removal																				
4a.1.1.1	Reactor Coolant Piping	40	160	9	8	91	258	-	140	706	706	-	-	548	548	-	-	-	95,775	6,773	-
4a.1.1.2	Pressurizer Relief Tank	5	23	2	1	21	54	-	25	132	132	-	-	94	94	-	-	-	20,849	732	-
4a.1.1.3	Reactor Coolant Pumps & Motors	-	846	649	149	-	6,818	-	2,003	10,466	10,466	-	-	-	10,761	-	-	-	1,105,267	31,433	-
4a.1.1.4	Pressurizer	-	1,226	842	172	-	1,860	-	881	4,981	4,981	-	-	-	3,456	-	-	-	497,982	4,082	-
4a.1.1.5	Steam Generators	-	3,084	546	1,213	-	12,750	-	4,195	21,788	21,788	-	-	-	25,098	6,883	-	-	2,386,205	98,461	-
4a.1.1.6	CRDMs/ICIs/Service Structure Removal	22	36	72	17	-	247	-	92	486	486	-	-	-	1,454	-	-	-	47,869	1,830	-
4a.1.1.7	Reactor Vessel Internals	32	2,956	4,185	98	-	765	223	3,719	11,977	11,977	-	-	-	1,740	-	-	-	177,455	29,697	1,417
4a.1.1.8	Vessel & Internals GTCC Disposal	-	-	-	-	-	20,777	-	3,117	23,893	23,893	-	-	-	-	-	-	831	142,496	-	-
4a.1.1.9	Reactor Vessel	-	7,566	1,125	288	-	4,273	223	8,197	21,671	21,671	-	-	-	9,722	-	-	-	986,490	29,697	1,417
4a.1.1	Totals	99	15,897	7,428	1,946	112	47,802	445	22,370	96,101	96,101	-	-	642	52,873	6,883	-	831	5,460,388	202,704	2,833
	Removal of Major Equipment																				
4a.1.2	Main Turbine/Generator	-	198	51	12	547	-	-	138	946	946	-	-	6,106	-	-	-	-	274,750	5,956	-
4a.1.3	Main Condensers	-	816	49	12	525	-	-	289	1,691	1,691	-	-	5,860	-	-	-	-	263,690	25,162	-
	Disposal of Plant Systems																				
4a.1.4.1	Decay Heat Closed Cooling Water	-	178	14	21	538	446	-	241	1,438	1,438	-	-	6,656	963	-	-	-	356,612	5,628	-
4a.1.4.2	Decay Heat Removal (RCA)	-	127	20	21	203	850	-	280	1,499	1,499	-	-	2,511	1,833	-	-	-	266,361	4,171	-
4a.1.4.3	Decay Heat Removal (Yard)	-	91	-	-	-	-	-	14	104	-	-	104	-	-	-	-	-	-	2,863	-
4a.1.4.4	Demineralized Water (RCA)	-	88	3	3	44	118	-	59	316	316	-	-	547	255	-	-	-	45,089	2,746	-
4a.1.4.5	Domestic Water (Clean)	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	148	-
4a.1.4.6	Domestic Water (RCA)	-	13	1	0	5	18	-	9	45	45	-	-	63	38	-	-	-	5,993	396	-
4a.1.4.7	Electrical (Clean)	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	191	-
4a.1.4.8	Emergency Feedwater (RCA)	-	41	2	2	33	65	-	32	175	175	-	-	407	140	-	-	-	29,058	1,280	-
4a.1.4.9	Fire Protection (Clean)	-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	1,167	-
4a.1.4.10	Fire Protection (RCA)	-	29	1	1	12	40	-	19	103	103	-	-	146	86	-	-	-	13,657	933	-
4a.1.4.11	Gaseous Waste Disposal System (RCA)	-	121	3	3	46	109	-	65	347	347	-	-	568	255	-	-	-	44,078	3,949	-
4a.1.4.12	HVAC - Auxiliary Building	-	474	6	8	139	251	-	204	1,081	1,081	-	-	1,725	540	-	-	-	118,524	14,278	-
4a.1.4.13	HVAC - Control Building	-	51	2	4	144	22	-	41	263	263	-	-	1,780	47	-	-	-	76,530	1,433	-
4a.1.4.14	HVAC - Miscellaneous	-	21	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	666	-
4a.1.4.15	HVAC - Service Building	-	76	1	2	83	14	-	35	211	211	-	-	1,029	29	-	-	-	44,397	2,055	-

Appendix D
Three Mile Island Unit 2
Custodial SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Disposal of Plant Systems (continued)																					
4a.1.4.16	Hydrogen Purge - Rad Monitoring	-	12	-	-	0	3	-	4	19	19	-	-	4	6	-	-	-	644	413	-
4a.1.4.17	Industrial Waste Treatment System	-	144	-	-	-	-	-	22	166	-	-	166	-	-	-	-	-	-	4,899	-
4a.1.4.18	Instrument Air (RCA)	-	73	3	2	22	96	-	46	242	242	-	-	271	207	-	-	-	29,566	2,251	-
4a.1.4.19	Intermediate Closed Cooling Water (RCA)	-	60	5	6	46	243	-	84	444	444	-	-	568	524	-	-	-	70,092	1,887	-
4a.1.4.20	Main Condensate (RCA)	-	132	5	8	331	51	-	97	624	624	-	-	4,101	149	-	-	-	176,316	4,075	-
4a.1.4.21	Main Reheat & Steam (RCA)	-	39	2	3	52	76	-	37	209	209	-	-	643	164	-	-	-	40,843	1,216	-
4a.1.4.22	Nuclear Services Closed Cycle Cooling	-	546	61	66	1,041	2,226	-	865	4,804	4,804	-	-	12,877	5,304	-	-	-	953,442	17,227	-
4a.1.4.23	Nuclear Services River Water (Clean)	-	51	-	-	-	-	-	8	59	-	-	59	-	-	-	-	-	-	1,764	-
4a.1.4.24	Nuclear Services River Water (RCA)	-	746	29	33	355	1,295	-	571	3,028	3,028	-	-	4,392	2,792	-	-	-	428,769	24,880	-
4a.1.4.25	Reactor Building Normal Cooling (Clean)	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	298	-
4a.1.4.26	Reactor Building Normal Cooling (RCA)	-	173	13	15	140	629	-	225	1,196	1,196	-	-	1,739	1,356	-	-	-	192,214	5,711	-
4a.1.4.27	SG Secondary Side Vents & Drains	-	43	2	1	-	71	-	29	147	147	-	-	-	154	-	-	-	13,769	1,413	-
4a.1.4.28	Sampling Nuclear System	-	139	6	4	-	226	-	93	468	468	-	-	-	530	-	-	-	43,764	4,528	-
4a.1.4.29	Sewage Treatment Plant (RCA)	-	3	-	-	3	1	-	1	8	8	-	-	35	3	-	-	-	1,651	82	-
4a.1.4.30	Station Service Air	-	142	3	3	11	122	-	68	350	350	-	-	139	263	-	-	-	29,187	4,806	-
4a.1.4.31	Sump Systems (RCA)	-	83	2	2	13	70	-	41	211	211	-	-	161	152	-	-	-	20,117	2,753	-
4a.1.4.32	Turbine Plant Sample (RCA)	-	11	0	0	5	10	-	6	33	33	-	-	61	22	-	-	-	4,489	328	-
4a.1.4	Totals	-	3,762	182	208	3,267	7,050	-	3,206	17,674	17,259	-	416	40,423	15,811	-	-	-	3,005,161	120,434	-
4a.1.5	Scaffolding in support of decommissioning	-	663	7	2	72	14	-	181	940	940	-	-	804	50	-	-	-	40,658	24,135	-
4a.1	Subtotal Period 4a Activity Costs	99	21,336	7,716	2,181	4,522	54,866	445	26,185	117,351	116,936	-	416	53,834	68,734	6,883	-	831	9,044,647	378,391	2,833
Period 4a Additional Costs																					
4a.2.1	Reactor Building Basement Dose Reduction	-	110	353	2,053	-	10,880	-	3,091	16,488	16,488	-	-	-	-	7,380	2,017	-	1,173,681	42,364	-
4a.2.2	Reactor Building Basement Liner Removal	-	80	77	194	-	943	-	293	1,586	1,586	-	-	-	-	1,502	-	-	115,368	2,286	-
4a.2.3	Reactor Building SNF & HOT Systems Removal	-	-	41	186	-	555	-	171	952	952	-	-	-	-	1,002	-	-	76,912	250	-
4a.2.4	Fuel Handling / Auxiliary SNF & HOT Systems Removal	1,324	1,153	70	203	-	4,443	-	1,849	9,042	9,042	-	-	-	8,864	-	-	40	666,018	72,761	-
4a.2.5	NSSS Component Surface Decontamination	11,775	-	1,200	50	-	9,525	-	5,887	28,438	28,438	-	-	-	-	-	-	381	22,861	46,920	-
4a.2.6	Core Flood Tanks Removal	45	300	35	42	-	642	-	268	1,332	1,332	-	-	-	1,716	-	-	-	124,165	10,059	-
4a.2.7	FHAB AX-004 Room Decontamination	-	115	106	457	-	884	101	344	2,007	2,007	-	-	-	-	2,504	-	-	162,951	5,075	-
4a.2.8	Legacy waste stored at INEEL	-	-	-	-	-	-	500	50	550	550	-	-	-	-	-	-	-	-	-	-
4a.2	Subtotal Period 4a Additional Costs	13,144	1,758	1,881	3,186	-	27,873	601	11,952	60,395	60,395	-	-	-	10,580	12,388	2,017	421	2,341,956	179,715	-
Period 4a Collateral Costs																					
4a.3.1	Process liquid waste	3	-	2	11	-	86	-	25	127	127	-	-	-	-	46	-	-	5,826	12	-
4a.3.2	Small tool allowance	-	238	-	-	-	-	-	36	274	246	-	27	-	-	-	-	-	-	-	-
4a.3	Subtotal Period 4a Collateral Costs	3	238	2	11	-	86	-	60	400	373	-	27	-	-	46	-	-	5,826	12	-
Period 4a Period-Dependent Costs																					
4a.4.1	Decon supplies	177	-	-	-	-	-	-	44	221	221	-	-	-	-	-	-	-	-	-	-
4a.4.2	Insurance	-	-	-	-	-	-	3,498	350	3,847	3,847	-	-	-	-	-	-	-	-	-	-
4a.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4a.4.4	Health physics supplies	-	5,001	-	-	-	-	-	1,250	6,251	6,251	-	-	-	-	-	-	-	-	-	-
4a.4.5	Heavy equipment rental	-	7,707	-	-	-	-	-	1,156	8,863	8,863	-	-	-	-	-	-	-	-	-	-
4a.4.6	Disposal of DAW generated	-	-	79	16	-	299	-	85	479	479	-	-	-	7,523	-	-	-	150,762	1,847	-
4a.4.7	Plant energy budget	-	-	-	-	-	-	3,036	455	3,491	3,491	-	-	-	-	-	-	-	-	-	-
4a.4.8	NRC Fees	-	-	-	-	-	-	1,465	146	1,611	1,611	-	-	-	-	-	-	-	-	-	-
4a.4.9	Site O&M Cost	-	-	-	-	-	-	1,304	196	1,499	1,499	-	-	-	-	-	-	-	-	-	-
4a.4.10	Radwaste Processing Equipment/Services	-	-	-	-	-	-	1,878	282	2,159	2,159	-	-	-	-	-	-	-	-	-	-
4a.4.11	Security Staff Cost	-	-	-	-	-	-	2,745	412	3,157	3,157	-	-	-	-	-	-	-	-	-	163,286
4a.4.12	DOC Staff Cost	-	-	-	-	-	-	119,666	17,950	137,616	137,616	-	-	-	-	-	-	-	-	-	2,020,389
4a.4.13	Utility Staff Cost	-	-	-	-	-	-	12,832	1,925	14,757	14,757	-	-	-	-	-	-	-	-	-	136,071
4a.4	Subtotal Period 4a Period-Dependent Costs	177	12,708	79	16	-	299	146,423	24,251	183,952	183,952	-	-	-	7,523	-	-	-	150,762	1,847	2,319,746
4a.0	TOTAL PERIOD 4a COST	13,422	36,040	9,678	5,394	4,522	83,125	147,469	62,449	362,099	361,656	-	443	53,834	86,838	19,317	2,017	1,252	11,543,190	559,965	2,322,579

