From:	Henry Kelly
To:	Docket, Hearing
Subject:	[External_Sender] Indian Point Transfer D=NRC-2020-0021-0001
Date:	Friday, February 21, 2020 5:18:04 PM
Attachments:	psdardec19.pdf

Secretary
U.S. Nuclear Regulatory Commission
Washington, DC
20555-0001
ATTN: Rulemaking and Adjudications Staff

D-NRC-2020-0021-0001

To whom it may concern,

My name is Henry Kelly. My wife Corinne and myself live at 6 Mancuso Drive, Ossining New York 10562-2527.
We moved to Ossining in August of 1986.
We live within the ten mile Indian Point Evacuation Zone. Especially since the 9/11 terrorist attack, when a hijacked aircraft flew by the Indian Point reactors on the way to the twin towers, we have been burdened by the constant concern for ourselves and our neighbors of a possible terrorist attack on the Indian Point site. We have also been worried about an accident at the plant leading to a radiological release. Years have passed and luckily, no attack or serious accident has occurred. The plant and the evacuation plan were, and are, part of our lives. Sadly and unfortunately, the evacuation plan is completely untenable, as anyone who lives near the plant knows. If anything happened to cause a radiological release at Indian Point, due to prevailing winds, we would find ourselves in a radioactive plume coming from the plant. When the emergency sirens finally began to work properly, each time they were tested our hearts skipped a beat. Three Mile Island, Chernobyl, and most recently Fukushima Daiichi clearly showed that design errors, human error, and natural disaster can produce deadly accidents. The yearly Westchester County Indian Point Emergency Guide and the siren tests are reminders that a serious disaster is a real, not imagined. possibility. Frankly, if one were to happen, we would consider ourselves trapped and probably helpless to avoid being irradiated. Our neighbors like us live with that background fear.
I commuted to New York City for many years. I often wondered what would happen to the economic and cultural capital of our country if an accident sent a large airborne radiological release down the Hudson River toward Manhattan. Where could people go and how to escape the consequences. What would the aftermath be like?
While there have been issues at Indian Point such as Tritium leaks, shutdowns, small fires, gas releases and equipment failures, thankfully, Entergy has prevented a catastrophe from occurring. Approximately 25 million men women and children inhabit the possible radiological impact areas of an accident. Cleanup would be a long term, painfully slow, and extremely expensive task. Exposure would create a medical nightmare that would go on for generations. Like the nuclear plant at Shoreham on Long Island that was closed, the Indian Point site was, and still is, a poor choice for a nuclear plant location. The population has increased year after year while road systems have remained inadequate to the growing population on a good day. Population immediately around the plant has increased. Each year the plant became more problematic and remained a real threat.
Finally after much public pressure and activism and education, the reactors at Indian Point are due to close. However, unfortunately, the feeling of relief instead has turned now to concern and, sadly, dread in the surrounding communities and throughout the region as Entergy is looking to offload the decommissioning of Indian Point to a limited liability corporation, Holtec Decommissioning International, LLC(HDI,LLC. Holtec is a new player in this growing lucrative nuclear decommissioning business..Alarmingly in their recent PSDAR document of December 19, 2019, attached, Holtec clearly displays that their focus is on cost issues with very little focus at all on risk, contingency and accident avoidance, or public safety. Needless to say if you read the 117 page document you come away very concerned. Any accident has the potential to damage communities from Buchanan to New York City, to

New Jersey and Connecticut. Yet no mention is there of planning for avoidance or response to an accident. Glaringly absent is any statement of their concern for pubic safety and acceptance of their responsibility to plan and cost for it..

There are many documents, maps, and reports circulating about the risks of decommissioning a nuclear plant. The NRC itself in its GEIS

Section 4.3.9.2 of NUREG-586 (Supplement 1) clearly states that "decommissioning increases the risk of accidents since activity is increased, raising accident potential above normal plant operations." When you add that to the history at the site where baffling decisions were made to allow pipelines to be laid to pump high pressure gas through and under and adjacent to the site raising danger of fire and explosion that could result in compromised nuclear waste storage, you realize that the proper focus is missing and that there is a real danger to the public.

How a limited liability corporation could even be considered to do this decommissioning work is stunning. To insure the work is done correctly you need a company that fully realizes, accepts and commits to the financial, safety, and ethical responsibility to fully protect the public during their stewardship.

Responsibility for avoiding accidents and the possible financial impacts and the human costs should be the top priority for the company doing the work to help them plan and train to avoid the problem...They need to cost and plan that into their work. They should be bound to that in any contract.

Holtec in its current PSDAR cost plan has made a disturbing assumption on Page 64 in a footnote and in the text, that DOE is expected to accept nuclear material in 2030... Their costing is based on that assumption which is totally unrealistic. There is now no place for the waste to go. New Mexico does not want it..The Yucca Mountain repository project has been shut down and defunded. Any decommissioning company tasked with the Indian Point work should factor the reality of long term in situ waste storage into their cost plan. The U.S.House of Representatives has a bill, the Stranded Act of 2020 H.R.5608 which needs to be passed for communities to deal with the long term burden that stranded nuclear material will face them with. Holtec in their proposal also ignores the fact that the Indian Point site is contaminated by radiological leakages ongoing over many years. There is no mention by Entergy, Holtec,or even the NRC of any clean up of this contamination as part of decommissioning. New York State has a petition for leave to intervene that includes documents showing Tritium and Strontium 90 plumes underground. Holtec only mentions soil down to three feet around the structures at the site in its decommissioning statements.

There are also now concerns about nuclear waste storage. Cask types and their ability to safely store waste over longer periods of time and even susceptibility to issues with eventual movement are coming up...The feeling is growing that Entergy and perhaps the NRC itself are in too much of a hurry to unload this "hot potato" to whoever will do the work with not enough questions asked...There are many companies that could do the work.

Citizen and community groups and local governments across the country are dealing with issues and after effects of plant decommissioning. The San Onofre plant decommissioning being done in part by Holtec and its subsidiaries is having issues. It appears that communities are left holding the bag on stranded nuclear waste, crippling tax shortfalls, decommissioning cost overruns, and security issues. Hoped for repurposing of sites is stalled..60 years after the first nuclear plants came online there is still no place to put the wastes..Nuclear waste seems to be stuck "in situ" for decades to come.

Given all the above issues there is a real need to halt and review in depth any transfer by Entergy to any LLC, including Holtec.

Full financial responsibility should be required of any decommissioning company. Decommissioning plans must include costs for long term robust secure storage. Sufficient infrastructure as well as associated support, monitoring, security, and accident avoidance and response costs must be identified and included.

Waste will be stuck at Indian Point for decades not years. That has to be realistically faced, planned for, and costed.

Pre decommissioning radiological contamination must be cleaned up.

Risks due to pipelines, fuel storage, power outages, possible terrorist attack must be identified and planned for.

Security and response plans are needed, based on thorough risk analysis and contingency planning for all possible scenarios.

Accident avoidance, response and training should be costed.

If decommissioning is not done correctly and an accident or accidents happen, the lives and futures of

millions of men ,women and children will be compromised. The center of our country's cultural and economic life could be crippled for decades.Videos showing the Chinese city of Wuhan turned into a ghost town by a virus are a chilling reminder of what can happen. They are a reminder that avoidance of a potential radiological disaster is crucial to the decommissioning. Monetary costs are but a fraction of the whole picture. Public safety is paramount.
Assumptions and scenarios of possible problems need to be created, planned for, and mitigation/contingency plans developed and costed and trained for.
Given human fallibility is a fact, it is hard to expect an error-free decommissioning. To avoid a tragedy, whoever gets the work should be fully aware and committed to their responsibility for public safety and held fully accountable legally and financially for the decommsioning of Indian.
Point.
Entergy alone should not have the final say in such a serious and important undertaking. New York State and the communities should also have a deciding say in the selection and approval process.

Sincerely,, Henry S. Kelly.
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HOLTEC
DECOMMISSIONING
INTERNATIONAL

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December 19, 2019

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Indian Point Nuclear Generating Units 1, 2 and 3
Docket Nos. 50-3, 50-247, 50-286 and 72-051
Provisional Operating License No. DPR-5
Renewed Facility Operating License Nos. DPR-26 and DPR-64

Subject: Post Shutdown Decommissioning Activities Report including Site-Specific Decommissioning Cost Estimate for Indian Point Nuclear Generating Units 1, 2, and 3

Reference:
[1] Letter US NRC to Con Edison, "Order to Authorize Decommissioning and Amendment No. 45 to License No. DR-5 for Indian Point Unit No. 1," January 31, 1996 (ML070310227)

[2] Letter from ENOI to US NRC, "Notification of Permanent Cessation of Power Operations Indian Point Nuclear Generating Unit Nos. 2 and 3, Docket Nos. 50-247 and 50-286, License Nos. DPR-26 and DPR-64," dated February 8, 2017 (ML17044A004)

[3] Letter, ENOI to US NRC, Application for Order Consenting to Transfers of Control of Licenses and Approving Conforming License Amendments, Indian Point Nuclear Generating Units 1, 2 and 3, November 21, 2019 (ML19326B953)

Pursuant to 10 CFR 50.82(a)(4), Holtec Decommissioning International, LLC (HDI) is submitting a Post Shutdown Decommissioning Activities Report (PSDAR) for the Indian Point Nuclear Generating Units 1, 2 and 3. On January 31, 1996, the US NRC issued an order to authorize decommissioning of IP1 and Amendment No. 45 to License No. DPR-5, which revised the license to possession-only status (Reference 1). By letter dated February 8, 2017, Entergy Nuclear Operations, Inc. (ENOI), Entergy Nuclear Indian Point 2, LLC (ENIP2), and Entergy Nuclear Indian Point 3, LLC (ENIP3) notified the Nuclear Regulatory Commission (NRC) that it would permanently cease power operations at IP2 and IP3 by April 30, 2020 and April 30, 2021, respectively, consistent with the terms of a certain settlement agreement with the State of New York and related parties (Reference 2).

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By letter dated November 21, 2019, ENOI, on behalf of itself, ENIP2, ENIP3, Holtec International (Holtec), and HDI, requested that the NRC consent to: (1) the transfer of control of Provisional Operating License No. DPR-5 and Renewed Facility Operating License Nos. DPR-26 and DPR-64 for IP1, 2 & 3, as well as the general license for the IP1, 2 & 3 Independent Spent Fuel Storage Installation (ISFSI) to Holtec subsidiaries to be known as Holtec Indian Point 2, LLC (Holtec IP2) and Holtec Indian Point 3, LLC (Holtec IP3); and (2) the transfer of ENOI's operating authority (i.e., its authority to conduct licensed activities at IP1, 2 & 3) to HDI (Reference 3). The enclosed document provides the HDI PSDAR using the DECON method that is planned to be implemented following NRC approval of the requested license transfers and the sale of the entities that own IP1, 2 & 3 from Entergy to Holtec.

The enclosed PSDAR has been developed consistent with Regulatory Guide 1.185, Revision 1, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report." This HDI DECON PSDAR describes HDI's decommissioning plan and includes HDI's DECON Site-Specific Decommissioning Cost Estimate (DCE). The site-specific DCE for decommissioning IP1, 2 & 3 illustrates that adequate funding is available in the NDT fund for each unit to complete license termination activities for that unit. In addition to the license termination costs, site restoration and spent nuclear fuel management costs are included in this estimate; however, pursuant to regulatory requirements, the non-license termination cost estimates are segregated and listed separately. HDI will submit a request for NRC approval of an exemption to use Nuclear Decommissioning Trust (NDT) funds for spent fuel management and site restoration activities.

This DECON PSDAR is contingent upon NRC approval of the LTA, completion of transfer of the licenses and asset sale closure.

ENOI has reviewed the contents of this letter and is aligned.

In accordance with 10 CFR 50.82(a)(4)(i), a copy of the DECON PSDAR is being provided to the State of New York by transmitting a copy of this letter and its enclosure to the designated State Officials.

This letter contains no new regulatory commitments.

If you have any questions, please contact me at (856) 797-0900, x3813 or via email at a.sterdis@holtec.com.

Sincerely,

Andrea L. Sterdis
Vice President, Regulatory & Environmental Affairs
Holtec Decommissioning International, LLC

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Enclosure: Post Shutdown Decommissioning Activities Report and Site-Specific Decommissioning Cost Estimate for Indian Point Nuclear Generating Station Units 1, 2, and 3

cc: w/ Enclosure

Regional Administrator, NRC Region I
Senior Resident Inspector, Indian Point Nuclear Generating Station Units 2 and 3
Senior Project Manager, NRC/NRR/DORL

Indian Point Entergy Center
Indian Point Units 1, 2 and 3

Post-Shutdown Decommissioning Activities Report

Prepared on Behalf of Holtec Decommissioning International, LLC
by Comprehensive Decommissioning International, LLC

December 2019

Rev. 0

Table of Contents

Acronyms

ACM	Asbestos Containing Material
ALARA	As Low As Reasonably Achievable
BMP	Best Management Practice
BOE	Basis of Estimate
CDI	Comprehensive Decommissioning International, LLC.
CFR	Code of Federal Regulations
CPM	Critical Path Method
DCE	Decommissioning Cost Estimate
DCGL	Derived Concentration Guideline Levels
DECON	A Method of Decommissioning defined by the NRC
DGC	Decommissioning General Contractor
DOE	Department of Energy
DPS	Distinct Population Segment
EC	European Commission
ECOS	Environmental Conservation Online System
ENOI	Entergy Nuclear Operations, Inc.
ENIP2	Entergy Nuclear Indian Point 2
ENIP3	Entergy Nuclear Indian Point 3
ENTERGY	Entergy Corporation
ENTOMB	A Method of Decommissioning defined by the NRC
FSS	Final Status Survey
GEIS	Generic Environmental Impact Statement (NUREG-0586)
GTCC	Greater than Class C
HDI	Holtec Decommissioning International
Holtec	Holtec International
Holtec IP2	Holtec Indian Point 2, LLC
Holtec IP3	Holtec Indian Point 3, LLC
HSA	Historical Site Assessment
IAEA	International Atomic Energy Agency
IP1, 2 & 3	Indian Point Units 1, 2 and 3
IPaC	Information for Planning and Consultation
IPEC	Indian Point Energy Center
ISDC	International Structure for Decommissioning Costing
ISFSI	Independent Spent Fuel Storage Installation
IT	Information Technology
LLMW	Low-Level Mixed Waste
LLRW	Low-Level Radioactive Waste
LSA	Low Specific Activity
LTP	License Termination Plan
LTMP	Long Term Monitoring Plan
MNA	Monitored Natural Attenuation
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual

MWe	Megawatts- Electric
MWt	Megawatts- Thermal
NDT	Nuclear Decommissioning Trust
NEA	Nuclear Energy Agency
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NLEP	Norther Long-eared Bat
NMFS	National Marine Fisheries Services
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
NUREG	Nuclear Regulatory Commission technical report designation
NYNHP	New York Natural Heritage Program
NYSDEC	New York State Department of Environmental Conservation
NYSHPO	New York State Historic Preservation Office
NYSERDA	New York State Energy Research and Development Authority
OECD	Organization for Economic Cooperation and Development
OSHA	Occupational Safety and Health Association
IP1, 2 & 3	Indian Point Units 1, 2 and 3
PSDAR	Post-Shutdown Decommissioning Activities Report
PSEP	Permanently Shutdown Emergency Plan
PWR	Pressurized Water Reactor
RPV	Reactor Pressure Vessel
RVI	Reactor Vessel Internals
SAFSTOR	A Method of Decommissioning defined by the NRC
SCO	Surface Contaminated Object
SEIS	Supplemental Environmental Impact Statement
SFP	Spent Fuel Pool
SME	Subject Matter Expert
SNF	Spent Nuclear Fuel
SPDES	State Pollutant Discharge Elimination System
SSC	Structures, Systems and Components
US	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WBS	Work Breakdown Structure
WCS	Waste Control Specialists
WMP	Waste Management Plan
WP	Work Package

1 INTRODUCTION AND SUMMARY

1.1 Introduction

In accordance with the requirements of Title 10 of the Code of Federal Regulations (CFR)50.82, "Termination of license," paragraph (a)(4)(i), this report constitutes the Holtec Decommissioning International, LLC (HDI) DECON Post-Shutdown Decommissioning Activities Report (PSDAR) for the decommissioning of the Indian Point Energy Center (IPEC) Unit Nos. 1, 2 and 3 (IP1, 2 & 3) following the scheduled permanent cessation of plant operations and permanent removal of fuel from the reactor vessels and subsequent transfer of the Part 50 and Part 72 licenses to Holtec International (Holtec) and HDI.

On January 31, 1996, the US NRC issued an order to authorize decommissioning of IP1 and Amendment No. 45 to License No. DPR-5, which revised the license to possession-only status (Reference 1). In accordance with 10 CFR 50.81(a)(1)(iii), certification of permanent cessation of operations of IP1 is deemed to have been submitted. In the same order, the staff required the licensee to submit a "detailed dismantling plan" for NRC review prior to commencing major dismantlement activities at IP1. Following the 1996 decommissioning rulemaking, the PSDAR satisfies this obligation (61 Fed. Reg. 39,278,39,291 (July 29, 1996)).

By letter dated February 8, 2017, Entergy Nuclear Operations, Inc. (ENOI), Entergy Nuclear Indian Point 2, LLC (ENIP2), and Entergy Nuclear Indian Point 3, LLC (ENIP3) notified the Nuclear Regulatory Commission (NRC) that it would permanently cease power operations at IP2 and IP3 by April 30, 2020 and April 30, 2021, respectively, consistent with the terms of a certain settlement agreement with the State of New York and related parties (Reference 2).

Pursuant to10 CFR 50.54 (bb) and 10 CFR 50.75(f)(3), ENOI submitted a Unit 1 & 2 Program for Maintenance of Irradiated Fuel and Preliminary Decommissioning Cost Analysis in October 2008 (Reference 3) and a Unit 3 Program for Maintenance of Irradiated Fuel and Preliminary Decommissioning Cost Analysis (Reference 4) in December 2010.