Appendix D
Three Mile Island Unit 2
Custodial SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 4b - Site Decontamination																					
Disposal of Plant Systems																					
4b.1.2.1	Decay Heat Removal (RB)	-	150	11	10	-	514	-	168	853	853	-	-	-	1,108	-	-	-	99,380	4,941	-
4b.1.2.2	Electrical (Contaminated - RB)	-	28	1	1	-	54	-	21	105	105	-	-	-	116	-	-	-	10,435	893	-
4b.1.2.3	Electrical (Contaminated - RCA)	-	185	5	11	440	67	-	131	841	841	-	-	5,443	145	-	-	-	234,039	5,741	-
4b.1.2.4	Feedwater (RB)	-	24	3	3	-	158	-	46	234	234	-	-	-	341	-	-	-	30,612	804	-
4b.1.2.5	Fire Protection (RB)	-	12	1	1	-	27	-	10	50	50	-	-	-	58	-	-	-	5,171	407	-
4b.1.2.6	Fuel Handling (RB)	-	3	0	0	-	9	-	3	15	15	-	-	-	19	-	-	-	1,669	86	-
4b.1.2.7	Fuel Handling (RCA)	-	200	7	8	-	423	-	158	796	796	-	-	-	912	-	-	-	81,790	6,260	-
4b.1.2.8	Gaseous Waste Disposal System (RB)	-	2	0	-	-	4	-	2	8	8	-	-	-	9	-	-	-	790	76	-
4b.1.2.9	HVAC - Fuel Handling Building	-	234	2	4	89	86	-	94	509	509	-	-	1,097	185	-	-	-	61,125	6,871	-
4b.1.2.10	HVAC - Reactor Building	-	637	25	26	-	1,364	-	507	2,559	2,559	-	-	-	2,941	-	-	-	263,784	19,351	-
4b.1.2.11	Instrument Air (RB)	-	17	1	0	-	26	-	11	55	55	-	-	-	55	-	-	-	4,966	545	-
4b.1.2.12	Intermediate Closed Cooling Water (RB)	-	49	3	2	-	122	-	43	220	220	-	-	-	263	-	-	-	23,572	1,604	-
4b.1.2.13	Nitrogen for Nuclear Radwaste Sys (RB)	-	5	0	0	-	23	-	7	36	36	-	-	-	49	-	-	-	4,378	170	-
4b.1.2.14	Nuclear Services River Water (RB)	-	55	5	5	-	263	-	81	409	409	-	-	-	568	-	-	-	50,919	1,826	-
4b.1.2.15	OTSG Chemical Cleaning System	-	11	1	1	-	32	-	11	56	56	-	-	-	70	-	-	-	6,260	372	-
4b.1.2.16	Sewage Treatment Plant (Clean)	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	180	-
4b.1.2.17	Spent Fuel Cooling	-	248	9	9	36	421	-	175	898	898	-	-	452	907	-	-	-	99,713	8,156	-
4b.1.2.18	Spent Fuel Cooling (RB)	-	15	1	1	-	36	-	13	65	65	-	-	-	77	-	-	-	6,934	482	-
4b.1.2.19	Sump Systems (RB)	-	22	1	1	-	50	-	18	93	93	-	-	-	108	-	-	-	9,645	744	-
4b.1.2	Totals	-	1,905	77	83	565	3,677	-	1,500	7,807	7,800	-	6	6,991	7,930	-	-	-	995,182	59,509	-
4b.1.3	Scaffolding in support of decommissioning	-	994	11	3	108	22	-	272	1,409	1,409	-	-	1,206	75	-	-	-	60,988	36,203	-
Decontamination of Site Buildings																					
4b.1.4.1	Reactor	6,361	3,227	569	371	-	12,090	-	7,122	29,739	29,739	-	-	-	42,223	-	-	-	3,766,363	277,801	-
4b.1.4.2	Auxiliary	308	355	41	25	26	531	-	387	1,674	1,674	-	-	323	4,989	-	-	-	485,601	19,268	-
4b.1.4.3	BWST & CST Tank Pads	-	70	206	123	-	2,483	-	677	3,559	3,559	-	-	-	24,827	-	-	-	2,482,650	2,976	-
4b.1.4.4	Control & Service	14	4	1	0	0	10	-	11	41	41	-	-	2	97	-	-	-	9,763	566	-
4b.1.4.5	Control Building Area	56	29	5	3	20	56	-	53	221	221	-	-	249	545	-	-	-	64,320	2,530	-
4b.1.4.6	Fuel Handling	432	502	35	23	65	567	-	500	2,124	2,124	-	-	803	3,575	-	-	-	361,010	27,042	-
4b.1.4.7	Turbine	42	1	0	0	-	3	-	22	69	69	-	-	-	25	-	-	-	2,532	1,421	-
4b.1.4	Totals	7,213	4,188	857	546	111	15,739	-	8,773	37,426	37,426	-	-	1,377	76,281	-	-	-	7,172,239	331,602	-
4b.1	Subtotal Period 4b Activity Costs	7,213	7,087	945	632	784	19,438	-	10,544	46,642	46,636	-	6	9,574	84,286	-	-	-	8,228,408	427,313	-
Period 4b Additional Costs																					
4b.2.1	Bioshield & D-Ring Removal	-	3,767	982	186	-	15,491	-	4,941	25,367	25,367	-	-	-	137,100	-	-	-	15,491,430	62,557	-
4b.2.2	RB Exterior Concrete & Basemat Removal	-	2,816	305	58	-	4,251	-	1,524	8,954	8,954	-	-	-	42,506	-	-	-	4,250,566	49,359	-
4b.2.3	Underground Piping & Yard Soil	-	455	1,320	199	-	3,723	250	1,244	7,191	7,191	-	-	-	48,992	-	-	-	3,723,414	9,759	-
4b.2.4	Process NSSS decon & segmentation liquid inventory	-	-	65	222	-	3,471	555	991	5,304	5,304	-	-	-	-	-	1,347	-	158,780	-	779
4b.2.5	Auxiliary Building Total Removal	-	6,360	539	103	-	7,522	-	2,904	17,428	17,428	-	-	-	75,217	-	-	-	7,521,660	132,549	-
4b.2.6	Fuel Handling Building Total Removal	-	4,324	395	75	-	5,491	-	2,072	12,358	12,358	-	-	-	54,907	-	-	-	5,490,720	87,034	-
4b.2.7	On-site survey & release of concrete	-	1,614	-	508	1,049	-	-	242	3,413	3,413	-	-	-	-	-	-	-	-	25,415	-
4b.2.8	Defueling fuel canister racks	16	14	91	22	-	667	-	191	1,001	1,001	-	-	-	11,628	-	-	-	207,896	1,462	-
4b.2	Subtotal Period 4b Additional Costs	16	19,351	3,697	1,373	1,049	40,616	805	14,108	81,016	81,016	-	-	-	370,350	-	1,347	-	36,844,470	368,135	779
Period 4b Collateral Costs																					
4b.3.1	Process liquid waste	5	-	4	26	-	124	-	38	198	198	-	-	-	-	105	-	-	13,247	28	-
4b.3.2	Small tool allowance	-	322	-	-	-	-	-	48	370	370	-	-	-	-	-	-	-	-	-	-
4b.3.3	Decommissioning Equipment Disposition	-	-	53	18	537	108	-	116	832	832	-	-	6,000	373	-	-	-	303,507	739	-
4b.3	Subtotal Period 4b Collateral Costs	5	322	58	44	537	232	-	202	1,400	1,400	-	-	6,000	373	105	-	-	316,754	767	-
Period 4b Period-Dependent Costs																					
4b.4.1	Decon supplies	736	-	-	-	-	-	-	184	920	920	-	-	-	-	-	-	-	-	-	-
4b.4.2	Insurance	-	-	-	-	-	-	2,348	235	2,583	2,583	-	-	-	-	-	-	-	-	-	-
4b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix D
Three Mile Island Unit 2
Custodial SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 4b Period-Dependent Costs (continued)																				
4b.4.4	Health physics supplies	-	5,602	-	-	-	-	-	1,401	7,003	7,003	-	-	-	-	-	-	-	-	-	-
4b.4.5	Heavy equipment rental	-	4,834	-	-	-	-	-	725	5,559	5,559	-	-	-	-	-	-	-	-	-	-
4b.4.6	Disposal of DAW generated	-	-	61	12	-	231	-	66	369	369	-	-	-	5,795	-	-	-	116,139	1,423	-
4b.4.7	Plant energy budget	-	-	-	-	-	-	1,522	228	1,750	1,750	-	-	-	-	-	-	-	-	-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	656	66	721	721	-	-	-	-	-	-	-	-	-	-
4b.4.9	Site O&M Cost	-	-	-	-	-	-	875	131	1,007	1,007	-	-	-	-	-	-	-	-	-	-
4b.4.10	Radwaste Processing Equipment/Services	-	-	-	-	-	-	1,261	189	1,450	1,450	-	-	-	-	-	-	-	-	-	-
4b.4.11	Security Staff Cost	-	-	-	-	-	-	1,352	203	1,554	1,554	-	-	-	-	-	-	-	-	-	80,394
4b.4.12	DOC Staff Cost	-	-	-	-	-	-	59,778	8,967	68,745	68,745	-	-	-	-	-	-	-	-	-	1,017,572
4b.4.13	Utility Staff Cost	-	-	-	-	-	-	8,037	1,206	9,243	9,243	-	-	-	-	-	-	-	-	-	85,218
4b.4	Subtotal Period 4b Period-Dependent Costs	736	10,436	61	12	-	231	75,828	13,599	100,904	100,904	-	-	-	5,795	-	-	-	116,139	1,423	1,183,185
4b.0	TOTAL PERIOD 4b COST	7,970	37,196	4,760	2,061	2,371	60,516	76,633	38,454	229,962	229,956	-	6	15,574	460,805	105	1,347	-	45,505,770	797,638	1,183,964
	PERIOD 4e - License Termination																				
	Period 4e Direct Decommissioning Activities																				
4e.1.1	ORISE confirmatory survey	-	-	-	-	-	-	116	35	150	150	-	-	-	-	-	-	-	-	-	-
4e.1.2	Terminate license									a											
4e.1	Subtotal Period 4e Activity Costs	-	-	-	-	-	-	116	35	150	150	-	-	-	-	-	-	-	-	-	-
	Period 4e Additional Costs																				
4e.2.1	License Termination Survey	-	-	-	-	-	-	4,001	1,200	5,202	5,202	-	-	-	-	-	-	-	-	111,562	-
4e.2	Subtotal Period 4e Additional Costs	-	-	-	-	-	-	4,001	1,200	5,202	5,202	-	-	-	-	-	-	-	-	111,562	-
	Period 4e Collateral Costs																				
4e.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,046	157	1,203	1,203	-	-	-	-	-	-	-	-	-	-
4e.3	Subtotal Period 4e Collateral Costs	-	-	-	-	-	-	1,046	157	1,203	1,203	-	-	-	-	-	-	-	-	-	-
	Period 4e Period-Dependent Costs																				
4e.4.1	Insurance	-	-	-	-	-	-	195	19	214	214	-	-	-	-	-	-	-	-	-	-
4e.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4e.4.3	Health physics supplies	-	888	-	-	-	-	-	222	1,110	1,110	-	-	-	-	-	-	-	-	-	-
4e.4.4	Disposal of DAW generated	-	-	3	1	-	12	-	3	19	19	-	-	-	306	-	-	-	6,127	75	-
4e.4.5	Plant energy budget	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	-
4e.4.6	NRC Fees	-	-	-	-	-	-	141	14	156	156	-	-	-	-	-	-	-	-	-	-
4e.4.7	Site O&M Cost	-	-	-	-	-	-	189	28	217	217	-	-	-	-	-	-	-	-	-	-
4e.4.8	Security Staff Cost	-	-	-	-	-	-	80	12	91	91	-	-	-	-	-	-	-	-	-	4,731
4e.4.9	DOC Staff Cost	-	-	-	-	-	-	3,589	538	4,128	4,128	-	-	-	-	-	-	-	-	-	54,159
4e.4.10	Utility Staff Cost	-	-	-	-	-	-	1,278	192	1,470	1,470	-	-	-	-	-	-	-	-	-	12,617
4e.4	Subtotal Period 4e Period-Dependent Costs	-	888	3	1	-	12	5,589	1,047	7,541	7,541	-	-	-	306	-	-	-	6,127	75	71,508
4e.0	TOTAL PERIOD 4e COST	-	888	3	1	-	12	10,753	2,439	14,096	14,096	-	-	-	306	-	-	-	6,127	111,637	71,508
	PERIOD 4 TOTALS	21,393	74,124	14,441	7,456	6,893	143,653	234,855	103,341	606,157	605,707	-	449	69,408	547,948	19,422	3,364	1,252	57,055,080	1,469,241	3,578,050
	PERIOD 5b - Site Restoration																				
	Period 5b Direct Decommissioning Activities																				
	Demolition of Remaining Site Buildings																				
5b.1.1.1	Air Intake Tunnel	-	100	-	-	-	-	-	15	115	-	-	115	-	-	-	-	-	-	2,757	-
5b.1.1.2	Circulating Water Chlorinator	-	37	-	-	-	-	-	6	43	-	-	43	-	-	-	-	-	-	950	-
5b.1.1.3	Circulating Water Intake Flume	-	30	-	-	-	-	-	5	35	-	-	35	-	-	-	-	-	-	736	-
5b.1.1.4	Circulating Water Pumphouse	-	118	-	-	-	-	-	18	136	-	-	136	-	-	-	-	-	-	3,112	-
5b.1.1.5	Coagulator	-	39	-	-	-	-	-	6	45	-	-	45	-	-	-	-	-	-	955	-
5b.1.1.6	Control & Service	-	2,317	-	-	-	-	-	348	2,664	133	-	2,531	-	-	-	-	-	-	46,913	-
5b.1.1.7	Control Building Area	-	618	-	-	-	-	-	93	710	-	-	710	-	-	-	-	-	-	11,471	-

Appendix D
Three Mile Island Unit 2
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(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Demolition of Remaining Site Buildings (continued)																					
5b.1.1.8	Cooling Towers	-	522	-	-	-	-	-	78	600	-	-	600	-	-	-	-	-	-	11,550	-
5b.1.1.9	Emergency Diesel Generator	-	880	-	-	-	-	-	132	1,011	-	-	1,011	-	-	-	-	-	-	16,744	-
5b.1.1.10	Main & Aux Transformer Foundations	-	66	-	-	-	-	-	10	75	-	-	75	-	-	-	-	-	-	1,387	-
5b.1.1.11	Mechanical Draft Cooling Towers	-	52	-	-	-	-	-	8	60	-	-	60	-	-	-	-	-	-	997	-
5b.1.1.12	Miscellaneous Yard Foundations	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	210	-
5b.1.1.13	River Water Pumphouse	-	1,235	-	-	-	-	-	185	1,420	-	-	1,420	-	-	-	-	-	-	21,553	-
5b.1.1.14	Turbine	-	1,212	-	-	-	-	-	182	1,393	-	-	1,393	-	-	-	-	-	-	35,605	-
5b.1.1.15	Turbine Generator Pedestal	-	493	-	-	-	-	-	74	567	-	-	567	-	-	-	-	-	-	8,458	-
5b.1.1	Totals	-	7,726	-	-	-	-	-	1,159	8,884	133	-	8,751	-	-	-	-	-	-	163,399	-
Site Closeout Activities																					
5b.1.2	Grade & landscape site	-	105	-	-	-	-	-	16	121	-	-	121	-	-	-	-	-	-	957	-
5b.1.3	Final report to NRC	-	-	-	-	-	-	289	43	332	332	-	-	-	-	-	-	-	-	-	3,120
5b.1	Subtotal Period 5b Activity Costs	-	7,831	-	-	-	-	289	1,218	9,338	465	-	8,872	-	-	-	-	-	-	164,356	3,120
Period 5b Additional Costs																					
5b.2.1	River Water Pump House Cofferdam	-	144	-	-	-	-	-	22	166	-	-	166	-	-	-	-	-	-	2,116	-
5b.2.2	Concrete Processing	-	221	-	4	-	-	-	34	259	-	-	259	-	-	-	-	-	-	1,785	-
5b.2.3	Survey & Release of scrap materials	-	-	230	13	-	-	425	89	756	756	-	-	-	-	-	-	-	850,136	1,700	-
5b.2.4	Backfill site	-	399	-	-	-	-	-	60	459	-	-	459	-	-	-	-	-	-	5,554	-
5b.2	Subtotal Period 5b Additional Costs	-	765	230	17	-	-	425	204	1,640	756	-	885	-	-	-	-	-	850,136	11,155	-
Period 5b Collateral Costs																					
5b.3.1	Small tool allowance	-	75	-	-	-	-	-	11	86	-	-	86	-	-	-	-	-	-	-	-
5b.3	Subtotal Period 5b Collateral Costs	-	75	-	-	-	-	-	11	86	-	-	86	-	-	-	-	-	-	-	-
Period 5b Period-Dependent Costs																					
5b.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5b.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	1,889	-	-	-	-	-	283	2,173	-	-	2,173	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	78	12	89	-	-	89	-	-	-	-	-	-	-	-
5b.4.5	Security Staff Cost	-	-	-	-	-	-	105	16	121	-	-	121	-	-	-	-	-	-	-	6,274
5b.4.6	DOC Staff Cost	-	-	-	-	-	-	6,986	1,048	8,034	-	-	8,034	-	-	-	-	-	-	-	101,769
5b.4.7	Utility Staff Cost	-	-	-	-	-	-	1,228	184	1,413	-	-	1,413	-	-	-	-	-	-	-	13,594
5b.4	Subtotal Period 5b Period-Dependent Costs	-	1,889	-	-	-	-	8,398	1,543	11,830	-	-	11,830	-	-	-	-	-	-	-	121,638
5b.0	TOTAL PERIOD 5b COST	-	10,560	230	17	-	-	9,112	2,976	22,894	1,221	-	21,673	-	-	-	-	-	850,136	175,511	124,758
PERIOD 5 TOTALS		-	10,560	230	17	-	-	9,112	2,976	22,894	1,221	-	21,673	-	-	-	-	-	850,136	175,511	124,758
TOTAL COST TO DECOMMISSION		21,963	92,190	15,013	7,617	9,715	145,253	362,056	125,957	779,764	756,139	-	23,625	71,919	570,967	19,422	3,364	1,252	59,977,950	1,670,974	5,068,167

Appendix D
Three Mile Island Unit 2
Custodial SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

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

TOTAL COST TO DECOMMISSION WITH 19.27% CONTINGENCY:	$779,764	thousands of 2003 dollars
TOTAL NRC LICENSE TERMINATION COST IS 96.97% OR	$756,139	thousands of 2003 dollars
NON-NUCLEAR DEMOLITION COST IS 3.03% OR:	$23,625	thousands of 2003 dollars
TOTAL CLASS A THROUGH CLASS C RADWASTE VOLUME BURIED:	593,753	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,252	cubic feet
TOTAL SCRAP METAL REMOVED:	29,694	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,670,974	man-hours

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

APPENDIX E

DETAILED COST ANALYSIS

HARDENED SAFSTOR

Appendix E
Three Mile Island Unit 2
Hardened SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 2c - SAFSTOR Dormancy during TMI-1 Decommissioning																					
Period 2c Direct Decommissioning Activities																					
2c.1.1	Quarterly inspection									a											
2c.1.2	Semi-annual environmental survey									a											
2c.1.3	Prepare reports									a											
2c.1.4	Bituminous roof replacement	-	-	-	-	-	-	57	9	65	65	-	-	-	-	-	-	-	-	-	-
2c.1.5	Maintenance supplies	-	-	-	-	-	-	315	47	362	362	-	-	-	-	-	-	-	-	-	-
2c.1	Subtotal Period 2c Activity Costs	-	-	-	-	-	-	372	56	428	428	-	-	-	-	-	-	-	-	-	-
Period 2c Period-Dependent Costs																					
2c.4.1	Insurance	-	-	-	-	-	-	646	65	710	710	-	-	-	-	-	-	-	-	-	-
2c.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2c.4.3	Health physics supplies	-	244	-	-	-	-	-	61	305	305	-	-	-	-	-	-	-	-	-	-
2c.4.4	Disposal of DAW generated	-	-	11	2	-	40	-	11	65	65	-	-	-	1,014	-	-	-	20,313	249	-
2c.4.5	Plant energy budget	-	-	-	-	-	-	501	75	576	576	-	-	-	-	-	-	-	-	-	-
2c.4.6	NRC Fees	-	-	-	-	-	-	78	8	86	86	-	-	-	-	-	-	-	-	-	-
2c.4.7	Security Staff Cost	-	-	-	-	-	-	461	69	531	531	-	-	-	-	-	-	-	-	-	27,450
2c.4.8	Utility Staff Cost	-	-	-	-	-	-	525	79	604	604	-	-	-	-	-	-	-	-	-	5,229
2c.4	Subtotal Period 2c Period-Dependent Costs	-	244	11	2	-	40	2,211	368	2,876	2,876	-	-	-	1,014	-	-	-	20,313	249	32,679
2c.0	TOTAL PERIOD 2c COST	-	244	11	2	-	40	2,583	424	3,304	3,304	-	-	-	1,014	-	-	-	20,313	249	32,679
PERIOD 2 TOTALS		-	244	11	2	-	40	2,583	424	3,304	3,304	-	-	-	1,014	-	-	-	20,313	249	32,679
PERIOD 3a - Reactivate Site Following SAFSTOR Dormancy																					
Period 3a Direct Decommissioning Activities																					
3a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	180	27	208	208	-	-	-	-	-	-	-	-	-	1,950
3a.1.2	Prepare and submit PSDAR	-	-	-	-	-	-	740	111	851	851	-	-	-	-	-	-	-	-	-	8,000
3a.1.3	Review plant dwgs & specs.	-	-	-	-	-	-	426	64	490	490	-	-	-	-	-	-	-	-	-	4,600
3a.1.4	Perform detailed rad survey									a											
3a.1.5	Estimate by-product inventory	-	-	-	-	-	-	926	139	1,064	1,064	-	-	-	-	-	-	-	-	-	10,000
3a.1.6	End product description	-	-	-	-	-	-	185	28	213	213	-	-	-	-	-	-	-	-	-	2,000
3a.1.7	Detailed by-product inventory	-	-	-	-	-	-	241	36	277	277	-	-	-	-	-	-	-	-	-	2,600
3a.1.8	Define major work sequence	-	-	-	-	-	-	694	104	798	798	-	-	-	-	-	-	-	-	-	7,500
3a.1.9	Perform SER and EA	-	-	-	-	-	-	5,775	866	6,641	6,641	-	-	-	-	-	-	-	-	-	62,400
3a.1.10	Perform Site-Specific Cost Study	-	-	-	-	-	-	463	69	532	532	-	-	-	-	-	-	-	-	-	5,000
3a.1.11	Prepare/submit License Termination Plan	-	-	-	-	-	-	758	114	872	872	-	-	-	-	-	-	-	-	-	8,192
3a.1.12	Receive NRC approval of termination plan									a											
Activity Specifications																					
3a.1.13.1	Re-activate plant & temporary facilities	-	-	-	-	-	-	1,023	153	1,177	1,059	-	118	-	-	-	-	-	-	-	11,055
3a.1.13.2	Plant systems	-	-	-	-	-	-	771	116	887	798	-	89	-	-	-	-	-	-	-	8,333
3a.1.13.3	Reinforced concrete	-	-	-	-	-	-	296	44	341	170	-	170	-	-	-	-	-	-	-	3,200
3a.1.13.4	Turbine & condenser	-	-	-	-	-	-	74	11	85	-	-	85	-	-	-	-	-	-	-	800
3a.1.13.5	Plant structures & buildings	-	-	-	-	-	-	289	43	332	166	-	166	-	-	-	-	-	-	-	3,120
3a.1.13.6	Waste management	-	-	-	-	-	-	1,703	255	1,958	1,958	-	-	-	-	-	-	-	-	-	18,400
3a.1.13.7	Facility & site closeout	-	-	-	-	-	-	83	12	96	48	-	48	-	-	-	-	-	-	-	900
3a.1.13	Total	-	-	-	-	-	-	4,240	636	4,876	4,200	-	676	-	-	-	-	-	-	-	45,808
Planning & Site Preparations																					
3a.1.14	Prepare dismantling sequence	-	-	-	-	-	-	444	67	511	511	-	-	-	-	-	-	-	-	-	4,800
3a.1.15	Plant prep. & temp. svces	-	-	-	-	-	-	2,419	363	2,782	2,782	-	-	-	-	-	-	-	-	-	-
3a.1.16	Design water clean-up system	-	-	-	-	-	-	518	78	596	596	-	-	-	-	-	-	-	-	-	5,600
3a.1.17	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,048	307	2,355	2,355	-	-	-	-	-	-	-	-	-	-
3a.1.18	Procure casks/liners & containers	-	-	-	-	-	-	228	34	262	262	-	-	-	-	-	-	-	-	-	2,460
3a.1	Subtotal Period 3a Activity Costs	-	-	-	-	-	-	20,285	3,043	23,327	22,652	-	676	-	-	-	-	-	-	-	170,910