By letter dated November 21, 2019, ENOI, on behalf of itself, ENIP2, ENIP3, Holtec International (Holtec), and HDI, requested that the NRC consent to: (1) the transfer of control of Provisional Operating License No. DPR-5 and Renewed Facility Operating License Nos. DPR-26 and DPR-64 for IP1, 2 & 3, as well as the general license for the IP1, 2 & 3 Independent Spent Fuel Storage Installation (ISFSI) to Holtec subsidiaries to be known as Holtec Indian Point 2, LLC (Holtec IP2) and Holtec Indian Point 3, LLC (Holtec IP3); and (2) the transfer of ENOI's operating authority (i.e., its authority to conduct licensed activities at IP1, 2 & 3) to HDI (Reference 5).

This document provides the HDI PSDAR using the DECON method that is planned to be implemented following NRC approval of the requested license transfers and the sale of the

entities that own IP1, 2 & 3 from Entergy to Holtec. This HDI DECON PSDAR describes HDI's decommissioning plan and includes HDI's DECON Site-Specific Decommissioning Cost Estimate (DCE) as Enclosure 1.

The initiation of decommissioning activities will occur immediately following the sale and license transfers. The sale closure and license transfers are targeted to be completed by May 31, 2021, following IP3 permanent cessation of plant operations and permanent reactor defueling. In addition, HDI will submit a request for NRC approval of an exemption to use Nuclear Decommissioning Trust (NDT) funds for spent fuel management and site restoration activities.

Following the sale closure and transfer of the facility licenses, HDI will initiate decommissioning activities using the DECON method. Decommissioning is expected to be completed well before 60 years following permanent cessation of operations as required by 10 CFR 50.82(a)(3). HDI has a project goal to complete non-ISFSI decommissioning within 15 years following sale closure and license transfer. The plan described in this PSDAR and the cost estimate provided in Enclosure 1 reflect HDI's current decommissioning plan resulting in obtaining NRC issuance of a license amendment reducing the IP1, 2 & 3 licensed area to the ISFSI and permitting partial site release within 12 years of sale closure and license transfer. While the cost estimate presented herein is based on a 12-year schedule for partial site release, HDI expects that the cost estimates would bound a project schedule supporting partial site release out to 15 years.

In accordance with the requirements of Title 10 of the Code of Federal Regulations (CFR)50.82, "Termination of license," paragraph (a)(4)(i), this DECON PSDAR is being submitted to notify the NRC of HDI's decommissioning plans based on an accelerated decommissioning schedule for the prompt decommissioning of IP1, 2 & 3 and unrestricted release of all portions of the site other than the ISFSI, if the license transfers are approved by the NRC and the transaction closes.

The DECON PSDAR is contingent upon NRC approval of the transfer of the IP 1, 2 and 3 licenses.

Prior to the IP2 and IP3 permanent shutdowns, ENOI, in coordination with HDI, is preparing for the safe and orderly transition from facility operations to dismantlement and decontamination. After transfer of the licenses is complete, the facility will be dismantled and decontaminated to levels that permit license termination. This DECON PSDAR contains the following:

1. A description of the planned decommissioning activities along with a schedule for accomplishment.

2. A discussion that provides the reasons for concluding that the environmental impacts associated with site-specific decommissioning activities will be bounded by appropriate previously issued environmental impact statements.

3. A site-specific DCE, including the projected license termination, spent fuel management, and site restoration costs.

This DECON PSDAR has been developed consistent with Regulatory Guide 1.185, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report" (Reference 6). The DECON PSDAR is based on currently available information, and the plans discussed herein may be modified as additional information becomes available or conditions change. As required by 10 CFR 50.82(a)(7), the NRC will be notified in writing, with copies sent to the State of New York, before performing any decommissioning activity inconsistent with, or making any significant schedule change from, those actions and schedules described in the DECON PSDAR, including changes that significantly increase the decommissioning cost.

1.2 Background

Indian Point is located on approximately 239 acres of land on the east bank of the Hudson River at the Village of Buchanan in upper Westchester County, New York. There are three units on site, two operating units (IP2 & 3) and one in safe-storage (IP1). IP1 is located between IP2 to the north and IP3 to the south.

IP1 was a four-loop pressurized water reactor with a thermal rating of 615 megawatts thermal (MWt). Operation of the unit was suspended on October 31, 1974 and all spent fuel had been removed from the reactor vessel by January 1976. Since that time, the unit has remained in protective storage. In 2003, the NRC issued Amendment No. 52 to the Provisional Operating License for IP1. Included within the amendment was a change to expiration date of the IP1 license to be consistent with that of IP2.

In 2008, the remaining 160 spent fuel assemblies from IP1 (244 assemblies had previously been shipped to West Valley Reprocessing Plant, a commercial fuel reprocessing facility in upstate New York operated by Nuclear Fuel Services, Inc. from 1966 to 1972, for reprocessing) were transferred to an on-site ISFSI (Reference 7).

IP2 and IP3 each employ a pressurized water reactor and nuclear steam supply system (NSSS) furnished by Westinghouse Electric Corporation. The units are each currently licensed to generate 3,216 megawatts thermal which corresponds to a generator output of approximately 1,080 megawatts electric (MWe).

Pursuant to 10 CFR 50.51(b), "Continuation of license," the license for a facility that has permanently ceased operations continues in effect beyond the expiration date to authorize ownership and possession of the facility until the NRC notifies the licensee in writing that the license has been terminated.

During the period that the license remains in effect, 10 CFR 50.51(b) requires that the licensee:

1. Take actions necessary to decommission and decontaminate the facility and

continue to maintain the facility (including storage, control, and maintenance of the spent fuel) in a safe condition.

2. Conduct activities in accordance with all other restrictions applicable to the facility in accordance with NRC regulations and the 10 CFR 50 renewed facility operating licenses.

10 CFR 50.82(a)(9) states that power reactor licensees must submit an application for termination of the license at least two (2) years prior to the license termination date, and that the application must be accompanied, or preceded, by a License Termination Plan (LTP) to be submitted for NRC approval.

1.3 Summary of Decommissioning Methods

The NRC has evaluated the environmental impacts of three (3) general methods for decommissioning power reactor facilities in NUREG-0586, "Final Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors" (Reference 8). The three (3) general methods evaluated are summarized as follows:

- DECON: The equipment, structures, and portions of the facility and site that contain radioactive contaminants are promptly removed or decontaminated to a level that permits termination of the license shortly after cessation of operations.

- SAFSTOR: After the plant is shut down and defueled, the facility is placed in a safe, stable condition and maintained in that state (safe storage). The facility is decontaminated and dismantled at the end of the storage period to levels that permit license termination. During SAFSTOR, a facility is left intact, or may be partially dismantled, but the fuel is removed from the reactor vessel, and radioactive liquids are drained from systems and components and then processed. Radioactive decay occurs during the SAFSTOR period, thereby reducing the quantity of contamination and radioactivity that must be disposed of during decontamination and dismantlement.

- ENTOMB: Radioactive structures, systems, and components (SSCs) are encased in a structurally long-lived substance, such as concrete. The entombed structure is appropriately maintained, and continued surveillance is carried out until the radioactivity decays to a level that permits termination of the license.

1.4 Decommissioning Method Selected

Following license transfers and sale closure, HDI plans to decommission and dismantle IP1, 2 & 3 using the DECON method. This DECON PSDAR describes the selected methods to be used for the decontamination and dismantlement of the site. The HDI decommissioning strategy for the project is to initiate the prompt decommissioning of IP1, 2 & 3 following shutdown, reactor defueling, and license transfers to support partial release of the IP1, 2 & 3 site, except for the ISFSI, within fifteen years after the license transfers and sale closure.

The plan described in this PSDAR and the cost estimates provided in Enclosure 1 reflect HDI's current decommissioning plan resulting in a schedule for obtaining NRC issuance of a license amendment reducing the IP1, 2 & 3 licensed area to the ISFSI and permitting partial site release within 12 years of sale closure and license transfer. To execute this plan, once the licenses are transferred, the decommissioning objectives will be:

a. Decommissioning of IP1, 2 & 3 and site restoration of all areas, except for the ISFSI, for unrestricted use.
b. NRC approval of partial site release, including issuance of amended licenses to include only the operation of the ISFSI.
c. Department of Energy (DOE) acceptance of Spent Nuclear Fuel (SNF) from the IP1, 2 & 3 ISFSI.
d. Decommissioning of the ISFSI after DOE has removed the SNF.
e. Termination of the NRC licenses and site release of the ISFSI area.
f. Site restoration of the ISFSI area.

The HDI decommissioning strategy is to complete radiological decommissioning and release for unrestricted use of all portions of the site within twelve to fifteen years after license transfers, except for the ISFSI ("partial site release") per the decommissioning schedule depicted in Figure 3-1. In accordance with 10 CFR 50.82(a)(9), the site LTP will be developed and submitted for NRC approval at least two (2) years prior to the expected date for partial site release. NRC license termination will occur following spent fuel and Greater than Class C (GTCC) waste removal from the site and decommissioning of the ISFSI.

The HDI decommissioning approach for IP1, 2 & 3 is described in the following sections.

- Section 2.0 describes the planned decommissioning activities and the general timing of their implementation.
- Section 3.0 presents the overall decommissioning schedule and milestones, including the spent fuel management activities, in a project timeline.
- Section 4.0 provides an analysis of expected decommissioning costs, including the costs associated with spent fuel management and site restoration.
- Section 5.0 describes the basis for concluding that the environmental impacts associated with decommissioning IP1, 2 & 3 are bounded by the NRC GEIS related to decommissioning.
- Section 6.0 provides the list of references.
- Enclosure 1 includes the IP1, 2 & 3 Site-Specific Decommissioning Cost Estimate (DCE)

2 DESCRIPTION OF PLANNED DECOMMISSIONING ACTIVITIES

HDI will contract with Comprehensive Decommissioning International, LLC (CDI) to decommission IP1, 2 & 3 using the DECON method, as defined in Section 1.3 of this report. Use of the DECON method will require HDI to manage the spent fuel because of the DOE's failure to perform its contractual obligation to remove spent fuel in a timely manner. To explain the basis for projecting the cost of managing SNF, a discussion of spent fuel management activities for the site is included herein.

Prior to the sale and license transfer, ENOI will perform activities to permanently shut down and defuel the IP2 and IP3 reactors and place the units in a safe storage condition. To facilitate efficient transition of the site to DECON, ENOI, in coordination with HDI, will direct the activities that will facilitate transitioning to the HDI decommissioning plan.

In conjunction with HDI, CDI developed the decommissioning scope, schedule, and associated cost estimate for IP1, 2 & 3. CDI adopted the International Structure for Decommissioning Costing (ISDC) Work Breakdown Structure (WBS) (Reference 9) and corresponding WBS dictionary to develop the IP1, 2 & 3 site-specific DCE and decommissioning schedule. The ISDC, developed jointly by the Organization for Economic Cooperation and Development (OECD)/Nuclear Energy Agency (NEA), the International Atomic Energy Agency (IAEA) and the European Commission (EC), provides a method for developing standardized itemization of decommissioning costs. The ISDC WBS is a delivery-based, hierarchical structure that is identified as the international standard cost structure for nuclear facility decommissioning and is organized into eleven (11) groups. Of the eleven principal work groups, Activity 03-Additional Activities for Safe Enclosure and Entombment and Activity 09-Research and Development are not applicable to the prompt decommissioning approach planned for the IP1, 2 & 3 decommissioning.

Because the ISDC WBS is organized differently than those traditionally used for United States domestic decommissioning estimates, to facilitate a comparison of projected IP1, 2 & 3 decommissioning costs to the NRC Reference Pressurized Water Reactor (PWR) decommissioning costs contained in NUREG/CR-5884, “Revised Analyses of Decommissioning for the Reference Pressurized-Water Reactor Power Station,” (Reference 10) the decommissioning activities have been organized into periods similar to those described in NRC guidance.

For consistency with the DCE format found in Regulatory Guide 1.202, “Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors,” (Reference 11) the ISDC WBS has also been mapped into project periods. In addition to the periods described in the Regulatory Guide, Period 5 was established to account for long-term fuel storage costs, and Period 6 was established for instances where costs that are applicable to multiple periods are identified and quantified. The mapping of the 11 ISDC WBS elements to the project periods, is shown in Table 2-1.

Table 2-1 WBS Elements Mapped to Periods

Period	Period Title	WBS Element
1	Pre-Decommissioning Planning and Preparation	01.02.01 Pre-decommissioning actions
2	Plant Deactivation	01.02.02 Facility Shutdown Activities
3	Safe Storage Operations	01.02.10 Fuel and Nuclear Material (until fuel on pad)
4	Dismantlement	01.02.04 Dismantling Activities Within the Radiological Controlled Area
		01.02.05 Waste Processing, Storage and Disposal
		01.02.07 Conventional Dismantling, Demolition, and Site Restoration (LTP portion only)
5	Ongoing ISFSI Operations	01.02.10 Fuel and Nuclear Material (after fuel on pad)
6	Program Management	01.02.06 Site Infrastructure and Operation
		01.02.08 Project Management, Engineering and Support
		01.02.11 Miscellaneous Expenditures
Note:	*WBS 01.02.03 and 01.02.09 are not used in the cost model*	

The major decommissioning activities and the general sequence for performing the activities are discussed in more detail in the sections that follow. The project decommissioning schedule is shown in Figure 3-1.

2.1 Period 1 Pre-Decommissioning Planning & Preparation

2.1.1 Pre-Decommissioning Planning and Preparation (Pre-License Transfer)

HDI and CDI are working with ENOI to understand and support IP2 and IP3 plans for permanent shutdown, reactor defueling, and preparations for safe storage. These efforts are focused on facilitating the safe, compliant, and efficient license transfers and transition to prompt radiological decommissioning (i.e., DECON) once the sale and license transfers are complete.

The transition activities ensure that the decommissioning organization is fully prepared to assume the responsibilities of IP1, 2 & 3 decommissioning. Alignment with ENOI will begin well in advance of license transfer and sale closure. HDI will prepare a Transition Plan describing the process for conducting an orderly and effective transition in alignment with the NRC license transfers, site permits, licenses, etc. from ENOI to HDI.

2.1.2 Period 1 – Pre-Decommissioning Planning and Preparation Activities

This section discusses the activities that will be performed by HDI and CDI prior to license transfer, and those that will be performed immediately following license transfer.

At the time of sale and license transfers, IP1, 2 & 3 will be in a defueled condition. HDI's decommissioning planning takes into account the IP2 and IP3 permanent shutdown and defueling transition activities in determining the expected site conditions at the time of the

license transfers. In the time leading up to, and immediately following, the sale closure and license transfers, the following activities will be performed:

- Decommissioning planning, including finalizing the plan for transitioning to DECON.
- Procurement of services, materials, and supplies.
- Stakeholder interaction.
- Review of the Historical Site Assessment (HSA) to support the identification, categorization, and quantification of radiological, regulated, and hazardous wastes in support of waste management planning.
- Development of the decommissioning As Low as Reasonably Achievable (ALARA) budget.
- Development of a Waste Management Plan (WMP), including determination of transportation and disposal container requirements and pathways.
- Performance of safety, security, and environmental studies, as required.
- Review of the IP1, 2 & 3 reclassification of plant SSCs.
- Reactor Vessel Internals (RVI) and Reactor Pressure Vessel (RPV) segmentation tooling design, fabrication, and testing.
- Licensing and permitting actions necessary to reflect the permanently defueled plant configurations

During Period 1, planning and preparing for the prompt decontamination and dismantlement of IP1, 2 & 3 will begin by completing the following activities:

- Finalize the decommissioning organization, including integration of incumbent plant staff and CDI personnel. IP1, 2 & 3 personnel on site at the time of license transfer will be incorporated into the decommissioning organization according to their expertise and the position that they held within ENOI. Staffing and configuration requirements are expected to change during the period of decommissioning, principally dependent upon changes in license requirements, due to changes in the status of the spent fuel being stored onsite.
- Review the established IP1, 2 & 3 policies, programs, and procedures for ongoing activities, and identify changes to reflect the evolving plant status during decommissioning. The NRC requirements and functional needs for the anticipated plant conditions and DECON activities will be determined, and the procedures and programs will be evaluated for adoption, revision, replacement, or revocation using the appropriate NRC regulatory change processes. The plan is to adopt, revise, or eliminate existing IP1, 2 & 3 policies, programs, procedures, and work instructions, where applicable, since these documents have been used by IP1, 2 & 3 for operations in accordance with NRC regulations and the NRC license. As the plant statuses evolve due to decommissioning progress, these determinations and procedure/program evaluations and changes will periodically recur.
- Develop decommissioning Work Packages (WPs), including the radiation work

permits and job hazard analyses to support the WPs. Focus will be on the earliest activities in the schedule. To get input from the labor force who will be performing the work, area walkdowns with Subject Matter Experts (SMEs) and other appropriate personnel will be performed while preparing the WPs.

- Conduct site characterization activities so that radiological, regulated, and hazardous wastes are identified, categorized, and quantified to support decommissioning and waste management planning. Surveys will be conducted to establish the contamination and radiation levels throughout the plants. This information will be used in developing procedures to ensure that hazardous, regulated, and radiologically contaminated areas are remediated, and to ensure that worker exposure is controlled.
- Establish transportation and disposal contracts.

2.2 Period 2 – Plant Deactivation

Many of the activities associated with termination of operations, plant stabilization, isolation, and initial inspection will be completed by ENOI. In the period between permanent reactor defueling and sale closure and license transfer, ENOI will execute activities to deactivate IP2 and IP3. The IP2 and IP3 deactivation activities include the following:

1. Continuing operation and maintenance of the systems required to safely manage the spent nuclear fuel and comply within NRC regulations and facility license requirements.
2. Isolating power equipment and installation of temporary power systems in preparation for decommissioning.
3. Removing combustibles and chemicals to permit fire protection system modifications.

Following the sale closure and license transfer, deactivation activities and other activities required to prepare the IP1, 2 & 3 for decommissioning will continue, as necessary.