Appendix E
Three Mile Island Unit 2
Hardened SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 3a Period-Dependent Costs																					
3a.4.1	Insurance	-	-	-	-	-	-	258	26	283	283	-	-	-	-	-	-	-	-	-	-
3a.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3a.4.3	Health physics supplies	-	389	-	-	-	-	-	97	486	486	-	-	-	-	-	-	-	-	-	-
3a.4.4	Heavy equipment rental	-	254	-	-	-	-	-	38	292	292	-	-	-	-	-	-	-	-	-	-
3a.4.5	Disposal of DAW generated	-	-	4	1	-	16	-	5	26	26	-	-	-	404	-	-	-	8,103	99	-
3a.4.6	Plant energy budget	-	-	-	-	-	-	582	87	669	669	-	-	-	-	-	-	-	-	-	-
3a.4.7	NRC Fees	-	-	-	-	-	-	586	59	645	645	-	-	-	-	-	-	-	-	-	-
3a.4.8	Site O&M Cost	-	-	-	-	-	-	250	37	287	287	-	-	-	-	-	-	-	-	-	-
3a.4.9	Security Staff Cost	-	-	-	-	-	-	208	31	239	239	-	-	-	-	-	-	-	-	-	12,368
3a.4.10	DOC Staff Cost	-	-	-	-	-	-	8,638	1,296	9,934	9,934	-	-	-	-	-	-	-	-	-	160,600
3a.4.11	Utility Staff Cost	-	-	-	-	-	-	2,242	336	2,579	2,579	-	-	-	-	-	-	-	-	-	23,777
3a.4	Subtotal Period 3a Period-Dependent Costs	-	642	4	1	-	16	12,763	2,012	15,439	15,439	-	-	-	404	-	-	-	8,103	99	196,745
3a.0	TOTAL PERIOD 3a COST	-	642	4	1	-	16	33,048	5,055	38,766	38,091	-	676	-	404	-	-	-	8,103	99	367,656
PERIOD 3b - Decommissioning Preparations																					
Period 3b Direct Decommissioning Activities																					
Detailed Work Procedures																					
3b.1.1.1	Plant systems	-	-	-	-	-	-	876	131	1,007	907	-	101	-	-	-	-	-	-	-	9,466
3b.1.1.2	Remaining buildings	-	-	-	-	-	-	125	19	144	36	-	108	-	-	-	-	-	-	-	1,350
3b.1.1.3	Facility closeout	-	-	-	-	-	-	111	17	128	64	-	64	-	-	-	-	-	-	-	1,200
3b.1.1.4	Reinforced concrete	-	-	-	-	-	-	185	28	213	106	-	106	-	-	-	-	-	-	-	2,000
3b.1.1.5	Turbine & condensers	-	-	-	-	-	-	289	43	332	-	-	332	-	-	-	-	-	-	-	3,120
3b.1.1.6	Auxiliary building	-	-	-	-	-	-	505	76	581	523	-	58	-	-	-	-	-	-	-	5,460
3b.1.1	Total	-	-	-	-	-	-	2,091	314	2,405	1,636	-	769	-	-	-	-	-	-	-	22,596
3b.1	Subtotal Period 3b Activity Costs	-	-	-	-	-	-	2,091	314	2,405	1,636	-	769	-	-	-	-	-	-	-	22,596
Period 3b Additional Costs																					
3b.2.1	Lead Shielding Disposal	-	476	106	74	2,822	-	-	564	4,043	4,043	-	-	2,511	-	-	-	-	1,418,084	14,333	-
3b.2	Subtotal Period 3b Additional Costs	-	476	106	74	2,822	-	-	564	4,043	4,043	-	-	2,511	-	-	-	-	1,418,084	14,333	-
Period 3b Collateral Costs																					
3b.3.1	Decon equipment	553	-	-	-	-	-	-	83	636	636	-	-	-	-	-	-	-	-	-	-
3b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,046	157	1,203	1,203	-	-	-	-	-	-	-	-	-	-
3b.3.3	Small tool allowance	-	7	-	-	-	-	-	1	8	8	-	-	-	-	-	-	-	-	-	-
3b.3.4	Pipe cutting equipment	-	957	-	-	-	-	-	143	1,100	1,100	-	-	-	-	-	-	-	-	-	-
3b.3	Subtotal Period 3b Collateral Costs	553	963	-	-	-	-	1,046	384	2,947	2,947	-	-	-	-	-	-	-	-	-	-
Period 3b Period-Dependent Costs																					
3b.4.1	Decon supplies	17	-	-	-	-	-	-	4	21	21	-	-	-	-	-	-	-	-	-	-
3b.4.2	Insurance	-	-	-	-	-	-	340	34	374	374	-	-	-	-	-	-	-	-	-	-
3b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3b.4.4	Health physics supplies	-	273	-	-	-	-	-	68	342	342	-	-	-	-	-	-	-	-	-	-
3b.4.5	Heavy equipment rental	-	129	-	-	-	-	-	19	148	148	-	-	-	-	-	-	-	-	-	-
3b.4.6	Disposal of DAW generated	-	-	2	0	-	8	-	2	13	13	-	-	-	205	-	-	-	4,107	50	-
3b.4.7	Plant energy budget	-	-	-	-	-	-	295	44	339	339	-	-	-	-	-	-	-	-	-	-
3b.4.8	NRC Fees	-	-	-	-	-	-	297	30	327	327	-	-	-	-	-	-	-	-	-	-
3b.4.9	Site O&M Cost	-	-	-	-	-	-	127	19	146	146	-	-	-	-	-	-	-	-	-	-
3b.4.10	Security Staff Cost	-	-	-	-	-	-	106	16	121	121	-	-	-	-	-	-	-	-	-	6,279
3b.4.11	DOC Staff Cost	-	-	-	-	-	-	7,146	1,072	8,218	8,218	-	-	-	-	-	-	-	-	-	116,550
3b.4.12	Utility Staff Cost	-	-	-	-	-	-	1,139	171	1,310	1,310	-	-	-	-	-	-	-	-	-	12,083
3b.4	Subtotal Period 3b Period-Dependent Costs	17	402	2	0	-	8	9,449	1,480	11,358	11,358	-	-	-	205	-	-	-	4,107	50	134,913
3b.0	TOTAL PERIOD 3b COST	570	1,841	108	74	2,822	8	12,586	2,742	20,752	19,983	-	769	2,511	205	-	-	-	1,422,191	14,383	157,509

Appendix E
Three Mile Island Unit 2
Hardened SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 3 TOTALS		570	2,484	113	75	2,822	24	45,634	7,797	59,519	58,074	-	1,445	2,511	609	-	-	-	1,430,294	14,483	525,164
PERIOD 4b - Site Decontamination outside of Reactor Building																					
Disposal of Plant Systems																					
4b.1.2.1	Decay Heat Closed Cooling Water	-	178	14	21	538	446	-	241	1,438	1,438	-	-	6,656	963	-	-	-	356,612	5,628	-
4b.1.2.2	Decay Heat Removal (RCA)	-	127	20	21	203	850	-	280	1,499	1,499	-	-	2,511	1,833	-	-	-	266,361	4,171	-
4b.1.2.3	Decay Heat Removal (Yard)	-	91	-	-	-	-	-	14	104	-	-	104	-	-	-	-	-	-	2,863	-
4b.1.2.4	Demineralized Water (RCA)	-	88	3	3	44	118	-	59	316	316	-	-	547	255	-	-	-	45,089	2,746	-
4b.1.2.5	Domestic Water (Clean)	-	4	-	-	-	-	-	1	5	-	-	5	-	-	-	-	-	-	148	-
4b.1.2.6	Domestic Water (RCA)	-	13	1	0	5	18	-	9	45	45	-	-	63	38	-	-	-	5,993	396	-
4b.1.2.7	Electrical (Clean)	-	6	-	-	-	-	-	1	7	-	-	7	-	-	-	-	-	-	191	-
4b.1.2.8	Electrical (Contaminated - RCA)	-	185	5	11	440	67	-	131	841	841	-	-	5,443	145	-	-	-	234,039	5,741	-
4b.1.2.9	Emergency Feedwater (RCA)	-	41	2	2	33	65	-	32	175	175	-	-	407	140	-	-	-	29,058	1,280	-
4b.1.2.10	Fire Protection (Clean)	-	35	-	-	-	-	-	5	40	-	-	40	-	-	-	-	-	-	1,167	-
4b.1.2.11	Fire Protection (RCA)	-	29	1	1	12	40	-	19	103	103	-	-	146	86	-	-	-	13,657	933	-
4b.1.2.12	Fuel Handling (RCA)	-	200	7	8	-	423	-	158	796	796	-	-	-	912	-	-	-	81,790	6,260	-
4b.1.2.13	Gaseous Waste Disposal System (RCA)	-	121	3	3	46	109	-	65	347	347	-	-	568	255	-	-	-	44,078	3,949	-
4b.1.2.14	HVAC - Auxiliary Building	-	474	6	8	139	251	-	204	1,081	1,081	-	-	1,725	540	-	-	-	118,524	14,278	-
4b.1.2.15	HVAC - Control Building	-	51	2	4	144	22	-	41	263	263	-	-	1,780	47	-	-	-	76,530	1,433	-
4b.1.2.16	HVAC - Fuel Handling Building	-	234	2	4	89	86	-	94	509	509	-	-	1,097	185	-	-	-	61,125	6,871	-
4b.1.2.17	HVAC - Miscellaneous	-	21	-	-	-	-	-	3	24	-	-	24	-	-	-	-	-	-	666	-
4b.1.2.18	HVAC - Service Building	-	76	1	2	83	14	-	35	211	211	-	-	1,029	29	-	-	-	44,397	2,055	-
4b.1.2.19	Hydrogen Purge - Rad Monitoring	-	12	-	-	0	3	-	4	19	19	-	-	4	6	-	-	-	644	413	-
4b.1.2.20	Industrial Waste Treatment System	-	144	-	-	-	-	-	22	166	-	-	166	-	-	-	-	-	-	4,899	-
4b.1.2.21	Instrument Air (RCA)	-	73	3	2	22	96	-	46	242	242	-	-	271	207	-	-	-	29,566	2,251	-
4b.1.2.22	Intermediate Closed Cooling Water (RCA)	-	60	5	6	46	243	-	84	444	444	-	-	568	524	-	-	-	70,092	1,887	-
4b.1.2.23	Main Condensate (RCA)	-	132	5	8	331	51	-	97	624	624	-	-	4,101	149	-	-	-	176,316	4,075	-
4b.1.2.24	Main Reheat & Steam (RCA)	-	39	2	3	52	76	-	37	209	209	-	-	643	164	-	-	-	40,843	1,216	-
4b.1.2.25	Nuclear Services Closed Cycle Cooling	-	546	61	66	1,041	2,226	-	865	4,804	4,804	-	-	12,877	5,304	-	-	-	953,442	17,227	-
4b.1.2.26	Nuclear Services River Water (Clean)	-	51	-	-	-	-	-	8	59	-	-	59	-	-	-	-	-	-	1,764	-
4b.1.2.27	Nuclear Services River Water (RCA)	-	746	29	33	355	1,295	-	571	3,028	3,028	-	-	4,392	2,792	-	-	-	428,769	24,880	-
4b.1.2.28	Reactor Building Normal Cooling (Clean)	-	9	-	-	-	-	-	1	10	-	-	10	-	-	-	-	-	-	298	-
4b.1.2.29	Reactor Building Normal Cooling (RCA)	-	173	13	15	140	629	-	225	1,196	1,196	-	-	1,739	1,356	-	-	-	192,214	5,711	-
4b.1.2.30	Sampling Nuclear System	-	139	6	4	-	226	-	93	468	468	-	-	-	530	-	-	-	43,764	4,528	-
4b.1.2.31	Sewage Treatment Plant (Clean)	-	5	-	-	-	-	-	1	6	-	-	6	-	-	-	-	-	-	180	-
4b.1.2.32	Sewage Treatment Plant (RCA)	-	3	-	-	3	1	-	1	8	8	-	-	35	3	-	-	-	1,651	82	-
4b.1.2.33	Spent Fuel Cooling	-	248	9	9	36	421	-	175	898	898	-	-	452	907	-	-	-	99,713	8,156	-
4b.1.2.34	Station Service Air	-	142	3	3	11	122	-	68	350	350	-	-	139	263	-	-	-	29,187	4,806	-
4b.1.2.35	Sump Systems (RCA)	-	83	2	2	13	70	-	41	211	211	-	-	161	152	-	-	-	20,117	2,753	-
4b.1.2.36	Turbine Plant Sample (RCA)	-	11	0	0	5	10	-	6	33	33	-	-	61	22	-	-	-	4,489	328	-
4b.1.2	Totals	-	4,592	204	239	3,832	7,975	-	3,736	20,577	20,155	-	422	47,414	17,806	-	-	-	3,468,059	146,231	-
4b.1.3	Scaffolding in support of decommissioning	-	1,470	14	4	140	28	-	398	2,054	2,054	-	-	1,563	97	-	-	-	79,050	53,521	-
Decontamination of Site Buildings																					
4b.1.4.1	Auxiliary	308	355	41	25	26	531	-	387	1,674	1,674	-	-	323	4,989	-	-	-	485,601	19,268	-
4b.1.4.2	BWST & CST Tank Pads	-	70	206	123	-	2,483	-	677	3,559	3,559	-	-	-	24,827	-	-	-	2,482,650	2,976	-
4b.1.4.3	Control & Service	14	4	1	0	0	10	-	11	41	41	-	-	2	97	-	-	-	9,763	566	-
4b.1.4.4	Control Building Area	56	29	5	3	20	56	-	53	221	221	-	-	249	545	-	-	-	64,320	2,530	-
4b.1.4.5	Fuel Handling	432	502	35	23	65	567	-	500	2,124	2,124	-	-	803	3,575	-	-	-	361,010	27,042	-
4b.1.4.6	Turbine	42	1	0	0	-	3	-	22	69	69	-	-	-	25	-	-	-	2,532	1,421	-
4b.1.4	Totals	853	961	288	175	111	3,649	-	1,651	7,688	7,688	-	-	1,377	34,058	-	-	-	3,405,875	53,802	-
4b.1	Subtotal Period 4b Activity Costs	853	7,023	506	418	4,083	11,652	-	5,784	30,318	29,896	-	422	50,354	51,961	-	-	-	6,952,985	253,553	-
Period 4b Additional Costs																					
4b.2.1	Underground Piping & Yard Soil	-	455	1,320	199	-	3,723	250	1,244	7,191	7,191	-	-	-	48,992	-	-	-	3,723,414	9,759	-
4b.2.2	Main Turbine/Generator	-	198	51	12	547	-	-	138	946	946	-	-	6,106	-	-	-	-	274,750	5,956	-