2.3 Period 3 - Safe Storage Operation

Since HDI has chosen the DECON method for IP1, 2 & 3 decommissioning, the activities in this period only include preparations for, and conduct of, fuel movement to an onsite dry fuel storage facility. This period concludes once the fuel has been removed from the spent fuel pools (SFPs) and placed into long-term storage at the ISFSI. Safe storage operation activities include the following:

- Construction of additional dry fuel storage capacity.
- Transfer of SNF to dry storage canisters.
- Movement of fuel to long-term storage at the ISFSI.
- Operation and maintenance of the ISFSI until the spent fuel is removed from the SFPs and placed in the ISFSI.

2.4 Period 4 - Dismantlement

The scope of Period 4 includes the dismantling and decontamination of plant systems and structures. The work scope described in this section concludes with the removed components packaged and placed in containers, and transported to storage, treatment, or disposal. The waste will be properly packaged, shipped and tracked until properly disposed. Holtec's prompt decommissioning strategy does not rely on decontamination or offsite processing to accomplish free release of material and focuses instead on bulk removal of material as the most expedient and cost-effective solution to decommissioning. The end state of this work scope is to have the buildings cleared of all radioactive components and declared ready for free release or demolition. However, decontamination activities such as surface wipe-down will be performed as required to maintain worker exposure ALARA.

2.4.1 Asbestos Containing Material, Hazardous, and Universal Waste Removal

Removal of all Asbestos Containing Material (ACM) is one of the first priorities. Asbestos removal is planned prior to dismantling SSCs. Work boundaries will be established and set up with containment structures, tents, glove bags, ventilation, etc., for ACM removal. Final verification survey of all facilities will be performed to ensure all ACM has been removed prior to dismantlement and decontamination.

Removal of hazardous and universal waste[1] will also be conducted prior to dismantling SSCs, as constrained by the accessibility of the waste material. The waste will be placed in the proper containers for transportation to the appropriate disposal facility.

2.4.2 Site Characterization

To supplement site historical knowledge and the IP1, 2 & 3 HSA, site characterization activities will be performed during the decommissioning process. The characterization will further the identification, categorization, and quantification of radiological, regulated, and hazardous wastes. Surveys will be conducted to establish the contamination and radiation levels throughout the site. The information will be used in developing procedures to ensure that hazardous, regulated, and radiologically contaminated areas are remediated, and to ensure that worker exposure is controlled. As decontamination and dismantlement work proceeds, surveys will be conducted to maintain current site characterization, and to ensure that decommissioning activities are adjusted accordingly.

2.4.3 Segmentation and Dismantling of the RVIs and RPV

Segmenting, removing and packaging the RVI and RPV is critical to keeping the project on schedule. The RVI highly activated core grid segments are expected to generate most of the

[1] Universal waste is a category of waste materials designated as "hazardous waste" but containing materials that are commonly generated by a wide variety of establishments. US Environmental Protection Agency's (USEPA) universal waste regulations streamline the hazardous waste management standards for these wastes. It is identified in 40 CFR 273.9 by the USEPA and applies to four (4) specific categories of materials that can be managed as universal wastes: batteries, pesticides, mercury-containing equipment and lamps. States may have corollary regulations regarding these materials, as well as additional materials.

GTCC waste. The decommissioning approach is to segment the RVI and RPV in parallel with the spent fuel cooling period, to shorten the overall decommissioning schedule.

Reactor vessel and internals segmentation activities will begin with IP3, proceed to IP2 and conclude with IP1. Due to the similarities in the design of the IP2 & IP3 reactors, the same tooling will be used to segment each of the IP2 and IP3 reactor vessels and reactor vessel internals. Lessons learned from the IP3 segmentation will result in efficiency gains for the IP2 work. The IP1 reactor will require a unique tooling design, segmentation plan and segmentation approach. Depending on the condition of the IP1 reactor vessel, there may be an opportunity to remove, ship and dispose of the vessel intact. However, for the purposes of this estimate, the IP1 reactor vessel is assumed to be size-reduced and shipped for disposal in a segmented configuration.

The GTCC waste that is generated during segmentation activities will be placed in dry storage canisters, transported away from the reactor buildings and stored at the ISFSI.

2.4.4 Fuel Pool and Reactor Cavity Dismantlement

After the fuel has been removed from the IP2 and IP3 SFPs, the segmentation contractor will perform the fuel pool removal. The pools will be inspected with underwater cameras and radiation monitors to identify any special nuclear material or debris remaining after fuel movement. The IP1fuel was removed and the pool drained in 2008; however, inspection of the IP1 SFP will be performed to locate and remove any remaining special nuclear material or GTCC waste. Remote handling tools or vacuuming will be used to remove contamination found during the inspection. If any fuel fragments are identified, a regulatory compliant process will be used to remove and store the fragments.

The fuel racks will be removed from the pools, segmented, and size-reduced for disposal as Low-Level Radioactive Waste (LLRW). The SFP liners will be removed after the pools have been drained and decontaminated. Any GTCC waste generated from these activities will be placed in a dry storage cask, transported from the area, and stored on the ISFSI.

2.4.5 Large Component Dismantlement

The WPs developed in Period 1 will be used to remove the large components and the plant systems by building or area, to avoid impacting other critical path work. Access limitations, crane availability, and radiological conditions will drive the technology used for cutting and segmenting components and piping. Systems and/or components will be breached, air gapped, and purged to eliminate liquid waste prior to segmenting. While many large components are expected to be radiologically contaminated, they are not expected to require pre-dismantling decontamination. Spray fixative will be used on components, or openings of piping will be capped to control contamination. Depending on the contamination levels and configuration of the segmented large components, CDI will either place the segments in an appropriate shipping container or send the component for disposal as its own package with suitable wrapping or capping.

For each unit, the turbines, main condenser, moisture separator reheaters, feedwater pumps and heaters, and steam and feedwater piping are not expected to be radiologically contaminated. The subcontractor will remove large parts of the turbines (such as the low-pressure portion) intact and send the components offsite for disposal as intact packages suitably wrapped. The generators can be removed whole for recycling or reuse.

For each unit, the primary loop large components, including the steam generators and pressurizers will be removed from the Reactor Buildings. The auxiliary plant boilers, storage tanks, and the diesel generators will be removed.

2.4.6 Radioactive Waste Management

A major component of the decommissioning work scope for IP1, 2 & 3 is the packaging, transportation, and disposing of contaminated/activated equipment, piping, concrete, and soil. A WMP will be developed in Period 1 to incorporate the most cost-effective disposal strategy, consistent with regulatory requirements and disposal/processing options for each waste type. Characterization will be performed with systems and components in place to determine the waste classification, maximizing the use of non-destructive assay techniques, and direct instrumentation readings correlated with hard analytical data gathered via direct smears and sampling. IP1, 2 & 3 decommissioning will include a number of discrete waste stream profiles and a range of shipping packages. A range of reusable and single use containers will be used, and some items will be transported as sealed components without containerization (they become their own packaging).

Most waste will meet Class A, Low Specific Activity (LSA), or Surface Contaminated Object (SCO) definitions. LLRW will be managed in accordance with the approved WMP and commercial disposal facility requirements. This includes characterizing contaminated materials, packaging, transporting, and disposal at a licensed LLRW disposal facility.

For Class B and C waste, an import petition will be filed with the Texas Compact Commission to gain approval to dispose of out-of-compact waste at the Waste Control Specialists (WCS) facility in Texas. The guidance in NUREG-2155, "Implementation Guidance for Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material" (Reference 12) will be used for radioactive material that meet the form, concentration and quantity-of-concern criteria in 10 CFR 37, "Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material."

2.4.7 Waste Transportation

The transportation approach for Class A, LSA, or SCO classes of waste is to use a combination of truck and rail to support bulk quantity removal of waste. Since there is no active rail at IP1, 2 & 3, trucks will be used to deliver the waste to a transload facility. The waste transportation process will be fully defined in the WMP to include the number of shipments, the disposal facilities and applicable requirements. HDI may elect to ship large plant components by barge.

2.4.8 Removal of Mixed Wastes

Low-Level Mixed Waste (LLMW) generation will be minimized through appropriate characterization, as well as the demolition techniques employed. If mixed wastes are generated, they will be managed in accordance with applicable federal and state regulations. Mixed wastes from IP1, 2 & 3 will be transported by authorized and licensed transporters and shipped to authorized and licensed facilities.

2.4.9 License Termination including Final Status Surveys

In accordance with the requirements of 10 CFR 50.82(a)(9), an LTP will be submitted to the NRC at least two (2) years prior to the anticipated date of partial site release (i.e., amendment of the facility licenses to limit the scope of the licenses to just the ISFSI). That plan will include: a site characterization, description of the remaining dismantling/removal activities, plans for remediation of remaining radioactive materials, developed site-specific Derived Concentration Guideline Levels (DCGLs), plans for the Final Status (radiation) Survey (FSS), designation of the end use of the site, an updated cost estimate to complete the decommissioning, and associated environmental concerns.

The NRC-approved LTP will be used to perform the FSS, which will demonstrate that the remediated portion of the site (excluding the ISFSI containing the spent fuel and GTCC waste) can be released for unrestricted use and removed from the license. The site release criteria defined by the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (Reference 13) protocol will be used to demonstrate that the site release criteria have been met. The licenses will be amended to limit the NRC renewed facility operating licenses to the onsite ISFSI.

2.4.10 Site Restoration

During demolition, above-ground structures will be removed to a nominal depth of three (3) feet below the surrounding grade level. Characterization surveys will then be performed in the remainder of the below ground structures and any areas with activity exceeding established DCGLs will be removed. Final Status Surveys, including NRC verification surveys, will be conducted. Once the NRC approves the Final Status Surveys, the affected area(s) will be backfilled with suitable fill materials, graded, and appropriate erosion controls established. Site restoration activities will begin in non-radiological areas after demolition of buildings and structures outside the radiological controlled area. Final site restoration will be completed after ISFSI decommissioning and demolition is completed.

2.5 Period 5 - Ongoing ISFSI Operations

The HDI decommissioning plan includes the expansion of the existing ISFSI pad on the IPEC site to provide the dry cask storage capacity needed for the spent nuclear fuel currently in the IP2 and IP3 reactors and spent fuel pools. The expanded ISFSI will also include storage capacity for the GTCC waste. The spent fuel and GTCC waste will remain on the ISFSI until it is transferred to the DOE. The ISFSI will be staffed by a security force. In addition, personnel will be assigned to maintain the ISFSI and comply with the ISFSI

license requirements. Fuel and GTCC waste shipping will be performed when repositories for this type of waste are developed by the DOE. Approximately thirteen GTCC canisters are estimated to be needed for decommissioning activities. Following the removal of the spent fuel and GTCC waste, the ISFSI site will be decommissioned, remediated, and surveyed per the LTP. Following the Final Site Survey (FSS) and NRC approval, final license termination will occur.

2.6 Program Management

Program management costs include infrastructure and operation, management, and fees that are applicable to decommissioning Periods 1 through 4. These costs include the following:

- Site infrastructure and operation costs, including security, maintenance, site upkeep, operation of support systems, and environmental monitoring.
- Project management, engineering, and support including the core management group, scheduling and cost control, quality assurance, health and safety, records management, general administration and accounting, warehousing, engineering, regulatory, and support services.
- Regulatory fees, taxes, and insurance.

2.7 Changes to Management and Staffing

Following license transfers and sale closure, the management team will be comprised of HDI corporate leadership resources, supported by CDI leadership resources. The CDI management team will include Holtec and SNC-Lavalin personnel along with incumbent IPEC site personnel. This includes IP1, 2 & 3 personnel who transfer to CDI upon closure of the sale. These personnel will be integrated into the decommissioning organization according to their expertise and previous positions held while the plants were operating. Additionally, corporate support from SNC-Lavalin and/or Holtec will be provided in areas such as legal, financial reporting systems, Information Technology (IT), procurement, and human resources.

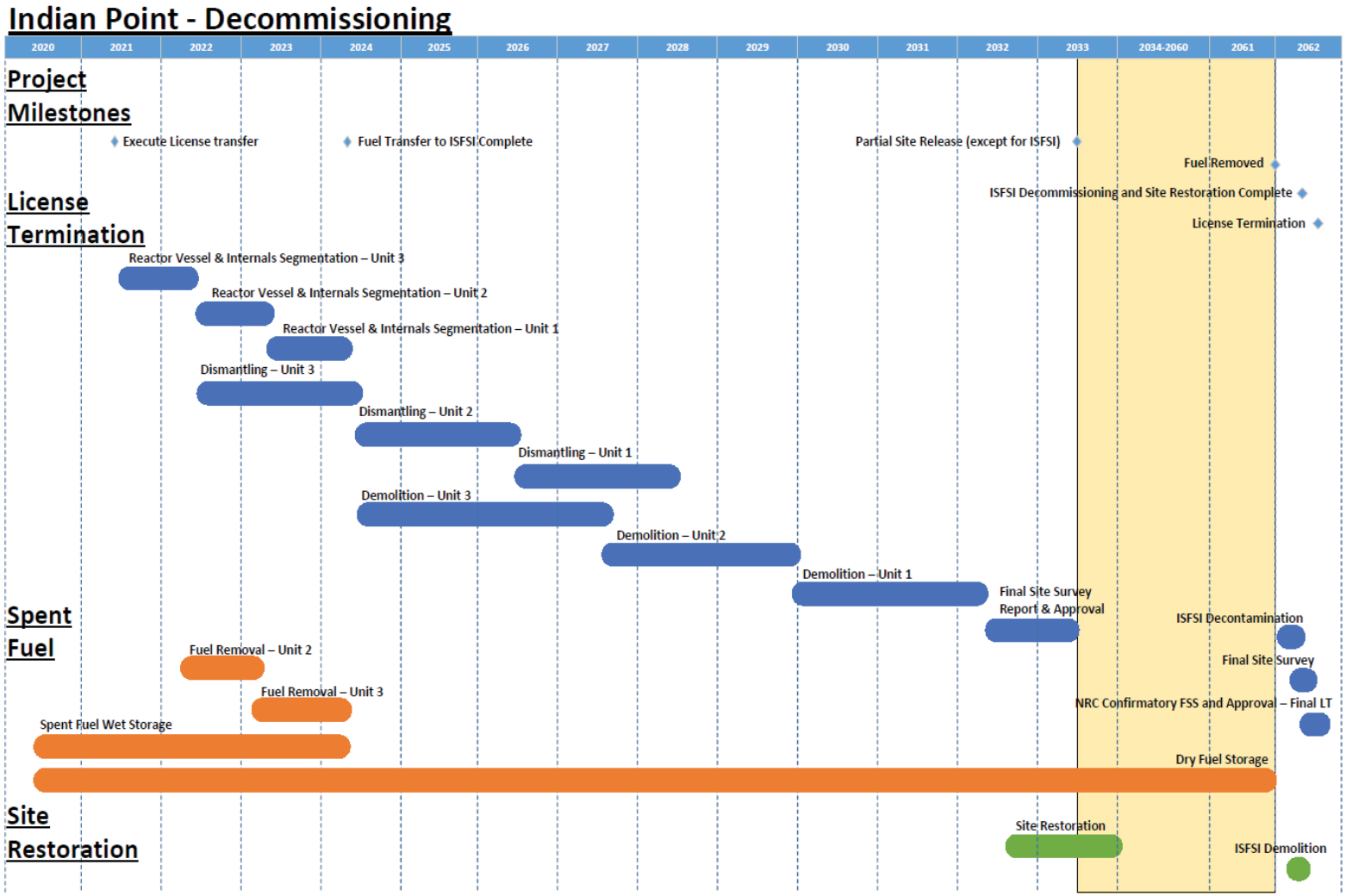
The number of site personnel will vary throughout the life of the project, with increased or decreased staffing levels required as decommissioning activities ramp up or down, or as requirements for security and emergency planning are reduced. The staffing projections after license transfer and sale closure are described in Section 3 of the Enclosure 1 of this DECON PSDAR.

3 SCHEDULE OF PLANNED DECOMMISSIONING ACTIVITIES

3.1 IP1, 2 & 3 Decommissioning Schedule

Figure 3-1 IP1, 2 & 3 Decommissioning Schedule, provides a project timeline that presents the high-level project schedule and milestones for decommissioning, including spent fuel storage and licensing. The schedule provided herein assumes that the sale closure and license transfer are executed on May 31, 2021 and ends following ISFSI decommissioning and final license termination.

Figure 3-1 IP1, 2 & 3 **Decommissioning Schedule**



4 ESTIMATE OF EXPECTED DECOMMISSIONING AND SPENT FUEL MANAGEMENT COSTS

The HDI DECON site-specific DCE for the decommissioning of IP1, 2 & 3 following the scheduled permanent cessation of plant operations and an assumed license transfer date of May 31, 2021 is included as Enclosure 1 to this DECON PSDAR. Costs in the DCE were determined based on the selection of the DECON method for decommissioning IP1, 2 & 3. CDI prepared the site-specific DECON DCE and schedule for HDI using several sources including the following:

- Information compiled by HDI and CDI during an extensive due diligence period.
- The site-specific decommissioning cost estimate in the ENOI preliminary DCE
- Input and professional judgment of experienced specialty subcontractors and SMEs.

The site-specific DCE is based on regulatory requirements, site conditions, Basis of Estimate (BOE) assumptions, LLRW disposal standards, high-level radioactive waste management options, and site restoration requirements. The methods utilized to estimate decommissioning costs were based on the professional judgment of the experienced SMEs, considering the nature of the work, degree of scope definition, availability of quantifiable cost and pricing data, among other factors. The decommissioning costs presented in this report are reported in 2019 dollars. Escalation of future decommissioning costs over the remaining decommissioning project life-cycle are excluded.

The detailed decommissioning project schedule is used as the foundation for developing the DCE model and the risk model. The schedule baseline is a detailed Critical Path Method (CPM) schedule developed with input from the key decommissioning subcontractors and SMEs. The schedule and cost estimates are based on the ISDC WBS and corresponding WBS dictionary.

The site-specific DCE for decommissioning IP1, 2 & 3 demonstrates that adequate funding is available in the NDT fund for each unit to complete license termination activities for that unit. In addition to the license termination costs, site restoration and spent nuclear fuel management costs are included in this estimate; however, pursuant to regulatory requirements, the non-license termination cost estimates are segregated and listed separately.