Appendix E
Three Mile Island Unit 2
Hardened SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 4b Additional Costs (continued)																				
4b.2.3	Main Condensers	-	816	49	12	525	-	-	289	1,691	1,691	-	-	5,860	-	-	-	-	263,690	25,162	-
4b.2.4	Auxiliary Building Total Removal	-	6,360	539	103	-	7,522	-	2,904	17,428	17,428	-	-	-	75,217	-	-	-	7,521,660	132,549	-
4b.2.5	Fuel Handling Building Total Removal	-	4,324	395	75	-	5,491	-	2,072	12,358	12,358	-	-	-	54,907	-	-	-	5,490,720	87,034	-
4b.2.6	FHAB AX-004 Room Decontamination	-	115	106	457	-	884	101	344	2,007	2,007	-	-	-	-	2,504	-	-	162,951	5,075	-
4b.2.7	Fuel Handling / Auxiliary SNF & HOT Systems Removal	1,324	1,153	70	203	-	4,443	-	1,849	9,042	9,042	-	-	-	8,864	-	-	40	666,018	72,761	-
4b.2.8	Onsite survey & release of concrete	-	1,217	-	58	117	-	-	183	1,574	1,574	-	-	-	-	-	-	-	-	19,171	-
4b.2.9	Legacy waste stored at INEEL	-	-	-	-	-	-	500	50	550	550	-	-	-	-	-	-	-	-	-	-
4b.2.10	Defueling fuel canister racks	16	14	91	22	-	667	-	191	1,001	1,001	-	-	-	11,628	-	-	-	207,896	1,462	-
4b.2	Subtotal Period 4b Additional Costs	1,340	14,652	2,621	1,142	1,189	22,731	851	9,263	53,788	53,788	-	-	11,965	199,608	2,504	-	40	18,311,100	358,929	-
	Period 4b Collateral Costs																				
4b.3.1	Process liquid waste	19	-	6	35	-	147	-	52	259	259	-	-	-	-	140	-	-	17,616	37	-
4b.3.2	Small tool allowance	-	265	-	-	-	-	-	40	304	304	-	-	-	-	-	-	-	-	-	-
4b.3.3	Decommissioning Equipment Disposition	-	-	53	18	537	108	-	116	832	832	-	-	6,000	373	-	-	-	303,507	739	-
4b.3	Subtotal Period 4b Collateral Costs	19	265	59	53	537	255	-	207	1,395	1,395	-	-	6,000	373	140	-	-	321,122	776	-
	Period 4b Period-Dependent Costs																				
4b.4.1	Decon supplies	535	-	-	-	-	-	-	134	668	668	-	-	-	-	-	-	-	-	-	-
4b.4.2	Insurance	-	-	-	-	-	-	1,715	171	1,886	1,886	-	-	-	-	-	-	-	-	-	-
4b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4b.4.4	Health physics supplies	-	4,260	-	-	-	-	-	1,065	5,326	5,326	-	-	-	-	-	-	-	-	-	-
4b.4.5	Heavy equipment rental	-	3,530	-	-	-	-	-	530	4,060	4,060	-	-	-	-	-	-	-	-	-	-
4b.4.6	Disposal of DAW generated	-	-	45	9	-	170	-	48	272	272	-	-	-	4,276	-	-	-	85,697	1,050	-
4b.4.7	Plant energy budget	-	-	-	-	-	-	1,111	167	1,278	1,278	-	-	-	-	-	-	-	-	-	-
4b.4.8	NRC Fees	-	-	-	-	-	-	479	48	527	527	-	-	-	-	-	-	-	-	-	-
4b.4.9	Site O&M Cost	-	-	-	-	-	-	639	96	735	735	-	-	-	-	-	-	-	-	-	-
4b.4.10	Radwaste Processing Equipment/Services	-	-	-	-	-	-	921	138	1,059	1,059	-	-	-	-	-	-	-	-	-	-
4b.4.11	Security Staff Cost	-	-	-	-	-	-	1,256	188	1,444	1,444	-	-	-	-	-	-	-	-	-	74,720
4b.4.12	DOC Staff Cost	-	-	-	-	-	-	38,322	5,748	44,070	44,070	-	-	-	-	-	-	-	-	-	625,780
4b.4.13	Utility Staff Cost	-	-	-	-	-	-	5,869	880	6,750	6,750	-	-	-	-	-	-	-	-	-	62,231
4b.4	Subtotal Period 4b Period-Dependent Costs	535	7,791	45	9	-	170	50,312	9,214	68,075	68,075	-	-	-	4,276	-	-	-	85,697	1,050	762,731
4b.0	TOTAL PERIOD 4b COST	2,746	29,730	3,231	1,621	5,809	34,807	51,163	24,468	153,575	153,154	-	422	68,319	256,219	2,644	-	40	25,670,900	614,308	762,731
	PERIOD 4e - Interim Site Release (excludes Reactor Building)																				
	Period 4e Direct Decommissioning Activities																				
4e.1.1	ORISE confirmatory survey	-	-	-	-	-	-	116	35	150	150	-	-	-	-	-	-	-	-	-	-
4e.1.2	Terminate license									a											
4e.1	Subtotal Period 4e Activity Costs	-	-	-	-	-	-	116	35	150	150	-	-	-	-	-	-	-	-	-	-
	Period 4e Additional Costs																				
4e.2.1	License Termination Survey	-	-	-	-	-	-	4,001	1,200	5,202	5,202	-	-	-	-	-	-	-	-	111,562	-
4e.2	Subtotal Period 4e Additional Costs	-	-	-	-	-	-	4,001	1,200	5,202	5,202	-	-	-	-	-	-	-	-	111,562	-
	Period 4e Collateral Costs																				
4e.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,046	157	1,203	1,203	-	-	-	-	-	-	-	-	-	-
4e.3	Subtotal Period 4e Collateral Costs	-	-	-	-	-	-	1,046	157	1,203	1,203	-	-	-	-	-	-	-	-	-	-
	Period 4e Period-Dependent Costs																				
4e.4.1	Insurance	-	-	-	-	-	-	195	19	214	214	-	-	-	-	-	-	-	-	-	-
4e.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4e.4.3	Health physics supplies	-	888	-	-	-	-	-	222	1,110	1,110	-	-	-	-	-	-	-	-	-	-
4e.4.4	Disposal of DAW generated	-	-	3	1	-	12	-	3	19	19	-	-	-	306	-	-	-	6,127	75	-
4e.4.5	Plant energy budget	-	-	-	-	-	-	117	18	135	135	-	-	-	-	-	-	-	-	-	-
4e.4.6	NRC Fees	-	-	-	-	-	-	141	14	156	156	-	-	-	-	-	-	-	-	-	-
4e.4.7	Site O&M Cost	-	-	-	-	-	-	189	28	217	217	-	-	-	-	-	-	-	-	-	-
4e.4.8	Security Staff Cost	-	-	-	-	-	-	100	15	116	116	-	-	-	-	-	-	-	-	-	5,977

Appendix E
Three Mile Island Unit 2
Hardened SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 4e Period-Dependent Costs (continued)																				
4e.4.9	DOC Staff Cost	-	-	-	-	-	-	3,553	533	4,086	4,086	-	-	-	-	-	-	-	-	-	52,787
4e.4.10	Utility Staff Cost	-	-	-	-	-	-	1,278	192	1,470	1,470	-	-	-	-	-	-	-	-	-	12,617
4e.4	Subtotal Period 4e Period-Dependent Costs	-	888	3	1	-	12	5,574	1,045	7,523	7,523	-	-	-	306	-	-	-	6,127	75	71,381
4e.0	TOTAL PERIOD 4e COST	-	888	3	1	-	12	10,737	2,437	14,078	14,078	-	-	-	306	-	-	-	6,127	111,637	71,381
	PERIOD 4 TOTALS	2,746	30,618	3,234	1,622	5,809	34,819	61,900	26,905	167,654	167,232	-	422	68,319	256,525	2,644	-	40	25,677,030	725,946	834,113
	PERIOD 5b - Site Restoration (excludes Reactor Building)																				
	Period 5b Direct Decommissioning Activities																				
	Demolition of Remaining Site Buildings																				
5b.1.1.1	Air Intake Tunnel	-	100	-	-	-	-	-	15	115	-	-	115	-	-	-	-	-	-	2,757	-
5b.1.1.2	Circulating Water Chlorinator	-	37	-	-	-	-	-	6	43	-	-	43	-	-	-	-	-	-	950	-
5b.1.1.3	Circulating Water Intake Flume	-	30	-	-	-	-	-	5	35	-	-	35	-	-	-	-	-	-	736	-
5b.1.1.4	Circulating Water Pumphouse	-	118	-	-	-	-	-	18	136	-	-	136	-	-	-	-	-	-	3,112	-
5b.1.1.5	Coagulator	-	39	-	-	-	-	-	6	45	-	-	45	-	-	-	-	-	-	955	-
5b.1.1.6	Control & Service	-	2,317	-	-	-	-	-	348	2,664	133	-	2,531	-	-	-	-	-	-	46,913	-
5b.1.1.7	Control Building Area	-	618	-	-	-	-	-	93	710	-	-	710	-	-	-	-	-	-	11,471	-
5b.1.1.8	Cooling Towers	-	522	-	-	-	-	-	78	600	-	-	600	-	-	-	-	-	-	11,550	-
5b.1.1.9	Emergency Diesel Generator	-	880	-	-	-	-	-	132	1,011	-	-	1,011	-	-	-	-	-	-	16,744	-
5b.1.1.10	Main & Aux Transformer Foundations	-	66	-	-	-	-	-	10	75	-	-	75	-	-	-	-	-	-	1,387	-
5b.1.1.11	Mechanical Draft Cooling Towers	-	52	-	-	-	-	-	8	60	-	-	60	-	-	-	-	-	-	997	-
5b.1.1.12	Miscellaneous Yard Foundations	-	8	-	-	-	-	-	1	9	-	-	9	-	-	-	-	-	-	210	-
5b.1.1.13	River Water Pumphouse	-	1,235	-	-	-	-	-	185	1,420	-	-	1,420	-	-	-	-	-	-	21,553	-
5b.1.1.14	Turbine	-	1,212	-	-	-	-	-	182	1,393	-	-	1,393	-	-	-	-	-	-	35,605	-
5b.1.1.15	Turbine Generator Pedestal	-	493	-	-	-	-	-	74	567	-	-	567	-	-	-	-	-	-	8,458	-
5b.1.1	Totals	-	7,726	-	-	-	-	-	1,159	8,884	133	-	8,751	-	-	-	-	-	-	163,399	-
	Site Closeout Activities																				
5b.1.2	Grade & landscape site	-	105	-	-	-	-	-	16	121	-	-	121	-	-	-	-	-	-	957	-
5b.1.3	Final report to NRC	-	-	-	-	-	-	289	43	332	332	-	-	-	-	-	-	-	-	-	3,120
5b.1	Subtotal Period 5b Activity Costs	-	7,831	-	-	-	-	289	1,218	9,338	465	-	8,872	-	-	-	-	-	-	164,356	3,120
	Period 5b Additional Costs																				
5b.2.1	River Water Pump House Cofferdam	-	144	-	-	-	-	-	22	166	-	-	166	-	-	-	-	-	-	2,116	-
5b.2.2	Concrete Processing	-	221	-	4	-	-	-	34	259	-	-	259	-	-	-	-	-	-	1,785	-
5b.2.3	Survey & Release of scrap materials	-	-	230	13	-	-	425	89	756	756	-	-	-	-	-	-	-	850,136	1,700	-
5b.2.4	RB fencing and security system	-	-	-	-	-	-	2,400	360	2,760	2,760	-	-	-	-	-	-	-	-	-	-
5b.2.5	Backfill site (excluding RB)	-	357	-	-	-	-	-	54	410	-	-	410	-	-	-	-	-	-	4,643	-
5b.2	Subtotal Period 5b Additional Costs	-	722	230	17	-	-	2,825	558	4,351	3,516	-	835	-	-	-	-	-	850,136	10,244	-
	Period 5b Collateral Costs																				
5b.3.1	Small tool allowance	-	75	-	-	-	-	-	11	86	-	-	86	-	-	-	-	-	-	-	-
5b.3	Subtotal Period 5b Collateral Costs	-	75	-	-	-	-	-	11	86	-	-	86	-	-	-	-	-	-	-	-
	Period 5b Period-Dependent Costs																				
5b.4.1	Insurance	-	-	-	-	-	-	258	26	283	-	-	283	-	-	-	-	-	-	-	-
5b.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5b.4.3	Heavy equipment rental	-	1,884	-	-	-	-	-	283	2,167	-	-	2,167	-	-	-	-	-	-	-	-
5b.4.4	Plant energy budget	-	-	-	-	-	-	78	12	89	-	-	89	-	-	-	-	-	-	-	-
5b.4.5	Security Staff Cost	-	-	-	-	-	-	105	16	121	-	-	121	-	-	-	-	-	-	-	6,257
5b.4.6	DOC Staff Cost	-	-	-	-	-	-	5,934	890	6,824	-	-	6,824	-	-	-	-	-	-	-	86,995
5b.4.7	Utility Staff Cost	-	-	-	-	-	-	1,225	184	1,409	-	-	1,409	-	-	-	-	-	-	-	13,557
5b.4	Subtotal Period 5b Period-Dependent Costs	-	1,884	-	-	-	-	7,599	1,410	10,893	-	-	10,893	-	-	-	-	-	-	-	106,809
5b.0	TOTAL PERIOD 5b COST	-	10,512	230	17	-	-	10,713	3,196	24,668	3,981	-	20,686	-	-	-	-	-	850,136	174,600	109,929

Appendix E
Three Mile Island Unit 2
Hardened SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
PERIOD 5 TOTALS		-	10,512	230	17	-	-	10,713	3,196	24,668	3,981	-	20,686	-	-	-	-	-	850,136	174,600	109,929
PERIOD 6c - Hardened SAFSTOR Dormancy																					
Period 6c Direct Decommissioning Activities																					
6c.1.1	Quarterly Inspection									a											
6c.1.2	Semi-annual environmental survey									a											
6c.1.3	Prepare reports									a											
6c.1.4	Bituminous roof replacement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c.1.5	Maintenance supplies	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c.1	Subtotal Period 6c Activity Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Period 6c Collateral Costs																					
6c.3.1	Offsite Monitoring & Security Services	-	-	-	-	-	-	39,970	5,995	45,965	45,965	-	-	-	-	-	-	-	-	-	-
6c.3	Subtotal Period 6c Collateral Costs	-	-	-	-	-	-	39,970	5,995	45,965	45,965	-	-	-	-	-	-	-	-	-	-
Period 6c Period-Dependent Costs																					
6c.4.1	Insurance	-	-	-	-	-	-	20,599	2,060	22,659	22,659	-	-	-	-	-	-	-	-	-	-
6c.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c.4.3	Plant energy budget	-	-	-	-	-	-	799	120	919	919	-	-	-	-	-	-	-	-	-	-
6c.4.4	NRC Fees	-	-	-	-	-	-	1,247	125	1,372	1,372	-	-	-	-	-	-	-	-	-	-
6c.4.5	Utility Staff Cost	-	-	-	-	-	-	16,759	2,514	19,273	19,273	-	-	-	-	-	-	-	-	-	166,840
6c.4	Subtotal Period 6c Period-Dependent Costs	-	-	-	-	-	-	39,404	4,818	44,223	44,223	-	-	-	-	-	-	-	-	-	166,840
6c.0	TOTAL PERIOD 6c COST	-	-	-	-	-	-	79,374	10,814	90,188	90,188	-	-	-	-	-	-	-	-	-	166,840
PERIOD 6 TOTALS		-	-	-	-	-	-	79,374	10,814	90,188	90,188	-	-	-	-	-	-	-	-	-	166,840
PERIOD 7a - Reactivate Site Following Hardened SAFSTOR Dormancy																					
Period 7a Direct Decommissioning Activities																					
7a.1.1	Prepare preliminary decommissioning cost	-	-	-	-	-	-	180	27	208	208	-	-	-	-	-	-	-	-	-	1,950
7a.1.2	Prepare and submit PSDAR	-	-	-	-	-	-	740	111	851	851	-	-	-	-	-	-	-	-	-	8,000
7a.1.3	Review plant dwgs & specs.	-	-	-	-	-	-	426	64	490	490	-	-	-	-	-	-	-	-	-	4,600
7a.1.4	Perform detailed rad survey									a											
7a.1.5	Estimate by-product inventory	-	-	-	-	-	-	185	28	213	213	-	-	-	-	-	-	-	-	-	2,000
7a.1.6	End product description	-	-	-	-	-	-	185	28	213	213	-	-	-	-	-	-	-	-	-	2,000
7a.1.7	Detailed by-product inventory	-	-	-	-	-	-	241	36	277	277	-	-	-	-	-	-	-	-	-	2,600
7a.1.8	Define major work sequence	-	-	-	-	-	-	694	104	798	798	-	-	-	-	-	-	-	-	-	7,500
7a.1.9	Perform SER and EA	-	-	-	-	-	-	5,775	866	6,641	6,641	-	-	-	-	-	-	-	-	-	62,400
7a.1.10	Perform Site-Specific Cost Study	-	-	-	-	-	-	463	69	532	532	-	-	-	-	-	-	-	-	-	5,000
7a.1.11	Prepare/submit License Termination Plan	-	-	-	-	-	-	1,137	171	1,308	1,308	-	-	-	-	-	-	-	-	-	12,288
7a.1.12	Receive NRC approval of termination plan									a											
Activity Specifications																					
7a.1.13.1	Re-activate plant & temporary facilities	-	-	-	-	-	-	1,023	153	1,177	1,059	-	118	-	-	-	-	-	-	-	11,055
7a.1.13.2	Reactor internals	-	-	-	-	-	-	1,314	197	1,511	1,511	-	-	-	-	-	-	-	-	-	14,200
7a.1.13.3	Reactor vessel	-	-	-	-	-	-	902	135	1,038	1,038	-	-	-	-	-	-	-	-	-	9,750
7a.1.13.4	Biological shield	-	-	-	-	-	-	46	7	53	53	-	-	-	-	-	-	-	-	-	500
7a.1.13.5	Steam generators	-	-	-	-	-	-	1,155	173	1,328	1,328	-	-	-	-	-	-	-	-	-	12,480
7a.1.13.6	Reinforced concrete	-	-	-	-	-	-	296	44	341	170	-	170	-	-	-	-	-	-	-	3,200
7a.1.13.7	Waste management	-	-	-	-	-	-	1,703	255	1,958	1,958	-	-	-	-	-	-	-	-	-	18,400
7a.1.13.8	Facility & site closeout	-	-	-	-	-	-	83	12	96	48	-	48	-	-	-	-	-	-	-	900
7a.1.13	Total	-	-	-	-	-	-	6,523	979	7,502	7,166	-	336	-	-	-	-	-	-	-	70,485
Planning & Site Preparations																					
7a.1.14	Prepare dismantling sequence	-	-	-	-	-	-	444	67	511	511	-	-	-	-	-	-	-	-	-	4,800
7a.1.15	Plant prep. & temp. svces	-	-	-	-	-	-	2,419	363	2,782	2,782	-	-	-	-	-	-	-	-	-	-

Appendix E
Three Mile Island Unit 2
Hardened SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
7a.1.16	Design water clean-up system	-	-	-	-	-	-	518	78	596	596	-	-	-	-	-	-	-	-	-	5,600
7a.1.17	Rigging/Cont. Cntrl Envlps/tooling/etc.	-	-	-	-	-	-	2,048	307	2,355	2,355	-	-	-	-	-	-	-	-	-	-
7a.1.18	Procure casks/liners & containers	-	-	-	-	-	-	228	34	262	262	-	-	-	-	-	-	-	-	-	2,460
7a.1	Subtotal Period 7a Activity Costs	-	-	-	-	-	-	22,207	3,331	25,538	25,202	-	336	-	-	-	-	-	-	-	191,683
	Period 7a Additional Costs																				
7a.2.1	Railroad Track Refurbishment	-	-	-	-	-	-	250	38	288	288	-	-	-	-	-	-	-	-	-	-
7a.2.2	Equipment Airlock Refurbishment	-	-	-	-	-	-	1,000	150	1,150	1,150	-	-	-	-	-	-	-	-	-	-
7a.2.3	RB Polar Crane Refurbishment	-	-	-	-	-	-	5,000	750	5,750	5,750	-	-	-	-	-	-	-	-	-	-
7a.2.4	RB Cask Handling System	-	-	-	-	-	-	1,000	150	1,150	1,150	-	-	-	-	-	-	-	-	-	-
7a.2	Subtotal Period 7a Additional Costs	-	-	-	-	-	-	7,250	1,088	8,338	8,338	-	-	-	-	-	-	-	-	-	-
	Period 7a Period-Dependent Costs																				
7a.4.1	Insurance	-	-	-	-	-	-	258	26	283	283	-	-	-	-	-	-	-	-	-	-
7a.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7a.4.3	Health physics supplies	-	389	-	-	-	-	-	97	486	486	-	-	-	-	-	-	-	-	-	-
7a.4.4	Heavy equipment rental	-	254	-	-	-	-	-	38	292	292	-	-	-	-	-	-	-	-	-	-
7a.4.5	Disposal of DAW generated	-	-	4	1	-	16	-	5	26	26	-	-	-	404	-	-	-	8,103	99	-
7a.4.6	Plant energy budget	-	-	-	-	-	-	582	87	669	669	-	-	-	-	-	-	-	-	-	-
7a.4.7	NRC Fees	-	-	-	-	-	-	586	59	645	645	-	-	-	-	-	-	-	-	-	-
7a.4.8	Site O&M Cost	-	-	-	-	-	-	125	19	144	144	-	-	-	-	-	-	-	-	-	-
7a.4.9	Security Staff Cost	-	-	-	-	-	-	208	31	239	239	-	-	-	-	-	-	-	-	-	12,368
7a.4.10	DOC Staff Cost	-	-	-	-	-	-	8,638	1,296	9,934	9,934	-	-	-	-	-	-	-	-	-	160,600
7a.4.11	Utility Staff Cost	-	-	-	-	-	-	2,242	336	2,579	2,579	-	-	-	-	-	-	-	-	-	23,777
7a.4	Subtotal Period 7a Period-Dependent Costs	-	642	4	1	-	16	12,638	1,993	15,295	15,295	-	-	-	404	-	-	-	8,103	99	196,745
7a.0	TOTAL PERIOD 7a COST	-	642	4	1	-	16	42,096	6,412	49,171	48,835	-	336	-	404	-	-	-	8,103	99	388,428
	PERIOD 7b - Decommissioning Preparations																				
	Period 7b Direct Decommissioning Activities																				
	Detailed Work Procedures																				
7b.1.1.1	Reactor internals	-	-	-	-	-	-	463	69	532	532	-	-	-	-	-	-	-	-	-	5,000
7b.1.1.2	CRD cooling assembly	-	-	-	-	-	-	139	21	160	160	-	-	-	-	-	-	-	-	-	1,500
7b.1.1.3	Reactor vessel	-	-	-	-	-	-	504	76	580	580	-	-	-	-	-	-	-	-	-	5,445
7b.1.1.4	Facility closeout	-	-	-	-	-	-	111	17	128	64	-	64	-	-	-	-	-	-	-	1,200
7b.1.1.5	Missile shields	-	-	-	-	-	-	42	6	48	48	-	-	-	-	-	-	-	-	-	450
7b.1.1.6	Biological shield	-	-	-	-	-	-	111	17	128	128	-	-	-	-	-	-	-	-	-	1,200
7b.1.1.7	Steam generators	-	-	-	-	-	-	1,703	255	1,958	1,958	-	-	-	-	-	-	-	-	-	18,400
7b.1.1.8	Reinforced concrete	-	-	-	-	-	-	185	28	213	106	-	106	-	-	-	-	-	-	-	2,000
7b.1.1.9	Reactor building	-	-	-	-	-	-	505	76	581	523	-	58	-	-	-	-	-	-	-	5,460
7b.1.1	Total	-	-	-	-	-	-	3,763	564	4,327	4,099	-	228	-	-	-	-	-	-	-	40,655
7b.1	Subtotal Period 7b Activity Costs	-	-	-	-	-	-	3,763	564	4,327	4,099	-	228	-	-	-	-	-	-	-	40,655
	Period 7b Additional Costs																				
7b.2.1	RB Defueling Equipment Disposition	-	215	22	28	-	786	-	257	1,307	1,307	-	-	-	2,577	-	-	-	245,011	6,870	-
7b.2	Subtotal Period 7b Additional Costs	-	215	22	28	-	786	-	257	1,307	1,307	-	-	-	2,577	-	-	-	245,011	6,870	-
	Period 7b Collateral Costs																				
7b.3.1	Decon equipment	553	-	-	-	-	-	-	83	636	636	-	-	-	-	-	-	-	-	-	-
7b.3.2	DOC staff relocation expenses	-	-	-	-	-	-	1,046	157	1,203	1,203	-	-	-	-	-	-	-	-	-	-
7b.3.3	Small tool allowance	-	3	-	-	-	-	-	0	3	3	-	-	-	-	-	-	-	-	-	-
7b.3.4	Pipe cutting equipment	-	957	-	-	-	-	-	143	1,100	1,100	-	-	-	-	-	-	-	-	-	-
7b.3	Subtotal Period 7b Collateral Costs	553	960	-	-	-	-	1,046	384	2,942	2,942	-	-	-	-	-	-	-	-	-	-