The estimates are based on current and/or assumed regulatory requirements, site conditions, baseline assumptions, low-level radioactive waste disposal standards, high-level radioactive waste management options and site restoration requirements. The cost to decommission the site, safeguard the spent fuel until it can be transferred to the DOE and restore the affected area of the site is estimated to be $598 million for IP1, $702 million for IP2 and $1,002 million for IP3. The summary of the costs estimated for License Termination, Spent Fuel Management, and Site Restoration activities are presented in Table 4-1.

Table 4-1 IP1, 2 & 3 Decommissioning DECON Cost Summary (thousands of 2019 dollars)

Decommissioning Activity	IP1	IP2	IP3
Decontamination			
Removal	162,256	186,173	197,721
Packaging	11,175	14,300	15,964
Transportation	41,043	19,637	28,135
Disposal	156,222	105,940	131,180
Off-site Waste Processing			
Program Management	119,726	144,384	182,529
Corporate A&G			
Spent Fuel (Direct Expenditures)	66,066	162,233	344,285
Insurance and Regulatory Fees	9,177	12,511	12,511
Energy	11,914	11,914	11,914
Characterization and Licensing Surveys	8,808	8,808	26,635
Property Taxes		22,537	38,676
Miscellaneous Equipment / Site Services	11,797	13,386	12,827
Spent Fuel Pool Isolation			
Grand Total	**598,184**	**701,822**	**1,002,378**

Cost Category	IP1	IP2	IP3
License Termination	485,015	469,456	583,168
Spent Fuel Management	72,381	188,278	371,370
Site Restoration	40,788	44,088	47,840
Grand Total	**598,184**	**701,822**	**1,002,378**

5 ENVIRONMENTAL IMPACTS

5.1 Environmental Impact of IPEC Decommissioning

HDI has concluded that the environmental impacts associated with planned IPEC site-specific decommissioning activities are less than and bounded by the previously issued environmental impact statements and site-specific analysis summarized in this report. 10 CFR 50.82(a)(4)(i) requires that the PSDAR include, " ... a discussion that provides the reasons for concluding that the environmental impacts associated with site-specific decommissioning activities will be bounded by appropriate previously issued environmental impact statements." The following discussion provides the reasons for reaching this conclusion and is based on previously issued environmental impact statements:

1. NUREG-0586, “Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors” (herein referred to as the GEIS) (Reference 8).
2. NUREG-1496, “Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities” (Reference 14)
3. NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 38, Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3, Final Report, Volume 1, December 2010 (herein referred to as the SEIS, Vol. 1) (Reference 15).
4. NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 38, Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3, Final, Volume 5, April 2018 (herein referred to as the SEIS, Vol. 5.) (Reference 16).
5. NUREG-1437, Revision 1, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, June 2013 (herein referred to as the SEIS, Revision 1) (Reference 17).

5.1.1 Onsite/Offsite Land Use

The NRC concluded in the GEIS (Reference 8) that the experience of plants being decommissioned has not included any need for additional land offsite. Consistent with this determination, HDI does not anticipate any changes in land use beyond the site boundary during decommissioning.

5.1.1.1 Onsite Land Use

IPEC has sufficient previously disturbed area onsite (due to construction or operations activities) for use during decommissioning.

Stormwater discharges from the site are currently regulated by an existing State Pollutant Discharge Elimination System (SPDES) Permit No. NY0004472 (Reference 18), and any construction activities that would disturb one acre or greater of soil not covered by the existing permit would require a stormwater permit from the New York State Department of Environmental Conservation (NYSDEC) prior to proceeding with the activity. The SPDES permit, and any NYSDEC stormwater permit contain best management practices (BMPs) to control sediment and erosion effect on water courses and wetlands.

HDI may elect to ship large plant components by barge using an existing dock or other landing on the east bank of the Hudson River adjacent to the operational area of IPEC. This shoreline was used during plant construction for delivery of the plant components and has continued to be used during operations for large component delivery. The dock or other landing location(s) are located on facility-owned property and would be accessed from within the operational area of the site. This land use would be for a short duration. No changes to land use patterns would result from the use of barge transportation.

HDI concludes that the impacts of IPEC decommissioning on onsite land use are bounded by the GEIS.

5.1.1.2 Offsite Land Use

Section 4.3.1 of the GEIS (Reference 8) concluded that the impacts on land are not detectable or destabilizing and are small for facilities having only onsite land use changes resulting from large component removal, structure dismantlement, and LLRW packaging and storage. These decommissioning activities will be conducted on previously disturbed land within the site boundary.

The NRC concluded in the GEIS that the experience of plants being decommissioned has not included any needs for additional land offsite. Consistent with this determination, HDI does not anticipate any changes in land use beyond the site boundary during decommissioning.

If HDI elects to use barge transportation, it is not anticipated that dredging will be required to provide enough depth for barge navigation. However, if dredging is necessary, it will be conducted under U.S. Army Corps of Engineers (USACE) and appropriate NYSDEC permits.

HDI concludes that the impacts of IPEC decommissioning on offsite land use are bounded by the GEIS.

5.1.2 Water Use

After the shutdown of IP2 and IP3, the operational demand for once-through cooling water and makeup water will be dramatically decreased. The amount of water used by the service water system after shutdown will also be reduced over time. The need for cooling water will continue to decrease as the heat load of spent fuel in the SFPs declines due to radioactive decay, and as spent fuel is relocated from the SFPs to the ISFSI.

After the shutdown of IP2 and IP3, the use of potable water will decrease commensurate with the expected decrease in site staffing levels. For these reasons, Section 4.3.2 of the GEIS (Reference 8) concluded that water use at decommissioning nuclear reactor facilities is significantly smaller than water use during operation.

The GEIS also concluded that water use during the decontamination and dismantlement phase will be greater than that during the storage phase. There are no anticipated unique water uses associated with the decommissioning of IPEC that are not addressed by the evaluation of the reference facility in the GEIS.

Therefore, HDI concludes that the impacts of IPEC decommissioning on water use are bounded by the GEIS.

5.1.3 Water Quality (Non-Radiological)

During the DECON planning and defueling periods, stormwater runoff and drainage paths will be maintained in their current configuration. Regulatory mandated programs and processes designed to minimize, detect, and contain spills will be maintained throughout the decommissioning process. Federal, state, and local regulations and permits pertaining to water quality will also remain in effect.

IPEC will continue to receive potable water from the Village of Buchanan.

Industrial and stormwater discharges to surface water from the facility are subject to the terms and conditions of the existing SPDES permit (Reference 18). Areas of one acre or more disturbed during decommissioning that are not covered by the existing permits will require new stormwater permits from the NYSDEC. In addition to the specific permit requirements, selection and implementation of BMPs for stormwater that may be generated from areas disturbed by decommissioning activities is also required.

Sanitary waste water generated at the site is currently discharged to the Village of Buchanan publicly owned treatment works (POTW) and will continue to be discharged

to this facility. As decommissioning proceeds, management of sanitary wastewater may be transitioned to temporary, contained onsite facilities with transport of the sanitary waste to offsite facilities permitted to receive, treat and dispose of the wastes.

During decommissioning, IPEC will comply with applicable regulations requiring reporting of hazardous materials spills, and reasonable precautions will be taken to prevent or mitigate spills of hazardous materials.

There are no ongoing environmental investigations under NYSDEC regulations currently occurring at IPEC, and none are known to be required. In the event contamination subject to NYSDEC reporting and remediation requirements is discovered, it will be reported to the agency and addressed through an appropriate state cleanup program or agreement with the State.

The IPEC circulating water intake structures may be abandoned in place or removed. The discharge structure may be returned to its owner,[2] abandoned in place or removed. Demolition of IPEC structures and buildings, and related earth-moving work (digging, grading, filling), has at least a limited potential to result in erosion and sedimentation that could affect water quality, but these kinds of construction activities routinely take place around operating nuclear power plants and are subject to the provisions of state-issued, and as applicable federal, permits and appropriate BMPs.

If barging is selected as a transportation method, dredging is not expected to be required. However, if dredging is necessary, it will be conducted under USACE and appropriate NYSDEC permits and required certifications (e.g., Water Quality Certification). The NRC confirmed in the final SEIS, Vol. 5 (Reference 16) the NRC's prior findings in the GEIS (Reference 8) that the impact of dredging to remove accumulated sediments in the vicinity of intake and discharge structures and to maintain barge shipping has localized effects on water quality that tend to be short-lived, and that the impact of dredging on water quality is small for all nuclear plants.

The GEIS (Reference 8) concludes that the impacts of decommissioning on non-radioactive aspects of water quality are small and will be neither detectable nor destabilizing. The SEIS, Vol. 1 (Reference 15) found that that there would be no impacts on water quality associated with IPEC decommissioning beyond those discussed in the GEIS.

Therefore, HDI concludes that the impacts of IPEC decommissioning on water quality are bounded by the GEIS.

5.1.4 Air Quality

There are many types of decommissioning activities listed in Section 4.3.4 of the GEIS (Reference 8) that have the potential to affect non-radiological air quality. For those

[2] New York State Energy Research and Development Authority (NYSERDA)

activities applicable to the DECON method, IPEC does not anticipate any activities beyond those listed in the GEIS that could potentially affect air quality. HDI will maintain existing air permits, or obtain new permits as applicable, for equipment that will be used during IPEC decommissioning. Federal, state, county and local regulations pertaining to air quality will remain in effect to regulate emissions associated with fugitive dust, criteria air pollutants, hazardous air pollutants, and ozone depleting gases.

The GEIS concluded that air quality impacts associated with decommissioning are small. The SEIS, Vol. 1 (Reference 15) found that there would be no impacts on air quality associated with IPEC decommissioning beyond those discussed in the GEIS.

Therefore, HDI concludes that the impacts of IPEC decommissioning on air quality are bounded by the GEIS.

5.1.5 Aquatic Ecology

Aquatic ecology encompasses the plants and animals in the intake structures and discharge canal, and the Hudson River. Aquatic ecology also includes the interaction of those organisms with each other and the environment. Section 4.3.5 of the GEIS (Reference 8) evaluates both the direct and indirect impacts from decommissioning on aquatic ecology.

Direct impacts can result from activities such as the removal of shoreline structures and active dredging. IPEC's shoreline structures are similar to those present at the plants listed in Table E-2 of the GEIS, and there are no apparent discriminators based on the salient characteristics (size and location) listed in Table E-5 of the GEIS (Reference 8).

The area within the IPEC site boundary disturbed by original construction includes the existing dock, other shoreline structures and areas that may be used as a barge landing. The area proposed for moving large plant components during decommissioning from the IPEC power block to a dock or barge landing is within the plant operational area and was used for similar activities during original construction and operations. The GEIS (Reference 8) concludes that for decommissioning activities that do not disturb lands beyond operational areas, the effects on aquatic ecology are not detectable or destabilizing, and that effects on aquatic ecology related to use of a dock or barge loading area and dredging for barge navigation are small.

Abandonment or removal of intake and discharge facilities and other shoreline structures, and use of a dock or barge landing, including dredging if needed, will be conducted in accordance with BMPs defined in permits issued by the NYSDEC and USACE, as applicable. The NRC concluded in the GEIS (Reference 8) and confirmed in the SEIS, Vol. 5 (Reference 16) that the impact of dredging on aquatic resources would be small because dredging occurs infrequently over a relatively short duration and affects relatively small areas.

As described in Section 5.1.2, the amount of cooling water withdrawn from the intake canal will dramatically decrease after IP2 and IP3 are shutdown and defueled, thus reducing the potential impacts from impingement and entrainment of aquatic species during the period when spent fuel continues to be stored in the SFPs and reducing the potential for thermal impacts. After transfer of the spent fuel to the ISFSI, the amount of water withdrawn will continue at a reduced flow rate as needed to support remaining decommissioning activities.

Any significant potential for sediment runoff or erosion on disturbed areas will be controlled in accordance with BMPs outlined in the current NYSDEC SPDES permit (Reference 18), and any new stormwater permit obtained from the NYSDEC.

The SEIS, Volume 1 (Reference 15) found that there would be no impacts on ecological resources associated with decommissioning beyond those discussed in the GEIS. Therefore, HDI concludes that the impacts of IPEC decommissioning on aquatic ecology are bounded by the GEIS.

5.1.6 Terrestrial Ecology

Terrestrial ecology considers the plants and animals near IPEC, as well as the interaction of those organisms with each other and the environment. Evaluations of impacts to terrestrial ecology are usually directed at important habitats and species, including plants and animals that are important to industry, recreational activities, the area ecosystems, and those protected by endangered species regulations and legislation. Section 4.3.6 of the GEIS (Reference 8) evaluates the potential impacts from both direct and indirect disturbance of terrestrial ecology.

Direct impacts can result from activities such as clearing native vegetation or filling a wetland. HDI does not anticipate disturbing habitat beyond the operational areas of the units. All dismantlement, demolition, and waste staging activities are envisioned to be conducted within the operational area of the site.

Indirect impacts may result from effects such as erosional runoff, dust or noise. Any construction activities that would disturb one acre or greater of soil would be subject to the requirements of the existing SPDES permit, or a new stormwater permit from the NYSDEC, prior to proceeding with the activity. The permits would contain BMPs to control sediment and the effects of erosion associated with the construction activity. Fugitive dust emissions will be controlled through the judicial use of water spraying. The basis for concluding that the environmental impacts of noise are bounded by the GEIS is discussed in Section 5.1.16 below.

Section 4.3.6 of the GEIS (Reference 8) concludes that if BMPs are used to control indirect disturbances and habitat disturbance is limited to operational areas, the potential impacts to terrestrial ecology are small. As discussed above, there are no unique disturbances to the terrestrial ecology anticipated during the decommissioning

of IPEC. Accordingly, HDI concludes that impacts of decommissioning activities within the IPEC operational area would be small.

An existing dock or a barge landing at the Hudson River shoreline within the operational area may be used to transfer large plant components and other materials to barges during decommissioning. These areas have been used during original construction and plant operation for similar activities. Any transfer of large plant components, soil or debris from demolition activities during decommissioning would be of short duration and would have minimal impact on terrestrial resources because the components will be transported to the barge loading area within the previously-disturbed operational area of the site that contains no unusual, rare, or sensitive plants or animals, and no important or sensitive habitats. Because no high-value terrestrial habitats will be disturbed, impacts are expected to be small and should not require mitigation beyond routine construction BMPs.

The SEIS, Vol. 1 (Reference 15) found that there would be no impacts on ecological resources associated with decommissioning beyond those discussed in the GEIS. Therefore, HDI concludes that the impacts of IPEC decommissioning on terrestrial ecology, including those outside of the operational area, are small and bounded by the GEIS.

5.1.7 Threatened and Endangered Species

Section 4.3.7 of the GEIS (Reference 8) does not make a generic determination of the impact of decommissioning on threatened and endangered species, and it concludes that the adverse impacts and associated significance of the impacts must be determined on a site- specific basis. The NRC noted in the GEIS that impacts to threatened and endangered species are expected to be minor and nondetectable if decommissioning activities are confined to site operational areas.

Table 5.1 identifies federally listed species potentially occurring in the vicinity of IPEC and the effect determinations found by the NRC in the SEIS, Vol. 5 (Reference 16).

TABLE 5.1 Effect Determinations for Federally Listed Species and Critical Habitats related to Indian Point Energy Center

Listed Species(a)	Common Name	Federal Status	SEIS Effect Determination
Acipenser brevirostrum	Shortnose Sturgeon	Endangered	May affect, not likely to jeopardize continued existence of
Acipenser oxyrinchus	Atlantic Sturgeon	Endangered/ Threatened	May affect, not likely to jeopardize continued existence of
Clemmys muhlenbergii	Bog Turtle	Threatened	No effect
Myotis septentrionalis	Northern Long-eared Bat	Threatened	Not likely to adversely affect
Myotis sodalis	Indiana Bat	Endangered	Not likely to adversely affect
Critical Habitat			
New York Bight DPS[3]	Atlantic Sturgeon		Not likely to destroy or adversely modify

A review of threatened and endangered terrestrial species in the IPEC area was presented in the SEIS, Vol. 1 (Reference 15) and further discussed in the SEIS, Vol. 5 (Reference 16).

In 2008, the State of New York designated 194 species as endangered, threatened, of special concern (animals) or rare (plants), in Westchester County (SEIS, Vol. 1: Reference 15). An updated list of State of New York threatened, endangered, special concern and rare terrestrial species potentially present in the vicinity of IPEC was requested from the New York Natural Heritage Program (NYNHP) in November 2019. The list from NYNHP will be reviewed to confirm that it is similar to the list of species potentially present in the vicinity of IPEC issued in 2008.

The federally-listed threatened and endangered species potentially present in the vicinity of IPEC that were identified and addressed in the SEIS, Vol. 5 (Reference 16) have been confirmed as current through review of available U.S. Fish and Wildlife Service (USFWS) on-line information resources.[4]

5.1.7.1 Protected Terrestrial Species

A review of threatened and endangered terrestrial species in the IPEC area was presented in the SEIS, Vol. 1 (Reference 15) and further addressed in the SEIS, Vol. 5 (Reference 16).

In 2010, the NRC noted that three federally-listed species were present in the vicinity of IPEC: the endangered Indiana Bat (Myotis sodalis); threatened Bog Turtle

[3] DPS - Distinct Population Segment
[4] USFWS Information for Planning and Consultation (IPaC) Environmental Conservation Online System (ECOS).

(Clemmys muhlenbergii); and candidate (for listing) New England Cottontail rabbit (Sylvilagus transitionalis). NRC concluded that continued operation of IP2 and IP3 was not expected to adversely affect any federally-listed, threatened or endangered terrestrial species during the license renewal term (SEIS, Vol. 1; Reference 15).

The NRC concluded that the New England Cottontail rabbit was unlikely to occur on or in the vicinity of IPEC (SEIS, Vol. 1; Reference 15). In 2015, the USFWS issued a determination that listing of the New England Cottontail rabbit as an endangered species was not warranted. The State of New York continues to list the New England Cottontail rabbit as a species of special concern.

The Northern Long-Eared Bat (NLEB) (Myotis septentrionalis) was added to the federal list of endangered species in April 2015. In June 2015 Entergy submitted information to the NRC relevant to the potential for impacts to the NLEB and Indiana Bat related to license renewal (Reference 19). The NRC reinitiated consultation with the USFWS under Section 7 of the Endangered Species Act of 1973, as amended, for the NLEB and Indiana Bat, and issued a biological assessment with USFWS concurrence concluding that the proposed IP2 and IP3 license renewal may affect, but is not likely to adversely affect, the NLEB and Indiana Bat (SEIS, Vol. 5: 616).

The NRC concluded in the SEIS, Vol. 5 (Reference 16) that the Bog Turtle is unlikely to occur on or in the immediate vicinity of the site and further determined that license renewal (including refurbishment if conducted) would have no effect on the Bog Turtle.

There appears to be sufficient space within the operational area for all decommissioning activities and temporary storage of materials and equipment. If barge transportation is used, moving large plant components within the operational area to the barge landing will likely involve heavy equipment and could produce some minor soil disturbance. These activities will be of short duration and take place in previously disturbed areas on IPEC-owned land that has very little value as wildlife habitat. No protected terrestrial species will be affected by this activity.

5.1.7.2 Protected Aquatic Species

In 2010, the NRC identified the Shortnose Sturgeon (Acipenser brevisrostrum) as a federally-listed endangered species, and the Atlantic Sturgeon (Acipenser oxyrinchus) as a candidate species, present in the Hudson River in the vicinity of IPEC and concluded that impacts from continued operation and maintenance of IPEC for the license renewal term was SMALL (SEIS, Vol. 1; Reference 15).

The New York Bight Distinct Population segment of the Atlantic Sturgeon (along with the Gulf of Maine, Chesapeake, Carolina and South Atlantic DPS) was federally-listed as a threatened species in April 2012. In January 2013, the National Marine Fisheries Service (NMFS) issued a Biological Opinion (Reference 20) concluding that the

continued operation of IP2 and IP3 was likely to adversely affect but not likely to jeopardize the continued existence of the Shortnose and Atlantic Sturgeons.

In 2016, NRC staff prepared and submitted to the NMFS an assessment evaluating the potential effects of continued IP2 and IP3 operation through the proposed license renewal term on proposed Atlantic Sturgeon critical habitat in the Hudson River and concluded that the proposed license renewal would not inhibit the growth, development, recruitment, or survival of juvenile, subadult or adult Atlantic Sturgeon or otherwise appreciably diminish the value of the proposed critical habitat (Reference 21).

In August 2017, the NMFS issued a conference report concluding that "effects to the proposed critical habitat for the Atlantic Sturgeon population of the New York Bight Distinct Population Segment (DPS) are insignificant and discountable" and the effects of license renewal are not likely to adversely affect the critical habitat proposed for the New York Bight DPS of Atlantic Sturgeon (Reference 22).

In the SEIS, Vol. 5 (Reference 16), the NRC documented the consultation process and the several NMFS and NRC findings, and concluded that the license renewal may affect but was not likely to jeopardize the continued existence of the Shortnose and Atlantic sturgeons and was not likely to destroy or adversely affect critical habitat of the Atlantic Sturgeon population of the New York Bight.

In the GEIS (Reference 8), the NRC anticipated that the potential impacts of decommissioning on aquatic threatened or endangered species will normally be no greater than and likely far less than the potential impacts of plant operations because the cooling system is not used at a unit undergoing decommissioning.

After permanent reactor shutdown and defueling, the potential for environmental impacts due to impingement and entrainment will be reduced by the dramatically lower flow rates and thermal differentials associated with decommissioning activities. Discharges from the facility will be reduced to those associated with continued operation of the SFPs for several years, discharges associated with decommissioning activities, and stormwater. Flow rates will be further reduced after transfer of the spent fuel from the SFPs to the ISFSI, and shutdown of the SFPs. Discharges during decommissioning will continue to be regulated by the SPDES permit (Reference 18) or new NYSDEC stormwater permits, as applicable.

If selected as a transportation option, barging large plant components from IPEC on the Hudson River and beyond is not expected to require dredging for barge navigation; however, if dredging is needed, it will be conducted in accordance with applicable federal, state and local permits and certifications that include consideration of environmental impacts to threatened and endangered species. In the SEIS, Revision 1 (Reference 17), the NRC noted that if dredging could affect threatened or endangered

species or critical habitat, as established under the Endangered Species Act, the USACE must consult with the USFWS or the NMFS before it makes a permit decision. Dredging would be conducted in accordance with BMPs defined in the applicable permits issued by the NYSDEC and USACE.

5.1.7.2 Conclusion

HDI anticipates that decommissioning activities at IPEC will not encroach on the habitat of any state or federally-listed terrestrial species. Any indirect (disturbance-related) impacts from construction noise and human activity are expected to be localized, of short duration, and ecologically insignificant.

When the details of decommissioning activities, such as demolition or disturbance of land areas that could affect a protected species have been finally determined and scheduled, if potential impacts associated with those activities are considered unbounded by existing environmental impact statements and evaluations, the site-specific assessment of environmental impacts to protected species in the PSDAR will be updated, or provided through a separate and appropriate permit or certification process (e.g., USACE permitting).

Based on the site-specific information presented in this section, and conclusions reached by the NRC in the GEIS (Reference 8), SEIS, Vol. 1 (Reference 15, SEIS, Vol. 5 (Reference 16) and SEIS, Revision 1, (Reference 17) HDI concludes that IPEC decommissioning activities are unlikely to significantly affect any threatened or endangered species, and will have no effect on any designated critical habitat.

Therefore, HDI concludes that the impacts of IPEC decommissioning on threatened and endangered species are analogous to those presented in the SEIS, Vols. 1 and 5, and the SEIS, Revision 1, and are therefore bounded by them.

5.1.8 Radiological

The GEIS (Reference 8) considered radiological doses to workers and members of the public when evaluating the potential consequences of decommissioning activities.

5.1.8.1 Occupational Dose

The occupational radiation exposure to IPEC plant personnel will be maintained ALARA and below the occupational dose limits in 10 CFR Part 20 during decommissioning. The need for plant personnel to routinely enter radiological areas to conduct maintenance, calibration, inspection, and other activities associated with an operating plant will be reduced, thus it is expected that the occupational dose to plant personnel will significantly decrease after the plant is permanently shutdown and defueled.

IPEC will be within the range of the cumulative occupational dose estimates for decommissioning PWR plants of 560 - 1,215 person-rem (per reactor) provided in Table 4-1 of the GEIS (Reference 8). Each of the three IPEC units are bounded by the PWRs evaluated in the GEIS, and because the ALARA program will be maintained to ensure that occupational dose is maintained ALARA and well within 10 CFR Part 20 limits.

HDI concludes that the impacts of IPEC decommissioning on occupational dose are small and are bounded by the GEIS.

5.1.8.2 Public Dose

Section 4.3.8 of the GEIS considered doses from liquid and gaseous effluents when evaluating the potential impacts of decommissioning activities on the public. Table G-15 of the GEIS compared effluent releases between operating facilities and decommissioning facilities and concluded that decommissioning releases are lower. The GEIS also concluded that the collective dose, and the dose to the maximally exposed individual from decommissioning activities, are expected to be well within the regulatory standards in 10 CFR Part 20 and Part 50. In Section 7.1 of the SEIS, Vol. 1 (Reference 15), no new or significant information was identified during the NRC's independent review of IPEC to indicate that public radiation dose impacts would occur during decommissioning beyond those discussed in the GEIS.

A plume of radiologically-contaminated ground water associated with the IP1 and IP2 spent fuel pools was discovered in 2005, fully investigated and subject to an ongoing Long-Term Monitoring Program (LTMP). The primary contaminants in the plume are tritium and strontium-90. The selected remedy is Monitored Natural Attenuation (MNA) being addressed under the oversight of the NRC. NRC has concluded that the LTMP has been effectively implemented and conforms to regulatory requirements that protect public health and safety and the environment (SEIS, Vol.5; Reference 16). HDI will continue the LTMP, including provisions of the program intended to detect inadvertent releases that may affect ground water, until the objectives of the selected MNA remedy are achieved.

The expected radiation dose to the public from IPEC decommissioning activities will be maintained within regulatory limits and below comparable levels when the plants were operating through the continued application of radiation protection and contamination controls, combined with the reduced source term available in the facility. Also, Section 7.1 of the SEIS, Vol. 1 (Reference 15) concluded that there would be no public radiation dose impacts associated with decommissioning of IPEC beyond those discussed in the GEIS (Reference 8).

HDI concludes that the impacts of IPEC decommissioning on public dose are small and are bounded by the GEIS.

5.1.9 Radiological Accidents

The likelihood of a large offsite radiological release that impacts public health and safety after IP2 and IP3 are permanently shutdown and defueled is considerably lower than the likelihood of a release from the plants during power operation. This is because most of the potential releases associated with power operation are not relevant after the fuel has been removed from the reactor. Furthermore, handling of spent fuel assemblies will continue to be controlled under work procedures designed to minimize the likelihood and consequences of a fuel handling accident. In addition, emergency plans and procedures will remain in place to protect the health and safety of the public while the possibility of significant radiological releases exists.

Section 4.3.9 of the GEIS (Reference 8) assessed the range of possible radiological accidents during decommissioning and separated them into two (2) general categories; fuel related accidents and non-fuel related accidents. Fuel related accidents have the potential to be more severe, and zirconium fire accidents could produce offsite doses that exceed the EPA's protective action guides. As part of its effort to develop generic, risk-informed requirements for decommissioning, the NRC staff performed analysis of the offsite radiological consequences of beyond-design-basis SFP accidents using fission product inventories at 30 and 90 days, and two (2), five (5), and ten (10) years. The results of the study indicate that the risk at SFPs is low, and well within the NRC's Quantitative Health Objectives. The generic risk is low primarily due to the very low likelihood of a zirconium fire.

The potential for decommissioning activities to result in radiological releases not involving spent fuel (i.e., releases related to decontamination, dismantlement, and waste handling activities) will be minimized by use of procedures and methods designed to minimize the likelihood and consequences of such releases.

Therefore, HDI concludes that the impacts of IPEC decommissioning on radiological accidents are small and are bounded by the previously issued GEIS.

5.1.10 Occupational Issues

Occupational issues are related to human health and safety. Section 4.3.10 of the GEIS (Reference 8) evaluates physical, chemical, ergonomic, and biological hazards. HDI has reviewed these occupational hazards in the GEIS and concluded that the decommissioning approach chosen for IPEC poses no unique hazards from those evaluated in the GEIS. HDI will continue to maintain appropriate administrative controls and requirements to ensure occupational hazards are minimized and that applicable federal, state, and local occupational safety standards and requirements continue to be met.

Section 4.3.10 in the GEIS concluded that impacts due to occupational issues would be small for all plants based on strict adherence to NRC and Occupational Safety and Health Administration (OSHA) standards, practices, and procedures. Therefore, HDI

concludes that the impacts of IPEC decommissioning on occupational issues are bounded by the GEIS.

5.1.11 Cost

Decommissioning costs for IPEC are discussed in Section 4.0 and in Enclosure 1 to this report. Section 4.3.11 of the GEIS recognizes that an evaluation of decommissioning cost is not a National Environmental Policy Act (NEPA) requirement. Therefore, a bounding analysis is not applicable.

5.1.12 Socioeconomics

Decommissioning of IPEC is expected to result in negative socioeconomic impacts. As IPEC ceases operation and transitions through the phases of decommissioning, an overall decrease in site workforce and tax payments will occur. The lost wages of these site staff will result in decreases in revenues available to support the local economy and local tax authorities. Some laid-off workers may relocate, thus potentially impacting the local cost of housing and availability of public services.

Section 4.3.12 of the GEIS (Reference 8) evaluated changes in workforce and population changes, changes in local tax revenue, and changes in public services. The decommissioning method selected for IPEC is DECON, with decommissioning planned to begin shortly after shutdown. The GEIS noted that when decommissioning begins shortly after shutdown, the impact of facility closure is mitigated, with less immediate negative impacts than would occur with the SAFSTOR and ENTOMB decommissioning methods.

The GEIS concluded that socioeconomic impacts of decommissioning are neither detectable nor destabilizing, and that mitigation measures are not warranted. Therefore, HDI concludes that the impacts of IPEC decommissioning on socioeconomic impacts are bounded by the GEIS.

5.1.13 Environmental Justice

Executive Order 12898 dated February 16, 1994, (Reference 23) directs federal executive agencies to make achieving environmental justice a part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations. In a policy statement published in the Federal Register on August 24, 2004 (69 FR 52040) the NRC committed to meet the general goals of the executive order related to its regulatory or licensing actions through the NEPA review process (Reference 24).

Section 4.3.13 in the GEIS (Reference 8) determined environmental justice to be an environmental impact area for which no generic conclusion could be determined due to its site-specific nature. Therefore, the GEIS indicates that site-specific

assessments for each decommissioning nuclear power plant must be prepared.

HDI conducted a site-specific assessment of environmental justice as it relates to the effects of IPEC decommissioning. HDI examined the geographic distribution of minority and low-income populations within a 50-mile radius of IPEC using the 2013-2017 American Community Survey 5-year estimates. Census block groups containing minority populations were identified and were concentrated in the larger census defined urban areas, such as the New York-Newark urbanized area located from 25 to 50 miles south of IPEC. The nearest minority population is located about 1 mile north of IPEC in Peekskill, NY. Census block groups containing low-income populations were also concentrated in the census defined urbanized areas located 25 to 50 miles south of the site. The nearest low-income population is in Peekskill approximately 2 miles north of IPEC. The locations and population characteristics of minority and low-income populations are similar to those evaluated by the NRC in the SEIS, Vol. 5 (Reference 16).

HDI has determined that decommissioning impacts to all resource areas would be small, indicating that the effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. Because no member of the public will be substantially affected, there can be no disproportionately high and adverse impacts on minority and low-income populations resulting from the decommissioning of IPEC. Based on these site-specific findings, HDI concludes that the impacts of IPEC decommissioning on minority and low-income populations are small.

5.1.14 Cultural, Historic and Archeological Resources

Section 4.3.14 in the GEIS (Reference 8) determined that potential effects of decommissioning on cultural, historical and archaeological resources would be small for all plants when the decommissioning activities are confined to the operational area. However, impacts outside the operational area "must be determined through site-specific analysis."

A review of New York State Historic Preservation Office (NYSHPO) regarding cultural, historical, and archaeological resources site showed that there were no previously recorded archeological or above-ground historic architectural resources identified on the IPEC property (SEIS, Vol. 1: Reference 15). The NRC concluded that the power block area and other areas south and east of the power block have been disturbed during site preparation and construction and have little to no potential for archeological resources. The NRC also found a potential for portions of the property not disturbed by construction activities south of the power block area and in the northeast portion of the IPEC property to contain intact subsurface archeological deposits (SEIS, Vol. 5: Reference 16).

HDI anticipates that decommissioning activities will take place within the IPEC operational and previously disturbed areas. In the event that ground disturbance is proposed in areas outside operational and previously disturbed areas, or historical or archeological resources are encountered during excavation, assessments and consultation with NYSHPO will be conducted, as appropriate.

Therefore, HDI concludes that potential for impacts to cultural, historical and archaeological resources is bounded by the GEIS.

5.1.15 Aesthetic Issues

During decommissioning, the impact of activities on aesthetic resources will be temporary and remain consistent with the aesthetics of an industrial site. In most cases, Section 4.3.15 of the GEIS (Reference 8) concludes that impacts such as dust, construction disarray, and noise would not easily be detectable offsite.

The GEIS concluded that the demolition and dismantlement of structures during decommissioning using the DECON method could result in aesthetic impacts improving fairly rapidly as a result of the removal of structures and restoration of the site. The GEIS concludes that the removal of structures is generally considered beneficial to the aesthetic impacts of the site, and that the potential aesthetic impacts of decommissioning are small.

Therefore, HDI concludes that the impacts of IPEC decommissioning on aesthetic issues are bounded by the GEIS.

5.1.16 Noise

General noise levels during the decommissioning process are not expected to be any more severe than during refueling outages and are not expected to present an audible intrusion on the surrounding community. Some decommissioning activities may result in higher than normal onsite noise levels (i.e., some types of demolition activities). However, these noise levels would be temporary and are not expected to present an audible intrusion on the surrounding community.

Section 4.3.16 of the GEIS (Reference 8) indicates that noise impacts are not detectable or destabilizing and makes a generic conclusion that potential noise impacts are small. Based on the standard decommissioning approach proposed for IPEC, HDI concludes that the impacts of IPEC decommissioning on noise are bounded by the GEIS.

5.1.17 Transportation

The transportation impacts of decommissioning are dependent on the number of shipments to and from the site, the types of shipments, the distance the material is shipped, and the radiological waste quantities and disposal plans. The shipments from the site would be primarily radioactive waste and non-radioactive waste associated with dismantlement and disposal of SSCs.

The total estimated cubic feet of radioactive waste associated with IPEC decommissioning destined for land disposal at an LLRW (Class A, B or C) disposal facility, or GTCC geologic repository is summarized below:

- Class A: 7,136,775 cubic feet
- Class B: 2,413 cubic feet
- Class C: 2,236 cubic feet
- GTCC: 4,534 cubic feet

The estimated LLRW volume (Class A, B, and C) for IPEC that is destined for land disposal will be approximately 7.1 million cubic feet using the DECON method. Of this volume, approximately 3.3 million cubic feet is estimated to be soil contaminated at very low levels.

Estimated waste volumes by unit are provided below.