Appendix E
Three Mile Island Unit 2
Hardened SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 7b Period-Dependent Costs																				
7b.4.1	Decon supplies	17	-	-	-	-	-	-	4	21	21	-	-	-	-	-	-	-	-	-	-
7b.4.2	Insurance	-	-	-	-	-	-	340	34	374	374	-	-	-	-	-	-	-	-	-	-
7b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7b.4.4	Health physics supplies	-	234	-	-	-	-	-	58	292	292	-	-	-	-	-	-	-	-	-	-
7b.4.5	Heavy equipment rental	-	129	-	-	-	-	-	19	148	148	-	-	-	-	-	-	-	-	-	-
7b.4.6	Disposal of DAW generated	-	-	2	0	-	8	-	2	13	13	-	-	-	205	-	-	-	4,107	50	-
7b.4.7	Plant energy budget	-	-	-	-	-	-	295	44	339	339	-	-	-	-	-	-	-	-	-	-
7b.4.8	NRC Fees	-	-	-	-	-	-	297	30	327	327	-	-	-	-	-	-	-	-	-	-
7b.4.9	Site O&M Cost	-	-	-	-	-	-	63	9	73	73	-	-	-	-	-	-	-	-	-	-
7b.4.10	Security Staff Cost	-	-	-	-	-	-	106	16	121	121	-	-	-	-	-	-	-	-	-	6,279
7b.4.11	DOC Staff Cost	-	-	-	-	-	-	8,538	1,281	9,819	9,819	-	-	-	-	-	-	-	-	-	142,820
7b.4.12	Utility Staff Cost	-	-	-	-	-	-	1,246	187	1,433	1,433	-	-	-	-	-	-	-	-	-	13,214
7b.4	Subtotal Period 7b Period-Dependent Costs	17	362	2	0	-	8	10,885	1,685	12,960	12,960	-	-	-	205	-	-	-	4,107	50	162,314
7b.0	TOTAL PERIOD 7b COST	570	1,536	24	28	-	795	15,694	2,890	21,537	21,308	-	228	-	2,782	-	-	-	249,118	6,920	202,969
	PERIOD 7 TOTALS	570	2,179	28	29	-	811	57,789	9,302	70,707	70,143	-	564	-	3,186	-	-	-	257,221	7,020	591,397
	PERIOD 8a - Large Component Removal																				
	Period 8a Direct Decommissioning Activities																				
	Nuclear Steam Supply System Removal																				
8a.1.1.1	Reactor Coolant Piping	40	160	9	7	137	129	-	115	596	596	-	-	822	274	-	-	-	93,724	6,773	-
8a.1.1.2	Pressurizer Relief Tank	5	23	2	1	37	11	-	17	96	96	-	-	169	19	-	-	-	20,849	732	-
8a.1.1.3	Reactor Coolant Pumps & Motors	-	846	649	149	-	6,818	-	2,003	10,466	10,466	-	-	-	10,761	-	-	-	1,105,267	31,433	-
8a.1.1.4	Pressurizer	-	1,226	842	172	-	1,860	-	881	4,981	4,981	-	-	-	3,456	-	-	-	497,982	4,082	-
8a.1.1.5	Steam Generators	-	3,084	546	1,213	-	12,750	-	4,195	21,788	21,788	-	-	-	25,098	6,883	-	-	2,386,205	98,461	-
8a.1.1.6	CRDMs/ICIs/Service Structure Removal	22	36	72	17	-	247	-	92	486	486	-	-	-	1,454	-	-	-	47,869	1,830	-
8a.1.1.7	Reactor Vessel Internals	32	2,956	4,185	98	-	765	223	3,719	11,977	11,977	-	-	-	1,740	-	-	-	177,455	29,697	1,417
8a.1.1.8	Vessel & Internals GTCC Disposal	-	-	-	-	-	20,777	-	3,117	23,893	23,893	-	-	-	-	-	-	831	142,496	-	-
8a.1.1.9	Reactor Vessel	-	7,566	1,125	288	-	4,273	223	8,197	21,671	21,671	-	-	-	9,722	-	-	-	986,490	29,697	1,417
8a.1.1	Totals	99	15,897	7,428	1,944	174	47,630	445	22,336	95,955	95,955	-	-	991	52,524	6,883	-	831	5,458,337	202,704	2,833
8a.1.2	Scaffolding in support of decommissioning	-	226	2	0	16	3	-	60	307	307	-	-	179	11	-	-	-	9,038	8,230	-
8a.1	Subtotal Period 8a Activity Costs	99	16,123	7,430	1,945	190	47,633	445	22,396	96,261	96,261	-	-	1,170	52,535	6,883	-	831	5,467,375	210,933	2,833
	Period 8a Additional Costs																				
8a.2.1	Reactor Building Basement Dose Reduction	-	110	353	2,053	-	10,880	-	3,091	16,488	16,488	-	-	-	-	7,380	2,017	-	1,173,681	42,364	-
8a.2.2	Reactor Building Basement Liner Removal	-	80	77	194	-	943	-	293	1,586	1,586	-	-	-	-	1,502	-	-	115,368	2,286	-
8a.2.3	Reactor Building SNF & HOT Systems Removal	-	-	41	186	-	555	-	171	952	952	-	-	-	-	1,002	-	-	76,912	250	-
8a.2.4	NSSS Component Surface Decontamination	11,775	-	1,200	50	-	9,525	-	5,887	28,438	28,438	-	-	-	-	-	-	381	22,861	46,920	-
8a.2.5	Core Flood Tanks Removal	45	300	35	42	-	642	-	268	1,332	1,332	-	-	-	1,716	-	-	-	124,165	10,059	-
8a.2	Subtotal Period 8a Additional Costs	11,820	491	1,705	2,525	-	22,546	-	9,709	48,796	48,796	-	-	-	1,716	9,884	2,017	381	1,512,987	101,879	-
	Period 8a Collateral Costs																				
8a.3.1	Process liquid waste	1	-	2	8	-	78	-	22	111	111	-	-	-	-	33	-	-	4,221	48	-
8a.3.2	Small tool allowance	-	132	-	-	-	-	-	20	151	136	-	15	-	-	-	-	-	-	-	-
8a.3	Subtotal Period 8a Collateral Costs	1	132	2	8	-	78	-	41	263	247	-	15	-	-	33	-	-	4,221	48	-
	Period 8a Period-Dependent Costs																				
8a.4.1	Decon supplies	177	-	-	-	-	-	-	44	221	221	-	-	-	-	-	-	-	-	-	-
8a.4.2	Insurance	-	-	-	-	-	-	3,499	350	3,849	3,849	-	-	-	-	-	-	-	-	-	-
8a.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8a.4.4	Health physics supplies	-	3,696	-	-	-	-	-	924	4,620	4,620	-	-	-	-	-	-	-	-	-	-
8a.4.5	Heavy equipment rental	-	7,711	-	-	-	-	-	1,157	8,868	8,868	-	-	-	-	-	-	-	-	-	-
8a.4.6	Disposal of DAW generated	-	-	55	11	-	208	-	59	332	332	-	-	-	5,219	-	-	-	104,582	1,281	-