Waste	Class	IP-1 Waste Volume (cubic feet)	IP-2 Waste Volume (cubic feet)	IP-3 Waste Volume (cubic feet)
Low-Level Radioactive Waste	A	3,586,546	1,365,109	2,185,120
	B	1,411	501	501
	C	1,088	574	574
Greater than Class C Waste	GTCC	412	2,061	2,061
Total		3,589,457	1,368,245	2,188,256
Total LLRW		3,589,045	1,366,184	2,186,195

The waste volumes requiring disposal as LLRW are anticipated to exceed the high-end estimate listed in Table 4-7 of the GEIS (Reference 8) on a per unit basis due to comparatively greater volumes of very low-level radioactive waste. The greater volumes are primarily the result of the volume of very low-level contaminated soil. The NRC noted in the GEIS (Reference 8) that the volumes and number of shipments evaluated for transportation impacts were received from a limited number of plants and may have been significantly higher or lower than the average facility for each reactor type.

HDI's objective for decommissioning of IPEC under the DECON method is to achieve unrestricted release and is anticipated to include removal and offsite disposal of most, if not all, above grade structures and contaminated soil. The NRC recognized in the GEIS (Reference 8) that facilities being decommissioned using the DECON method with an objective of achieving unrestricted release, including removal of all structures, could result in disposal of considerable volumes of radioactive and non-radioactive waste.

HDI must comply with applicable regulations when shipping radioactive waste from decommissioning. The NRC has concluded in Section 4.3.17 of the GEIS that these regulations are adequate to protect the public against unreasonable risk from the transportation of radioactive materials. Shipments will occur over an extended period of time and will not result in significant changes to local traffic density or patterns, or significant dose to workers or the public.

A portion of the waste may be removed from the site by barge and transported to an appropriate offsite location where it will be transferred to railcars or trucks for shipment to an appropriate disposal facility. If implemented, barge transportation will reduce the number of shipments from the site over local roadways. The use of barge transportation will increase marine vessel traffic in the area. It is expected that these activities will not cause a navigational safety hazard or a substantial delay in the normal movements of commercial or recreational vessels.

Shipments of non-radioactive wastes from the site are not expected to result in measurable deterioration of affected roads or a destabilizing increase in traffic density.

The GEIS (Reference 8) concludes that both non-radiological and radiological impacts of decommissioning transportation are not detectable or destabilizing. The NRC reached a generic conclusion that for all plants, the potential transportation impacts are small. No unique features or site-specific conditions are present at IPEC that would alter these findings. Therefore, HDI concludes that the potential impacts of IPEC decommissioning on transportation are bounded by the GEIS.

5.1.18 Irreversible and Irretrievable Commitment of Resources

Irreversible commitments are commitments of resources that cannot be recovered, and irretrievable commitments of resources are those that are lost for only a period of time.

Uranium is a natural resource that is irretrievably consumed during power operation. After the plants are permanently shutdown, uranium is no longer consumed. The use of the environment (air, water, land) is not considered to represent a significant irreversible or irretrievable resource commitment, but rather a relatively short-term investment. Since the IPEC site will be decommissioned to meet the unrestricted release criteria found in 10 CFR 20.1402, the land is not considered an irreversible resource. The only irretrievable resources that would occur during decommissioning would be materials used to decontaminate the facility (i.e., rags, solvents, gases, and tools), and the fuel used for decommissioning activities and transportation of materials to and from the site. However, the use of these resources is minor.

The NRC concluded in Section 4.3.18 of the GEIS (Reference 8) that the impacts of decommissioning on irreversible and irretrievable commitments of resources are small. Therefore, HDI concludes that the impacts of IPEC decommissioning on irreversible and irretrievable commitment of resources are bounded by the GEIS.

5.2 Environmental Impacts of License Termination

In accordance with 10 CFR 50.82(a)(9), the site LTP will be developed and submitted for NRC at least two (2) years prior to the expected date for partial site release. According to the schedule provided in Section 3 of this PSDAR, an LTP for the IPEC site will be developed to support a planned partial site release date in 2033. The LTP is scheduled to be submitted to the NRC in 2030. NRC final license termination will occur following the removal of spent nuclear fuel and GTCC waste from the site as well as completion of ISFSI decommissioning. As shown on the schedule provided in Section 3, ISFSI decommissioning is planned to be completed in 2062At that time, a supplemental environmental report will be submitted as required by 10 CFR 50.82(a)(9). While detailed planning for license termination activities will not be performed until after completion of most of the DECON decommissioning activities for site areas except the ISFSI, the absence of any unique site-specific factors, significant groundwater contamination, unusual demographics, or impediments to achieving unrestricted release suggest that impacts resulting from license termination will be similar to those evaluated in NUREG-1496 (Reference 14).

5.3 Discussion of Decommissioning in the SEIS

Postulated impacts associated with decommissioning are discussed in Section 7.0 of the SEIS, Vol. 1 (Reference 15), which identified six (6) issues related to decommissioning as follows:

- Radiation Doses
- Waste Management
- Air Quality
- Water Quality
- Ecological Resources
- Socioeconomic Impacts

The NRC staff did not identify any new and significant information during their independent review of the IPEC license renewal environmental report at that time, the site audit, or the scoping process for license renewal. Therefore, the NRC concluded that there are no impacts related to these issues beyond those discussed in the SEIS, Vol. 1 (Reference 15), SEIS, Vol. 5 (Reference 16) or the GEIS (Reference 8) for decommissioning. For the issues above, the license renewal and decommissioning GEIS' concluded the anticipated impacts are small. The NRC found no site-specific issues related to decommissioning and there are no decommissioning activities contemplated for IPEC that would alter that conclusion.

5.4 Additional Considerations

While not quantitative, the following considerations are relevant to concluding that decommissioning activities will not result in significant environmental impacts not previously reviewed:

- The release of effluents will continue to be controlled by license requirements and plant procedures.
- IPEC will continue to comply with the Offsite Dose Calculation Manual, Radiological Environmental Monitoring Program, and the Groundwater Protection Initiative Program during decommissioning.
- Releases of non-radiological effluents will continue to be controlled per the requirements of the SPDES permit (Reference 18) and applicable NYSDEC permits.
- Systems used to treat or control effluents during power operation will either be maintained or replaced by temporary or mobile systems for the decommissioning activities.
- Radiation protection principles used during plant operations will remain in

effect during decommissioning.

- Sufficient decontamination and source term reduction prior to dismantlement will be performed to ensure that occupational dose and public exposure will be maintained below applicable limits.
- Transport of hazardous and or radioactive waste will be in accordance with plant procedures, applicable federal regulations, and the requirements of the receiving facility.

Site access control during decommissioning will minimize or eliminate radiation exposure pathways to the public.

Additionally, NUREG-2157 (Reference 25) found that the generic environmental impacts of ongoing spent fuel storage are small.

5.5 Conclusions

Based on the above discussions, HDI concludes that the environmental impacts associated with planned IPEC site-specific decommissioning activities will be bounded by appropriate, previously issued environmental impact statements. Specifically, the environmental impacts are bounded by the GEIS (Reference 8), SEIS, Vol. 1 (Reference 15), SEIS, Vol. 5. (Reference 16), SEIS, Revision 1 (Reference 17) and the site-specific analyses summarized in this report.

1. The postulated impacts associated with the decommissioning method chosen, DECON, have already been considered in the SEIS and GEIS, or addressed in the site-specific analyses summarized in this report.
2. There are no unique aspects of IPEC or of the decommissioning techniques to be utilized that would invalidate the conclusions reached in the SEIS and GEIS.
3. The methods assumed to be employed to dismantle and demolish IPEC are standard construction-based techniques fully considered in the SEIS and GEIS.

Therefore, it can be concluded that the environmental impacts associated with the site-specific decommissioning activities for IPEC will be bounded by appropriate previously issued environmental impact statements.

10 CFR 50.82(a) (6) (ii) states that licensees shall not perform any decommissioning activities, as defined in 10 CFR 50.2 that result in significant environmental impacts not previously reviewed. No such impacts have been identified.

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Enclosure 1: IPEC Site-Specific Decommissioning Cost Estimate

Indian Point Energy Center
DECON Site-Specific Decommissioning Cost Estimate

Prepared for
Holtec Decommissioning International, LLC

Prepared by
Comprehensive Decommissioning International, LLC

Table of Contents

ACRONYM LIST

ACM	Asbestos Containing Material
ALARA	As Low As Reasonably Achievable
BOY	Beginning of Year
BOE	Basis of Estimate
CDI	Comprehensive Decommissioning International, LLC
CFR	Code of Regulations
CPM	Critical Path Method
DCE	Decommissioning Cost Estimate
DECON	A Method of Decommissioning defined by the NRC
DOE	Department of Energy
ENOI	Entergy Nuclear Operations, Inc.
ENIP2	Entergy Indian Point 2, LLC
ENIP3	Entergy Indian Point 3, LLC
Entergy	Entergy Corporation
ENTOMB	A Method of Decommissioning defined by the NRC
GEIS	Generic Environmental Impact Statement
GTCC	Greater Than Class C
HDI	Holtec Decommissioning, International, LLC
Holtec	Holtec International
Holtec IP2	Holtec Indian Point 2, LLC
Holtec IP3	Holtec Indian Point 3, LLC
HSA	Historical Site Assessment
IAEA	International Atomic Energy Agency
IP1, 2 & 3	Indian Point Units 1, 2 and 3
IPEC	Indian Point Energy Center
ISDC	International Structure for Decommissioning Costing
ISFSI	Independent Spent Fuel Storage Installation
LLRW	Low Level Radioactive Waste
LTA	License Transfer Application
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MWe	Megawatts Electric
MWt	Megawatts Thermal
MSS	Master Summary Schedule
MTU	Metric Tons of Uranium
MSS	Master Summary Schedule
NDT	Nuclear Decommissioning Trust
NEA	Nuclear Energy Agency
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
NUREG	Nuclear Regulatory Commission technical report designation
O&M	Operations and Maintenance

IPEC	Indian Point Energy Center
PWR	Pressurized Water Reactor
RPV	Reactor Pressure Vessel
PSDAR	Post Shutdown Decommissioning Activities Report
RRR	Real Rate of Return
RSSI	Radiation Survey and Site Investigation
RPV	Reactor Pressure Vessel
RVI	Reactor Vessel Internals
SAFSTOR	A Method of Decommissioning defined by the NRC
SFP	Spent Fuel Pool
SME	Subject Matter Expert
SNF	Spent Nuclear Fuel
SSC	Structures, Systems and Components
US	United States
WBS	Work Breakdown Structure
WCS	Waste Control Specialists

SUMMARY

This report provides site-specific Decommissioning Cost Estimates (DCE's) estimating the costs to decommission the Indian Point Entergy Center (IPEC) Units 1, 2 and 3 (IP1, 2 & 3). This DECON DCE provides the Holtec Decommissioning International, LLC (HDI) site-specific estimates using the DECON method for decommissioning that is planned to be implemented following the license transfers and sale of IP1, 2 & 3 from Entergy to Holtec. This DCE is included as an enclosure to the IP1, 2 & 3 HDI DECON Post-Shutdown Decommissioning Activities Report (PSDAR) that describes HDI's decommissioning plan. These estimates have been prepared in accordance with the requirements of 10 CFR 50.82(a)(8)(iii).

Costs in this DCE were determined based on HDI's selection of the DECON method for decommissioning. These estimates are based on current and/or assumed regulatory requirements, site conditions, basis of estimate assumptions, low-level radioactive waste disposal standards, high-level radioactive waste management options, and site restoration requirements. The methods utilized to estimate decommissioning costs were based on the professional judgment of experienced SMEs considering the nature of the work, degree of scope definition and the availability of quantifiable cost and pricing data. The decommissioning costs presented in this report are reported in 2019 dollars. Escalation of future decommissioning costs over the remaining decommissioning project life-cycle are excluded.

HDI's detailed decommissioning project schedule, implementing the DECON method, is used as the foundation for developing the decommissioning cost estimate model and the risk model. The schedule baseline is a detailed Critical Path Method (CPM) schedule developed with input from cost estimators, key decommissioning subcontractors and SMEs. The schedule and cost estimates are based on the International Structure for Decommissioning Costing (ISDC) for Nuclear Installations Work Breakdown Structure (WBS) and corresponding WBS dictionary.

This DECON DCE demonstrates that adequate funding is available in the Nuclear Decommissioning Trust (NDT) fund for each unit to complete license termination for IP1, 2 & 3. In addition to the license termination costs site restoration and spent nuclear fuel management costs are included in the estimates; however, per regulatory requirements, the non-radiological estimates are segregated and listed separately. The HDI request for NRC approval of an exemption from the requirements of 10 CFR 50.82(a)(8)(i)(A) to use NDT funds for spent fuel management and site restoration activities is being submitted by HDI separately.

HDI's costs to decommission each of the three IPEC units, safeguard the spent fuel until it can be transferred to the Department of Energy (DOE) and restore the impacted area of the site are summarized by decommissioning activity and by cost category in the tables below.

HDI Decommissioning Cost Estimate Summary (thousands of 2019 dollars)

Decommissioning Activity	IP1	IP2	IP3
Decontamination			
Removal	162,256	186,173	197,721
Packaging	11,175	14,300	15,964
Transportation	41,043	19,637	28,135
Disposal	156,222	105,940	131,180
Off-site Waste Processing			
Program Management	119,726	144,384	182,529
Corporate A&G			
Spent Fuel (Direct Expenditures)	66,066	162,233	344,285
Insurance and Regulatory Fees	9,177	12,511	12,511
Energy	11,914	11,914	11,914
Characterization and Licensing Surveys	8,808	8,808	26,635
Property Taxes		22,537	38,676
Miscellaneous Equipment / Site Services	11,797	13,386	12,827
Spent Fuel Pool Isolation			
Grand Total	598,184	701,822	1,002,378

Cost Category	IP1	IP2	IP3
License Termination	485,015	469,456	583,168
Spent Fuel Management	72,381	188,278	371,370
Site Restoration	40,788	44,088	47,840
Grand Total	**598,184**	**701,822**	**1,002,378**

1 INTRODUCTION

This report presents a Site-Specific Decommissioning Cost Estimate (DCE), in accordance with the requirements of 10 CFR 50.82(a)(8)(iii), for the decommissioning of the Indian Point Energy Center (IPEC) Unit Nos. 1, 2 and 3 (IP1, 2 & 3) following the scheduled permanent cessation of plant operations and permanent removal of fuel from the IP2 and IP3 reactor vessels. This update provides the Holtec Decommissioning International (HDI) site-specific DCE using the DECON method that is planned to be implemented following the license transfers and sale of the entities that own IP1, 2 & 3 from Entergy to Holtec.

On January 31, 1996, the US NRC issued an order to authorize decommissioning of IP1 and Amendment No. 45 to License No. DPR-5, which revised the license to possession-only status (Reference 1). In accordance with 10 CFR 50.81(a)(1)(iii), certification of permanent cessation of operations of IP1 is deemed to have been submitted. In the same order, the staff required the licensee to submit a "detailed dismantling plan" for NRC review prior to commencing major dismantlement activities at IP1. Following the 1996 decommissioning rulemaking, the PSDAR satisfies this obligation (61 Fed. Reg. 39,278,39,291 (July 29, 1996)).

By letter dated February 8, 2017, Entergy Nuclear Operations, Inc. (ENOI), Entergy Nuclear Indian Point 2, LLC (ENIP2), and Entergy Nuclear Indian Point 3, LLC (ENIP3) notified the Nuclear Regulatory Commission (NRC) that it had decided to permanently cease power operations at IP2 and IP3 by April 30, 2020 and April 30, 2021, respectively (Reference 2).

By letter dated November 21, 2019, ENOI, on behalf of itself, Entergy Nuclear Indian Point 2, LLC (ENIP2), Entergy Nuclear Indian Point 3, LLC (ENIP3), Holtec International (Holtec), and HDI, requested that the U.S. Nuclear Regulatory Commission (NRC) consent to: (1) the transfer of control of Provisional Operating License No. DPR-5 and Renewed Facility Operating License Nos. DPR-26 and DPR-64 for IP1, 2 & 3, as well as the general license for the IP1, 2 & 3 Independent Spent Fuel Storage Installation (ISFSI) to Holtec subsidiaries to be known as Holtec Indian Point 2, LLC (Holtec IP2) and Holtec Indian Point 3, LLC (Holtec IP3); and (2) the transfer of ENOI's operating authority (i.e., its authority to conduct licensed activities at IP1, 2 & 3) to HDI (Reference 3).

The initiation of decommissioning activities will occur immediately following the sale and license transfers. The sale closure and license transfers are targeted to complete by May 31, 2021, following IP3 cessation of plant operations and permanent reactor defueling. The cash flow forecasts provided in this DCE assume this date as the starting point. In addition, HDI will submit a request for NRC approval of an exemption to use NDT funds for spent fuel management and site restoration activities. The cash flows in this DCE are based on the assumption that the request will be approved.

1.1 Objectives

The goal for the project is the prompt decommissioning of the three reactors at the IPEC site following shutdown and permanent reactor defueling of IP2 & IP3, leading ultimately to the termination of the NRC licenses. Decommissioning objectives are:

a. Decommissioning and site restoration of all areas, except for the ISFSI.
b. NRC approval of partial site release, including issuance of amended licenses to include only the operation of the ISFSI.
c. DOE acceptance of Spent Nuclear Fuel (SNF) from the ISFSI.
d. Decommissioning of the ISFSI after DOE has removed the SNF.
e. Termination of the NRC licenses and site release of the ISFSI area.
f. Site restoration of the ISFSI area.

The objective of this DCE is to provide a description of the planned decommissioning activities and estimated costs, along with the detailed schedule of associated activities required to complete license termination for IP1, 2 & 3. The estimates and schedule are based on the assumptions delineated in this document.

1.2 Site Description

Indian Point is located on approximately 239 acres of land on the east bank of the Hudson River at the Village of Buchanan in upper Westchester County, New York. There are three units on site, two operating units (IP2 & 3) and one in safe storage (IP1). IP1 is located between IP2 to the north and IP3 to the south.

IP1 was a four-loop pressurized water reactor with a thermal rating of 615 megawatts thermal (MWt). Operation of the unit was suspended on October 31, 1974 and all spent fuel had been removed from the reactor vessel by January 1976. Since that time, the unit has remained in protective storage. In 2003, the NRC issued Amendment No. 52 to the Provisional Operating License for IP1. Included within the amendment was a change to expiration date of the IP1 license to be consistent with that of IP2.