Appendix E
Three Mile Island Unit 2
Hardened SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Class B Cu. Feet	Class C Cu. Feet	GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 8a Period-Dependent Costs (continued)																				
8a.4.7	Plant energy budget	-	-	-	-	-	-	3,037	456	3,493	3,493	-	-	-	-	-	-	-	-	-	-
8a.4.8	NRC Fees	-	-	-	-	-	-	1,465	147	1,612	1,612	-	-	-	-	-	-	-	-	-	-
8a.4.9	Site O&M Cost	-	-	-	-	-	-	652	98	750	750	-	-	-	-	-	-	-	-	-	-
8a.4.10	Radwaste Processing Equipment/Services	-	-	-	-	-	-	1,879	282	2,160	2,160	-	-	-	-	-	-	-	-	-	-
8a.4.11	Security Staff Cost	-	-	-	-	-	-	2,747	412	3,159	3,159	-	-	-	-	-	-	-	-	-	163,371
8a.4.12	DOC Staff Cost	-	-	-	-	-	-	100,393	15,059	115,452	115,452	-	-	-	-	-	-	-	-	-	1,716,489
8a.4.13	Utility Staff Cost	-	-	-	-	-	-	12,839	1,926	14,765	14,765	-	-	-	-	-	-	-	-	-	136,143
8a.4	Subtotal Period 8a Period-Dependent Costs	177	11,407	55	11	-	208	126,511	20,912	159,280	159,280	-	-	-	5,219	-	-	-	104,582	1,281	2,016,003
8a.0	TOTAL PERIOD 8a COST	12,097	28,152	9,192	4,489	190	70,464	126,957	53,059	304,600	304,585	-	15	1,170	59,470	16,800	2,017	1,212	7,089,165	314,142	2,018,837
	PERIOD 8b - Site Decontamination (Reactor Building)																				
	Period 8b Direct Decommissioning Activities																				
	Disposal of Plant Systems																				
8b.1.1.1	Decay Heat Removal (RB)	-	150	11	10	-	514	-	168	853	853	-	-	-	1,108	-	-	-	99,380	4,941	-
8b.1.1.2	Electrical (Contaminated - RB)	-	28	1	1	-	54	-	21	105	105	-	-	-	116	-	-	-	10,435	893	-
8b.1.1.3	Feedwater (RB)	-	24	3	3	-	158	-	46	234	234	-	-	-	341	-	-	-	30,612	804	-
8b.1.1.4	Fire Protection (RB)	-	12	1	1	-	27	-	10	50	50	-	-	-	58	-	-	-	5,171	407	-
8b.1.1.5	Fuel Handling (RB)	-	3	0	0	-	9	-	3	15	15	-	-	-	19	-	-	-	1,669	86	-
8b.1.1.6	Gaseous Waste Disposal System (RB)	-	2	0	-	-	4	-	2	8	8	-	-	-	9	-	-	-	790	76	-
8b.1.1.7	HVAC - Reactor Building	-	637	25	26	-	1,364	-	507	2,559	2,559	-	-	-	2,941	-	-	-	263,784	19,351	-
8b.1.1.8	Instrument Air (RB)	-	17	1	0	-	26	-	11	55	55	-	-	-	55	-	-	-	4,966	545	-
8b.1.1.9	Intermediate Closed Cooling Water (RB)	-	49	3	2	-	122	-	43	220	220	-	-	-	263	-	-	-	23,572	1,604	-
8b.1.1.10	Nitrogen for Nuclear Radwaste Sys (RB)	-	5	0	0	-	23	-	7	36	36	-	-	-	49	-	-	-	4,378	170	-
8b.1.1.11	Nuclear Services River Water (RB)	-	55	5	5	-	263	-	81	409	409	-	-	-	568	-	-	-	50,919	1,826	-
8b.1.1.12	OTSG Chemical Cleaning System	-	11	1	1	-	32	-	11	56	56	-	-	-	70	-	-	-	6,260	372	-
8b.1.1.13	SG Secondary Side Vents & Drains	-	43	2	1	-	71	-	29	147	147	-	-	-	154	-	-	-	13,769	1,413	-
8b.1.1.14	Spent Fuel Cooling (RB)	-	15	1	1	-	36	-	13	65	65	-	-	-	77	-	-	-	6,934	482	-
8b.1.1.15	Sump Systems (RB)	-	22	1	1	-	50	-	18	93	93	-	-	-	108	-	-	-	9,645	744	-
8b.1.1	Totals	-	1,075	55	52	-	2,752	-	970	4,904	4,904	-	-	-	5,935	-	-	-	532,284	33,713	-
8b.1.2	Scaffolding in support of decommissioning	-	112	2	1	24	5	-	33	177	177	-	-	268	17	-	-	-	13,557	4,090	-
	Decontamination of Site Buildings																				
8b.1.3.1	Reactor	6,361	3,227	569	371	-	12,090	-	7,122	29,739	29,739	-	-	-	42,223	-	-	-	3,766,363	277,801	-
8b.1.3	Totals	6,361	3,227	569	371	-	12,090	-	7,122	29,739	29,739	-	-	-	42,223	-	-	-	3,766,363	277,801	-
8b.1	Subtotal Period 8b Activity Costs	6,361	4,414	626	424	24	14,847	-	8,125	34,820	34,820	-	-	268	48,175	-	-	-	4,312,204	315,603	-
	Period 8b Additional Costs																				
8b.2.1	Bioshield & D-Ring Removal	-	3,767	982	186	-	15,491	-	4,941	25,367	25,367	-	-	-	137,100	-	-	-	15,491,430	62,557	-
8b.2.2	RB Exterior Concrete & Basemat Removal	-	2,816	305	58	-	4,251	-	1,524	8,954	8,954	-	-	-	42,506	-	-	-	4,250,566	49,359	-
8b.2.3	Process NSSS decon & segmentation liquid inventory	-	-	65	222	-	3,471	555	991	5,304	5,304	-	-	-	-	-	1,347	-	158,780	-	779
8b.2.4	Onsite survey & release of concrete	-	397	-	568	1,170	-	-	60	2,195	2,195	-	-	-	-	-	-	-	-	6,244	-
8b.2	Subtotal Period 8b Additional Costs	-	6,980	1,352	1,035	1,170	23,213	555	7,515	41,820	41,820	-	-	-	179,606	-	1,347	-	19,900,780	118,160	779
	Period 8b Collateral Costs																				
8b.3.1	Process liquid waste	3	-	3	18	-	104	-	30	158	158	-	-	-	-	73	-	-	9,263	19	-
8b.3.2	Small tool allowance	-	166	-	-	-	-	-	25	190	190	-	-	-	-	-	-	-	-	-	-
8b.3.3	Decommissioning Equipment Disposition	-	-	53	18	537	108	-	116	832	832	-	-	6,000	373	-	-	-	303,507	739	-
8b.3	Subtotal Period 8b Collateral Costs	3	166	56	36	537	211	-	171	1,180	1,180	-	-	6,000	373	73	-	-	312,770	759	-
	Period 8b Period-Dependent Costs																				
8b.4.1	Decon supplies	288	-	-	-	-	-	-	72	360	360	-	-	-	-	-	-	-	-	-	-
8b.4.2	Insurance	-	-	-	-	-	-	2,343	234	2,577	2,577	-	-	-	-	-	-	-	-	-	-
8b.4.3	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix E
Three Mile Island Unit 2
Hardened SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
Period 8b Period-Dependent Costs (continued)																					
8b.4.4	Health physics supplies	-	3,673	-	-	-	-	-	918	4,591	4,591	-	-	-	-	-	-	-	-	-	-
8b.4.5	Heavy equipment rental	-	4,823	-	-	-	-	-	723	5,546	5,546	-	-	-	-	-	-	-	-	-	-
8b.4.6	Disposal of DAW generated	-	-	44	9	-	168	-	48	269	269	-	-	-	4,217	-	-	-	84,505	1,035	-
8b.4.7	Plant energy budget	-	-	-	-	-	-	1,518	228	1,746	1,746	-	-	-	-	-	-	-	-	-	-
8b.4.8	NRC Fees	-	-	-	-	-	-	654	65	719	719	-	-	-	-	-	-	-	-	-	-
8b.4.9	Site O&M Cost	-	-	-	-	-	-	437	66	502	502	-	-	-	-	-	-	-	-	-	-
8b.4.10	Radwaste Processing Equipment/Services	-	-	-	-	-	-	1,258	189	1,446	1,446	-	-	-	-	-	-	-	-	-	-
8b.4.11	Security Staff Cost	-	-	-	-	-	-	1,716	257	1,973	1,973	-	-	-	-	-	-	-	-	-	102,080
8b.4.12	DOC Staff Cost	-	-	-	-	-	-	57,454	8,618	66,073	66,073	-	-	-	-	-	-	-	-	-	969,760
8b.4.13	Utility Staff Cost	-	-	-	-	-	-	8,595	1,289	9,884	9,884	-	-	-	-	-	-	-	-	-	91,143
8b.4	Subtotal Period 8b Period-Dependent Costs	288	8,496	44	9	-	168	73,974	12,708	95,687	95,687	-	-	-	4,217	-	-	-	84,505	1,035	1,162,983
8b.0	TOTAL PERIOD 8b COST	6,651	20,056	2,078	1,504	1,732	38,439	74,530	28,519	173,507	173,507	-	-	6,268	232,371	73	1,347	-	24,610,260	435,557	1,163,762
PERIOD 8e - License Termination																					
Period 8e Direct Decommissioning Activities																					
8e.1.1	ORISE confirmatory survey	-	-	-	-	-	-	116	35	150	150	-	-	-	-	-	-	-	-	-	-
8e.1.2	Terminate license									a											
8e.1	Subtotal Period 8e Activity Costs	-	-	-	-	-	-	116	35	150	150	-	-	-	-	-	-	-	-	-	-
Period 8e Additional Costs																					
8e.2.1	License Termination Survey	-	-	-	-	-	-	293	88	382	382	-	-	-	-	-	-	-	-	1,386	-
8e.2	Subtotal Period 8e Additional Costs	-	-	-	-	-	-	293	88	382	382	-	-	-	-	-	-	-	-	1,386	-
Period 8e Collateral Costs																					
8e.3.1	DOC staff relocation expenses	-	-	-	-	-	-	1,046	157	1,203	1,203	-	-	-	-	-	-	-	-	-	-
8e.3	Subtotal Period 8e Collateral Costs	-	-	-	-	-	-	1,046	157	1,203	1,203	-	-	-	-	-	-	-	-	-	-
Period 8e Period-Dependent Costs																					
8e.4.1	Insurance	-	-	-	-	-	-	131	13	144	144	-	-	-	-	-	-	-	-	-	-
8e.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8e.4.3	Health physics supplies	-	204	-	-	-	-	-	51	256	256	-	-	-	-	-	-	-	-	-	-
8e.4.4	Disposal of DAW generated	-	-	2	0	-	8	-	2	13	13	-	-	-	205	-	-	-	4,107	50	-
8e.4.5	Plant energy budget	-	-	-	-	-	-	79	12	90	90	-	-	-	-	-	-	-	-	-	-
8e.4.6	NRC Fees	-	-	-	-	-	-	95	9	104	104	-	-	-	-	-	-	-	-	-	-
8e.4.7	Site O&M Cost	-	-	-	-	-	-	63	9	73	73	-	-	-	-	-	-	-	-	-	-
8e.4.8	Security Staff Cost	-	-	-	-	-	-	36	5	41	41	-	-	-	-	-	-	-	-	-	2,114
8e.4.9	DOC Staff Cost	-	-	-	-	-	-	2,382	357	2,739	2,739	-	-	-	-	-	-	-	-	-	35,383
8e.4.10	Utility Staff Cost	-	-	-	-	-	-	857	129	985	985	-	-	-	-	-	-	-	-	-	8,457
8e.4	Subtotal Period 8e Period-Dependent Costs	-	204	2	0	-	8	3,641	588	4,445	4,445	-	-	-	205	-	-	-	4,107	50	45,954
8e.0	TOTAL PERIOD 8e COST	-	204	2	0	-	8	5,097	868	6,180	6,180	-	-	-	205	-	-	-	4,107	1,436	45,954
PERIOD 8 TOTALS		18,748	48,412	11,272	5,993	1,922	108,911	206,583	82,446	484,287	484,272	-	15	7,438	292,046	16,874	3,364	1,212	31,703,530	751,135	3,228,552
PERIOD 9b - Site Restoration																					
Period 9b Direct Decommissioning Activities																					
Demolition of Remaining Site Buildings																					
9b.1.1	Totals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site Closeout Activities																					
9b.1.2	Grade & landscape site	-	105	-	-	-	-	-	16	121	-	-	121	-	-	-	-	-	-	957	-
9b.1.3	Final report to NRC	-	-	-	-	-	-	289	43	332	332	-	-	-	-	-	-	-	-	-	3,120
9b.1	Subtotal Period 9b Activity Costs	-	105	-	-	-	-	289	59	453	332	-	121	-	-	-	-	-	-	957	3,120

Appendix E
Three Mile Island Unit 2
Hardened SAFSTOR Decommissioning Cost Estimate
(Thousands of 2003 Dollars)

Activity Index	Activity Description	Decon Cost	Removal Cost	Packaging Costs	Transport Costs	Off-Site Processing Costs	LLRW Disposal Costs	Other Costs	Total Contingency	Total Costs	NRC Lic. Term. Costs	Spent Fuel Management Costs	Site Restoration Costs	Processed Volume Cu. Feet	Burial Volumes Class A Cu. Feet	Burial Volumes Class B Cu. Feet	Burial Volumes Class C Cu. Feet	Burial Volumes GTCC Cu. Feet	Burial / Processed Wt., Lbs.	Craft Manhours	Utility and Contractor Manhours
	Period 9b Additional Costs																				
9b.2.1	Backfill site (RB)	-	65	-	-	-	-	-	10	75	-	-	75	-	-	-	-	-	-	911	-
9b.2	Subtotal Period 9b Additional Costs	-	65	-	-	-	-	-	10	75	-	-	75	-	-	-	-	-	-	911	-
	Period 9b Collateral Costs																				
9b.3.1	Small tool allowance	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	-	-
9b.3	Subtotal Period 9b Collateral Costs	-	1	-	-	-	-	-	0	1	-	-	1	-	-	-	-	-	-	-	-
	Period 9b Period-Dependent Costs																				
9b.4.1	Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9b.4.2	Property taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9b.4.3	Heavy equipment rental	-	1,884	-	-	-	-	-	283	2,167	-	-	2,167	-	-	-	-	-	-	-	-
9b.4.4	Plant energy budget	-	-	-	-	-	-	78	12	89	-	-	89	-	-	-	-	-	-	-	-
9b.4.5	Security Staff Cost	-	-	-	-	-	-	70	11	81	-	-	81	-	-	-	-	-	-	-	4,171
9b.4.6	DOC Staff Cost	-	-	-	-	-	-	5,934	890	6,824	-	-	6,824	-	-	-	-	-	-	-	86,995
9b.4.7	Utility Staff Cost	-	-	-	-	-	-	1,225	184	1,409	-	-	1,409	-	-	-	-	-	-	-	13,557
9b.4	Subtotal Period 9b Period-Dependent Costs	-	1,884	-	-	-	-	7,306	1,379	10,569	-	-	10,569	-	-	-	-	-	-	-	104,724
9b.0	TOTAL PERIOD 9b COST	-	2,056	-	-	-	-	7,595	1,448	11,099	332	-	10,767	-	-	-	-	-	-	1,868	107,844
PERIOD 9 TOTALS		-	2,056	-	-	-	-	7,595	1,448	11,099	332	-	10,767	-	-	-	-	-	-	1,868	107,844
TOTAL COST TO DECOMMISSION through Hardened SAFSTOR		22,634	96,505	14,887	7,738	10,552	144,605	472,172	142,331	911,425	877,525	-	33,899	78,268	553,380	19,518	3,364	1,252	59,938,524	1,675,300	5,596,518

TOTAL COST TO DECOMMISSION WITH 18.51 % CONTINGENCY:	$911,425	thousands of 2003 dollars
TOTAL NRC LICENSE TERMINATION COST IS 96.28 % OR	$877,525	thousands of 2003 dollars
NON-NUCLEAR DEMOLITION COST IS 3.72 % OR:	$33,899	thousands of 2003 dollars
TOTAL CLASS A THROUGH CLASS C RADWASTE VOLUME BURIED:	576,262	cubic feet
TOTAL GREATER THAN CLASS C RADWASTE VOLUME GENERATED:	1,252	cubic feet
TOTAL SCRAP METAL REMOVED:	29,694	tons
TOTAL CRAFT LABOR REQUIREMENTS:	1,675,300	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