In 2008, the remaining 160 spent fuel assemblies (244 assemblies had previously been shipped to West Valley Reprocessing Plant, a commercial fuel reprocessing facility in upstate New York operated by Nuclear Fuel Services, Inc. from 1966 to 1972, for reprocessing) were transferred to an on-site ISFSI.

IP2 and IP3 each employ a pressurized water reactor and nuclear steam supply system (NSSS) furnished by Westinghouse Electric Corporation. The units are each currently licensed to generate 3,216 MWt which corresponds to a generator output of approximately 1,080 megawatts electric (MWe).

1.3 Regulatory Guidance

Current regulations governing decommissioning, waste management, and spent fuel management; and the funding of those elements, include the following:

- Decommissioning is defined in 10 CFR 50.2 as the safe removal of a facility or site from service and the reduction of residual radioactivity to levels that permit release of the site and termination of the license.
- Pursuant to 10 CFR 50.51(b), each license for a facility that has permanently ceased operations continues in effect beyond the expiration date to authorize ownership and possession of the production or utilization facility, until the Commission notifies the licensee in writing that the license is terminated.
- Prior to, or within two years following permanent cessation of operations, the licensee is required by 10 CFR 50.82(a)(4)(i) to submit a PSDAR to the NRC. The PSDAR must contain a site-specific DCE, including the projected cost of managing irradiated fuel.
- Pursuant to 10 CFR 50.82(a)(7) the licensee is required to notify the NRC before performing any decommissioning activity inconsistent with, or making any significant changes from, those actions and schedules described in the PSDAR.
- Pursuant to 10 CFR 50.82(a)(8)(iii), within 2 years following permanent cessation of operations, if not already submitted, the licensee shall submit a site-specific DCE.
- In accordance with 10 CFR 72.30, licensees must have a proposed decommissioning plan for the ISFSI site and facilities that includes a cost estimate for the plan. The plan should contain sufficient information on the proposed practices and procedures for the decontamination of the ISFSI and for the disposal of residual radioactive materials after all spent fuel, high-level radioactive waste, and reactor related GTCC waste have been removed.
- Use of the decommissioning funds is limited by 10 CFR 50.82(a)(8)(i) to legitimate decommissioning expenses that neither reduces the value of the trust fund below that necessary to place and maintain the reactor in a safe storage condition if unforeseen conditions or expenses arise, nor inhibits the ability of the licensee to complete funding of any shortfalls in the trust needed to ensure the availability of funds to ultimately release the site and terminate the license. .
- As provided in 10 CFR 50.82(a)(8)(ii), a licensee may withdraw funds from the decommissioning trust up to a cumulative total of 3 percent of the generic amount calculated under 10 CFR 50.75 for decommissioning planning purposes at any time. After submittal of the certifications of permanent shutdown and fuel removal required under 10 CFR 50.82(a)(1) and commencing 90 days after the NRC has received the PSDAR, the licensee may use an additional 20 percent of the decommissioning funds prescribed in 10 CFR 50.75(c) for decommissioning purposes. The licensee is prohibited from using the remaining 77 percent of the generic decommissioning funds until a site-specific DCE is submitted to the NRC.
- Regulatory Guide 1.202, Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors, (Reference 4) provides the standard format and content to facilitate preparation and NRC review of required cost estimates.

2 DECOMMISSIONING OPTIONS, THE METHOD SELECTED AND APPROACH

2.1 Decommissioning Methods

The NRC has evaluated the environmental impacts of three general methods for decommissioning power reactor facilities in NUREG-0586, "Final Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors," (Reference 5). The three general methods evaluated are summarized as follows:

- DECON: The equipment, structures and portions of the facility and site that contain radioactive contaminants are promptly removed or decontaminated to a level that permits termination of the license shortly after cessation of operations.
- SAFSTOR: After the plant is shutdown and defueled, the facility is placed in a safe, stable condition and maintained in that state (safe storage). The facility is decontaminated and dismantled at the end of the storage period to levels that permit license termination. During SAFSTOR, a facility is left intact or may be partially dismantled, but the fuel is removed from the reactor vessel and radioactive liquids are drained from systems and components and then processed. Radioactive decay occurs during the SAFSTOR period, thereby reducing the quantity of contamination and radioactivity that must be disposed of during decontamination and dismantlement.
- ENTOMB: Radioactive structures, systems and components (SSCs) are encased in a structurally long-lived substance, such as concrete. The entombed structure is appropriately maintained, and continued surveillance is carried out until the radioactivity decays to a level that permits termination of the license.

2.2 Decommissioning Method Selected

Decommissioning activities will be planned and executed using the DECON method and will proceed following sale and license transfer to HDI. Decommissioning is expected to be completed well before 60 years following permanent cessation of operations as required by 10 CFR 50.82(a)(3).

The DECON PSDAR and this DECON DCE provides an estimate of the costs to decommission the facility utilizing the DECON method. Immediately following the sale and license transfer, HDI will finalize decommissioning preparations and transition the plants into DECON.

2.3 Decommissioning Approach

The decommissioning approach reflected in this cost estimate is organized into activities based on the International Structure for Decommissioning Costing (ISDC) Work Breakdown Structure (WBS) and corresponding WBS dictionary. The ISDC WBS is a

delivery-based, hierarchical structure organized at the highest level of a decommissioning project into eleven groups of similar activities or principal work groups:

01 – Pre-decommissioning actions
02 – Facility shutdown activities
03 – Additional activities for safe enclosure and entombment
04 – Dismantling activities within the radiologically controlled area
05 – Waste processing, storage and disposal
06 – Site infrastructure and operation
07 – Conventional dismantling, demolition and site restoration
08 – Project management, engineering and support
09 – Research and development
10 – Fuel and nuclear material
11 – Miscellaneous expenditures

Of the eleven principal work groups identified in the ISDC Level 1 WBS, activities 03 and 09 are not used for this project. Activity 03-Additional activities for safe enclosure and entombment is not applicable to the prompt decommissioning approach used by HDI. There are no experimental activities associated with the project, therefore Activity 09-Research and development is not used.

NRC guidance in Regulatory Guide 1.202, Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors, (Reference 4) provides the recommended method of summarizing total decommissioning costs by period. The four periods are: Planning & Preparation, Plant Deactivation, Safe Storage Operations, and Dismantlement. NUREG-1713, "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Reactors" (Reference 6), and NUREG/CR-5884, "Revised Analyses of Decommissioning for the Reference Pressurized-Water Reactor Power Station," (Reference 7) divides decommissioning activities associated with the DECON method into similar periods.

To facilitate a comparison of projected decommissioning costs to the reference Pressurized Water Reactor (PWR), decommissioning activities are organized into periods like those described in NRC guidance, with differences described below.

Periods 1 through 4 are generally consistent with the decommissioning periods in Regulatory Guide 1.202; however, a Program Management cost category is added to capture generic labor and project support costs that are applicable to periods 1 through 4 but not readily distributable into individual periods. Since acceptance of spent nuclear fuel by DOE is not assumed to be completed until the end of 2061, a fifth period is included in this cost estimate and is identified as Ongoing Independent Spent Fuel Storage Installation (ISFSI) Operations. This fifth period captures the costs associated with storing spent fuel and Greater Than Class C (GTCC) waste following completion of dismantlement activities in addition to the costs of the eventual decommissioning of the storage facility.

Period 1 – Pre-decommissioning Planning & Preparation

In the time leading up to and immediately following the sale and license transfers, preparations for performance of decommissioning will include the following activities:

1. Final decommissioning planning
2. Procurement of services, materials and supplies
3. Reactor Vessel Internals (RVI) and Reactor Pressure Vessel (RPV) segmentation, tooling design, fabrication, and testing
4. Licensing and permitting actions necessary to reflect the defueled and permanently shutdown plant configuration
5. Stakeholder interaction
6. Facility characterization so that radiological, regulated, and hazardous wastes are identified, categorized and quantified to support decommissioning and waste management planning
7. Waste management planning, including determination of transportation and disposal container requirements and disposal pathways
8. Performance of safety, security and environmental studies

Period 2 - Plant Deactivation

During the time between the permanent shutdown of IP2 and IP3, and the sale and license transfers, ENOI will defuel the reactors in preparation for decommissioning. Following sale and transfer of the licenses, HDI will operate and maintain the Spent Fuel Pools (SFPs) and supporting systems required for cooling of the Spent Nuclear Fuel (SNF) and perform the following activities:

1. Isolation of power equipment
2. Drainage and drying of systems
3. Removal of system fluids, operational waste and redundant material
4. Radiological inventory characterization to support detailed planning

Due to the prompt decommissioning strategy utilized by HDI, reactor vessel and internals segmentation and removal activities are included in Period 4.

Period 3 - Safe Storage Operations

Since the DECON method will be used, the activities in this period only include preparations for and conduct of IP2 & 3 fuel movement to an on-site dry fuel storage facility (IP1 fuel is already stored on the ISFSI). This period concludes once all the spent nuclear fuel has been removed from the SFPs and placed into long term storage at the ISFSI. Activities include the following:

1. Construction of additional dry fuel storage capacity
2. Transfer of spent nuclear fuel to dry storage canisters
3. Movement and placement of fuel into long term storage at the ISFSI

4. Operation of the ISFSI until all fuel is placed on the ISFSI

Period 4 - Dismantlement

The following dismantlement activities will be performed during this period according to the project decommissioning schedule. These activities include detailed work planning, procurement, mobilization and execution of the dismantlement and disposal work and support activities, including measures to maintain occupational dose As Low As Reasonably Achievable (ALARA).

1. Asbestos Containing Material (ACM), Hazardous, and Universal Waste removal
2. Dismantling of main process systems, structures and components
3. Dismantling of reactor internals, core components and reactor vessel
4. Dismantling of other primary loop components
5. Dismantling of other systems and components
6. Procurement of equipment, tools and services
7. Procurement of waste containers
8. Demolition of buildings and structures within the radiologically controlled area
9. Maintenance, surveillance and operational support for waste management
10. Low level waste management
11. Management of exempt waste and materials
12. Management of waste and materials generated outside the radiologically controlled area
13. Final status survey
14. Earthworks and landworks
15. Landscaping and site finishing

Period 5 – Ongoing ISFSI Operations

Ongoing ISFSI Operations activities are associated with storing spent fuel and GTCC waste following completion of dismantlement activities in addition to the costs of the eventual decommissioning of the storage facility. Activities for Period 5 include:

1. Operational activities from the time that all spent fuel is in storage at the ISFSI until all spent fuel and GTCC waste is removed from the ISFSI
2. Decommissioning of the ISFSI

Program Management

Program Management costs include infrastructure and operation, management and fees that are generic in nature and applicable across decommissioning Periods 1 through 4. These costs include the following:

1. Site infrastructure and operation costs, including security, maintenance, site upkeep, operation of support systems and environmental monitoring

2. Project management, engineering and support including the core management group, scheduling and cost control, quality assurance, health and safety, records management, general administration and accounting, warehousing, engineering, regulatory and support services
3. Regulatory fees, taxes and insurance

Due to the generic nature of Program Management costs and the fact that work activities associated with Periods 1 through 4 are performed concurrently, it is not feasible to allocate these costs to discrete Periods. Once decommissioning activities are complete, and the project enters Period 5, Ongoing ISFSI Operations, all costs, including Program Management, are captured within the Period.

WBS Principal Activities Mapping,

The nine Level 1 WBS principal activities used for the project are mapped in Table 2-1 to the decommissioning periods described above in accordance with the following conventions:

- Period 1, Pre-Decommissioning Planning and Preparation maps directly to principal work group 01-Pre-decommissioning actions.
- Period 2, Plant Deactivation, maps directly to principal work group 02-Facility Shutdown.
- Period 3, Safe Storage Operations maps to principal work group 10-Fuel and Nuclear Material for those activities required to complete the movement of all spent nuclear fuel into dry storage, as indicated by the 2024 end date.
- Period 4, Dismantlement, maps to principal work groups 04-Dismantling Activities Within the Radiologically Controlled Area, 05-Waste Processing, Storage and Disposal and 07-Convential Dismantling Demolition and Site Restoration.
- Period 5, Ongoing ISFSI Operations, maps to principal work group 10- Fuel and Nuclear Materials like Period 2, but activities in this period begin once all spent nuclear fuel is placed in dry storage and end when the ISFSI is decommissioned in 2062.
- Program Management is applicable to activities performed across Periods 1 through 4 and is mapped to principal work groups 06-Site Infrastructure and Operation; 08-Project Management, Engineering and Support and 11-Miscellaneous Expenditures.

Table 2-1 Decommissioning Periods and WBS Elements

Period	WBS Element	IP1 Start and End Dates	IP2 Start and End Dates	IP3 Start and End Dates
1. Pre-Decommissioning Planning and Preparation	01.02.01 Pre-decommissioning actions	05/31/2021 – 05/16/2022	05/31/2021 – 05/16/2022	05/31/2021 – 05/16/2022
2. Plant Deactivation	01.02.02 Facility Shutdown Activities	N/A	05/31/2021-03/31/2023	05/31/2021-04/12/2024
3. Safe Storage Operations	01.02.10 Fuel and Nuclear Material	05/31/2021 – 04/12/2024	05/31/2021 – 04/12/2024	05/31/2021 – 04/12/2024
4. Dismantlement	01.02.04 Dismantling Activities Within the Radiological Controlled Area	05/31/2021 – 09/22/2028	05/31/2021 – 09/23/2026	05/31/2021 – 09/23/2024
	01.02.05 Waste Processing, Storage and Disposal	05/31/2021 – 12/17/2032	05/31/2021 – 12/17/2032	05/31/2021 – 12/17/2032
	01.02.07 Conventional Dismantling, Demolition, and Site Restoration	07/01/2023 – 12/19/2032	09/24/2022 – 12/19/2032	01/07/2022 – 12/19/2032
5. Ongoing ISFSI Operations	01.02.10 Fuel and Nuclear Material	04/12/2024 – 03/31/2062	04/12/2024 – 03/31/2062	04/12/2024 – 03/31/2062
Program Management	01.02.06 Site Infrastructure and Operation	05/31/2021 – 07/09/2033	05/31/2021 – 07/09/2033	05/31/2021 – 07/09/2033
	01.02.08 Project Management, Engineering and Support	05/31/2021 – 07/09/2033	05/31/2021 – 07/09/2033	05/31/2021 – 07/09/2033
	01.02.11 Miscellaneous Expenditures	05/31/2021 – 07/09/2033	05/31/2021 – 07/09/2033	05/31/2021 – 07/09/2033

3 DECOMMISSIONING COST ESTIMATE

The DECON DCE for decommissioning IP1, 2 & 3 presented in this section demonstrates that adequate funding is available in the Nuclear Decommissioning Trust (NDT) funds to complete license termination. In addition to the License Termination costs, Site Restoration and Spent Fuel Management costs are included in the estimates; however, per regulatory requirements, the non-radiological licensing estimates are segregated and listed separately. In addition, this section provides a cash flow analysis demonstrating the adequacy of decommissioning funding.

The decommissioning costs presented in this report are reported in 2019 dollars. Escalation of future decommissioning costs over the remaining decommissioning project life-cycle are excluded.

The cost estimate summary is presented, followed by a discussion of the site-specific details that were taken into consideration while developing this DCE. Site-specific matters include items that are applicable to the DECON method for Pressurized Water Reactors (PWRs). Section 4.0 discusses the estimating methodology, basis of estimate and assumptions that were used in preparing the cost estimates.

3.1 Cost Estimate Summary

This DECON DCE conforms with the guidance provided in NRC Regulatory Guide 1.202 (Reference 4). The estimates were developed and organized using the ISDC WBS and corresponding WBS dictionary (Reference 8). The ISDC WBS is a delivery-based, hierarchical structure and is identified as the international standard cost structure for nuclear facility decommissioning projects, addressing the entirety of work within the planned scope of a typical nuclear facility decommissioning project (i.e., license termination, site restoration, and spent nuclear fuel management). The ISDC WBS is organized at the highest level of a decommissioning project into eleven principal work groups of which nine are applicable to this project. As described in subsection 2.3 of this DCE, Activity 03-Additional activities for safe enclosure and entombment and Activity 09-Research and development are not used.

To organize the WBS information in a format consistent with regulatory guidance, Tables 3-1a, 3-1b and 3-1c present decommissioning costs by the five Periods and Program Management category described in Section 2.3.

Tables 3-2a, 3-2b and 3-2c provide a detailed view of the Program Management costs on an annualized basis. Program Management costs include expenses that are common to decommissioning Periods 1 through 4, and include site infrastructure and operation, project management, engineering, regulatory, support services, scheduling and cost control, quality assurance, general administration, materials management, insurance, taxes and fees. Due to the generic nature of Program Management costs and the fact that work activities associated with Periods 1 through 4 are performed concurrently, it is not feasible to allocate these costs

to discrete Periods. Once decommissioning activities are complete, and the project enters Period 5, Ongoing ISFSI Operations, all costs, including Program Management, are captured within the Period.

The decommissioning project cost estimate summary by activity and cost category for each unit is shown in Table 3-3.

The estimates capture costs associated with License Termination, in addition to costs associated with Spent Fuel Management and Site Restoration. License Termination costs are those costs associated with the collective work required to plan, mobilize and execute the removal of the radioactive contamination from the site, consistent with the definition of decommissioning per 10 CFR 50.2. Site Restoration costs are those costs associated with conventional dismantling, demolition, and removal from the site of structures and systems after confirmation that radioactive contaminants have been removed. Spent Fuel Management are the costs to safely manage spent fuel from sale and license transfers until successful transfer to the DOE. The costs of Spent Fuel Management and Site Restoration are not considered part of the 10 CFR 50.2 definition of decommissioning and are listed separately per regulatory requirements.

3.2 Site-Specific Matters Considered in DCE

Based on the guidance in Regulatory Guide 1.202, the following site-specific matters are discussed. These items not only influence the methods used to decommission the plants, but many have significant cost impacts as well.

- **Management after License Transfers, DECON Labor Requirements and Costs**
  Following approval of license transfers and closing on the sale, the management team will be comprised of HDI and Comprehensive Decommissioning International, LLC (CDI) personnel as well as site incumbent personnel who accept offers of employment and are transferred to CDI upon closure of the sale. These personnel will be incorporated into the decommissioning organization according to their expertise and previous positions held while the plants were operating. HDI will ensure that positions filled by incumbent employees that are vacated due to attrition are backfilled with qualified personnel, subject to a determination of need to fill the position. The attrition strategy includes filling vacant positions with other qualified employees, hiring from the community of former employees, assigning qualified personnel from the HDI and CDI parent companies, and seeking qualified personnel from industry staff augmentation firms.

  Tables 3-4a, 3-4b and 3-4c present the labor costs and the annualized labor requirements and Tables 3-5a, 3-5b and 3-5c present labor costs and the labor requirements by decommissioning period. The cost basis for labor resources was developed using a salary survey for comparable rates across the US and using plant staff salary information provided by ENOI. Neither the 3-4 or 3-5 tables include resources that will be mobilized by the subcontractors responsible for providing project management, supervisory, engineering and labor resources necessary to accomplish decommissioning

activities. Subcontractor labor resources and associated labor costs will be included in the subcontracts. For the decommissioning cost estimates documented herein, HDI has included subcontract cost estimates including labor costs using previous decommissioning experience, discussions with potential subcontractors, and SME judgement.

Following the license transfers, daily onsite staffing, excluding subcontractor resources, is estimated to be between 300 and 350 personnel and is expected to decrease as the spent fuel cools, as the fuel is moved from the pool to the ISFSI and as requirements for security and emergency planning are reduced. The subcontractor onsite staffing will be defined during contract development, bidding and selection. The maximum site population, inclusive of subcontractor resources, will vary throughout the life of the project, with increased and decreased staffing required as decommissioning activities ramp up or down. The maximum site population including subcontractors is not expected to exceed 450 personnel. Onsite HDI staffing changes (excluding subcontractor resources) are expected to occur at the following milestones:

- Emergency planning zone reduced following the spent fuel cooling period
- All spent fuel moved from the SFPs to the ISFSI
- Initiation of major demolition

- **Characterization**
  Characterization will be performed with systems and components in place, maximizing the use of non-destructive assay techniques and direct reading survey instrumentation readings correlated with analytical data gathered via direct smears and sampling. Site characterization activities will follow the Radiation Survey and Site Investigation (RSSI) described in NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" (Reference 9), The prompt decommissioning approach minimizes decontamination activities, resulting in maintaining occupational doses ALARA and reducing decommissioning costs.

- **Segmentation of the RPV and Internals**
  CDI will subcontract reactor and fuel system dismantling services. The subcontract will include project management, supervision, engineering, labor, tooling (including the design, fabrication, and testing of segmentation tooling) for the Reactor Pressure Vessels (RPV), Reactor Vessel Internals (RVI), irradiated hardware, SFPs, and cavity pool liner removals in addition to removal and disassembly of the refueling machine and bridge. GTCC waste generated during segmentation activities will be placed into dry storage canisters, transported away from the area and stored at the ISFSI until acceptance by the DOE.

Reactor vessel and internals segmentation activities will begin with IP3, proceed to IP2 and conclude with IP1. Due to the similarities in the design of the IP2 & IP3 reactors, the same tooling will be used to segment each of the IP2 and IP3 reactor vessels and reactor vessel internals. Lessons learned from the IP3 segmentation will result in efficiency gains for the

IP2 work. The IP1 reactor will require a unique tooling design, segmentation plan and segmentation approach. Depending on the condition of the IP1 reactor vessel, there may be an opportunity to remove, ship and dispose of the vessel intact. However, for the purposes of this estimate, the IP1 reactor vessel is assumed to be size-reduced and shipped for disposal in a segmented configuration.

The RVI will be reduced in size using specially designed tooling and mechanical techniques. The tooling will be developed during the decommissioning planning period and will be mobilized to the site and tested prior to use. Segmentation of the RVI will be completed systematically from the top to the bottom of the reactor. Highly activated portions of the RVI will be segmented into pieces that are sized to fit within the dry storage casks used for GTCC waste.

The RPVs will be separated from the surrounding structure and segmented in stages. The reactor support structures will be removed when they are no longer required to maintain needed structural support. RPV segments will be loaded into waste shipment casks using the reactor building crane and the loaded casks will be moved across the reactor building, lowered through the access hatch and readied for transport to the disposal site.

- **Fuel Pool and Spent Fuel Racks**
  The fuel pools will be inspected with underwater cameras and surveyed with radiation monitors to identify any radioactive material or debris remaining after removal of the spent fuel. Remote handling or vacuum lines will remove fuel contamination found during the inspection.

  The fuel racks will be removed from the pool, segmented and size reduced for disposal as Low Level Radioactive Waste (LLRW). Pool liners will be segmented after they have been drained and decontaminated to protect workers. Any GTCC waste generated during these activities will be placed in a dry storage cask, transported away from the area and stored at the ISFSI. CDI intends to subcontract the Fuel Pool and Spent Fuel Rack removal scope.

- **Turbine and Condenser Segmentation**

With the retirement of IP1, the turbine generator and some of its associated equipment was removed. The IP2 & IP3 turbine and condenser components will be segmented by a specialty subcontractor. The turbines and condensers are not expected to be radiologically contaminated, but due to the IP2 steam generator tube rupture in 2000, appropriate radiological precautions will be taken during the IP2 turbine and condenser segmentation activities. The subcontractor will remove large parts of the turbine (such as the low-pressure portion) intact and send the components offsite for disposal as intact packages suitably wrapped. The generator can be removed whole for later recycling or re-use.

- **Large Contaminated Components**
  CDI will subcontract the removal of large contaminated components and piping from power block structures. The prompt decommissioning strategy involves minimal decontamination or offsite processing and focuses instead on bulk removal of material as the most expedient and cost-effective solution to decommissioning. The subcontractor will provide management, labor, tools and equipment to the complete removal of large components. Support services include radiation protection, security, engineering support, heavy lift services and segmentation of components, if required. Containers or packaging will be provided by CDI.

- **Building and Structure Removal**
  Building demolition will be subcontracted with scope including equipment, personnel, permits, and surveys to perform the following activities:

  1. Hazardous waste (asbestos and lead paint) removal from buildings and components
  2. Demolition of site buildings to 3 feet below grade and backfill with clean fill material
  3. Demolition of above ground tanks
  4. Removal of parking lot surfaces
  5. Final grading, and
  6. Site restoration

- **Review of Decommissioning Records**
  Based on a review of IP1, 2 & 3 decommissioning records required by 10 CFR 50.75(g), and the draft Historical Site Assessment (HSA) prepared for ENOI, HDI has concluded that events occurring during plant operation involving the spread of contamination in and around the facility, equipment, or site are well documented and the fate and transport of contaminants are generally understood. The decommissioning cost estimates include a conservative estimate of contaminated soil that will be removed, packaged, shipped and disposed as low level or exempt waste.

- **Final Radiological Surveys**
  After completing site decommissioning activities, the final status surveys will be performed to demonstrate that the remediated portion of the site (excluding the ISFSI containing the spent fuel and GTCC waste) can be released for unrestricted use and removed from the license. The site release criteria are defined by the MARSSIM protocol and is in general 25 mrem/year from all pathways. Adherence to the NRC-approved License Termination Plan (LTP) and MARSSIM guidance will ensure that the surveys are conducted so that applicable regulatory criteria are satisfied.

- **Spent Fuel Management**
  DOE's repository program assumes that spent fuel will be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor.

In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste" (Reference 10), indicating plans to implement a program over the next 10 years that begins operations of a pilot interim storage facility by 2021 with an initial focus of accepting used nuclear fuel from shutdown reactor sites with a larger interim storage facility to be available by 2025. Although the DOE proposed it would start fuel acceptance in 2025, no progress has been made in the repository program since DOE's 2013 strategy was issued except for the completion of the Yucca Mountain safety evaluation report. Because of this continued delay, this DCE assumes a start date for DOE fuel acceptance of 2030.

IP1 possesses some of the oldest fuel in the queue and is therefore eligible per the DOE Acceptance Priority Ranking & Annual Capacity Report, DOE/RW-0567 (Reference 11), for capacity allocations beginning in the second year that the DOE begins accepting spent fuel from the commercial nuclear industry. Article V.E. of the DOE standard Contract provides Standard Contract Holders the right to determine which spent fuel and/or high level waste are delivered to DOE, including the right to exchange spent fuel acceptance allocations with other Standard Contract holders. As permitted by Article V.E., as the Standard Contract holders for IP1, 2, and 3, Holtec IP2 and Holtec IP3 would exchange acceptance allocations among the IPEC Units, such that IP2 sent fuel would be removed from the site first, followed by IP1 spent fuel and then followed by IP3 spent fuel.[5]

Accordingly, HDI's spent fuel management plan assumes that:

- DOE will commence transferring commercial spent fuel from the industry to a federal facility (not necessarily a final repository) in 2030
- IP2 spent fuel removal will begin in 2031and complete in 2048
- IP1 spent fuel removal will begin in 2048 and complete in 2049
- IP3 spent fuel removal will begin in 2049 and complete in 2061

These assumptions are based on DOE fuel acceptance allocations in Metric Tons of Uranium (MTU) provided by ENOI. Table 3-6 presents the assumed fuel removal quantities for each unit by year in MTU and number of fuel assemblies.

Spent fuel management activities will be funded from the NDT funds following receipt of an exemption from current NRC restrictions on use of the funds.

[5] Holtec's position is that the DOE has a contractual obligation to accept the spent fuel earlier than the projections set out in this DCE, consistent with its contract commitments. No assumption made in this study should be interpreted to be inconsistent with this claim. For planning purposes only, the fuel removal schedule assumed in this estimate is based upon DOE acceptance of fuel according to the "Oldest Fuel First" priority ranking. It is expected that Holtec IP2 and Holtec IP3 will seek the most expeditious means of removing fuel from the site, based on shutdown reactor priority, exchanges of acceptance allocations with other Standard Contract holders, and other contract provisions.

- **ISFSI Only License Amendment**
  The dry fuel storage capacity will be expanded to accommodate all the fuel stored in the SFPs. Once all spent fuel is removed from the SFPs and stored at the ISFSI, the security, Technical Specifications and emergency planning requirements will be revised to reflect plant conditions.

  Following site decommissioning, the NRC license will be amended to limit applicability to that portion of the site where the ISFSI containing the spent fuel and the GTCC waste is located, with the remainder of the site being released for unrestricted use. Once the fuel and the GTCC waste are removed from the site, the ISFSI will be decommissioned and the license terminated.

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

  The design and capacity of the current ISFSI is based upon the Holtec HISTORM 100S dry cask storage system (IP1 fuel is stored in a shorter version of the cask). The system consists of a multi-purpose canister, with a nominal capacity of 32 fuel assemblies, and a steel-lined concrete storage overpack. Currently the ISFSI Pad has a 75-cask capacity, with an expansion planned for 65 additional casks. Plans for spent fuel management would result in 62 IP2 spent fuel storage casks (in addition to the existing 5 casks for IP1 spent fuel) and 58 IP3 spent fuel storage casks being placed on the storage pad(s) at the site.

  The canister overpack assemblies are not expected to have any interior or exterior radioactive surface contamination. Any neutron activation of the steel and concrete is expected to be extremely small. The decommissioning estimate assumes that some of the inner steel liners and the concrete overpacks will contain low levels of neutron-induced residual radioactivity that would necessitate remediation at the time of decommissioning. As an allowance, 7 of the 67 IP2 overpacks and 7 of the 58 IP3 overpacks are assumed to be affected, i.e., contain residual radioactivity and therefore require the use of radiological demolition methods. The waste generated from the demolition of the overpack assemblies is assumed to meet criteria for free release and therefore the packaging, transportation and disposal costs are conservatively allocated to Site Restoration expense.

  The storage overpacks used for the GTCC canisters (estimated quantity of thirteen) are not expected to have any interior contamination of residual activation and can be reused or disposed of by conventional means after a radiological release survey.

No contamination or activation of the ISFSI pads is assumed. As such, only verification surveys are included for the pad in the decommissioning estimate. The estimate is limited to costs necessary to terminate the ISFSI's NRC license and meet the §20.1402 criteria for unrestricted use

The estimated cost to decommission the ISFSI and release the facility for unrestricted use, allocated to each unit, is provided in Appendix A. The ISFSI decommissioning cost estimate Contingency Allowance has been added at an overall rate of 25%. This is consistent with the contingency evaluation criteria referenced by the NRC in NUREG-1757," Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness" (Reference 12). Costs are reported in 2019 dollars.

In accordance with the specific requirements of 10 CFR §72.30 for the ISFSI work scope, the cost estimate for decommissioning the ISFSI reflects: 1) the cost of CDI performing the decommissioning activities; 2) a Contingency Allowance of 25%; and 3) the cost of meeting the criteria for unrestricted use.

- **Waste Management**
  CDI developed waste volume estimates for IP1, 2 & 3 based on plant design and industry data. The estimates were modified to reflect the decommissioning approach and were used to perform a disposition analysis to determine the type, size, and quantity of waste containers required to hold the anticipated waste volume. Disposal facilities were selected, and pricing was confirmed, and various methods of transportation to the disposal facility were evaluated. Transportation logistics were evaluated to ensure that the overall shipping strategy would be efficient and balanced with respect to container utilization, transport cycles and support for shipping during peaks in demolition periods.

  Greater-Than-Class C (GTCC) Waste

  GTCC waste will be managed and stored onsite until the DOE accepts the waste for final disposition, or until an appropriately licensed facility becomes available. The GTCC waste will be present in the SFPs and generated during reactor internal segmentation. The segmentation plan will use characterization information and an activation analysis to minimize the quantity of GTCC waste, and the packaging plan will reflect the segmentation plan. It is anticipated that no more than thirteen GTCC canisters will be required for the storage of GTCC waste from decommissioning activities.

  Low-Level Radioactive Waste (LLRW)

  A major component of the decommissioning work scope is the packaging, transportation and disposal of contaminated/activated equipment, piping, concrete, and soil. Most of the waste volume will meet Class A, Low Specific Activity, or Surface Contaminated Object definitions, and higher activity items will be segmented and loaded to avoid complex transportation modes (e.g., cask transport.) as much as possible. Some components will be capped and shipped with minimal sectioning but

will require special conveyance equipment for at least a portion of the haul route. This is most likely for the RPV, large components, and some bulk debris items. Most of the radioactive debris will be shipped in metal shield boxes or standard combination intermodal containers.

HDI will consider novating contracts that are currently in place, including "life of plant" agreements for disposal of low-level waste, but will also seek bids from the Energy*Solutions* Clive facility and Waste Control Specialist (WCS) to find optimum disposal terms.

For Class B and C waste, the HDI intends to file an import petition with the Texas Compact Commission to gain approval to dispose of out-of-compact waste at the WCS site in Andrews, Texas. Holtec currently holds a contract with WCS that permits disposal of radioactive waste from any decommissioning project in the United States.

One or more disposal facilities licensed in accordance with 10 CFR 20.2002 will be utilized for disposal of low activity waste since it is estimated that a significant portion of the heterogeneous bulk debris will be compatible with these facilities. In addition to lower disposition costs, the transportation route is shorter than the route to 10 CFR 61 licensed facilities, offering reduced shipping costs and better cycling efficiency for reusable bulk containers.

Mixed Wastes

Mixed Low-Level Waste generation will be minimized through appropriate characterization and demolition techniques and will be managed in accordance with applicable Federal and State regulations. Onsite treatment will not be pursued; rather, treatment needs will be procured from vendors such as Perma-Fix, Waste Control Specialists, and Energy*Solutions*.

Waste Transportation

The transportation approach for Class A, Low Specific Activity, or Surface Contaminated Object classes of waste will use a combination of truck, rail and potentially barge to support bulk quantity removal of waste. Since there is no active rail line at the site, a truck will be used to deliver the waste to a transload facility. Transportation of waste by barge to a nearby facility with rail access is an opportunity warranting further investigation due to the potential for a reduction in waste transportation vehicle road traffic and costs. However, transportation by barge is not used as a basis for costs in these estimates.

The transportation of all other classes of waste (Class B and C, GTCC, hazardous, and mixed), as well as the transportation of the spent fuel to the DOE repository, when it becomes available, will be by truck, as this mode of transportation minimizes transit time and is consistent with cask use requirements.

Table 3-7 presents IP1, 2 & 3 waste volume and weight estimates by Class. The HDI estimated costs do not include off-site processing since this option would only be utilized if items require decontamination to meet transportation criteria or if the item has significant residual value and can be salvaged or reused.

Table 3-1a
IP1 Decommissioning Activities and Costs by Period

	Period 1	Period 2	Period 3	Period 4	Period 5		
Activities	Pre-decommissioning Planning & Preparation	Plant Deactivation	Safe Storage Operations	Dismantlement	Ongoing ISFSI Operations	Program Management Costs	Total
License Termination (Decommissioning) Activities	**8,807,656**	**0**	**8,111,819**	**331,690,286**	**0**	**136,405,526**	**485,015,286**
Radioactive Component Removal	0	0	0	62,289,988	0	0	62,289,988
Dismantling of main process systems, structures and components	0	0	0	23,939,988	0	0	23,939,988
Dismantling of reactor internals	0	0	0	38,350,000	0	0	38,350,000
Decontamination and Dismantlement	0	0	0	5,949,044	0	0	5,949,044
Procurement of equipment for decontamination and dismantling	0	0	0	5,900,000	0	0	5,900,000
Procurement of general site-dismantling equipment	0	0	0	983,333	0	0	983,333
Procurement of special tools for dismantling the reactor systems	0	0	0	4,916,667	0	0	4,916,667
Dismantling of other systems and components	0	0	0	49,044	0	0	49,044
Conventional dismantling, demolition and site restoration	0	0	0	63,436,800	0	0	63,436,800
Demolition of buildings and structures	0	0	0	63,436,800	0	0	63,436,800
Demolition of buildings and structures from the formerly controlled area	0	0	0	63,436,800	0	0	63,436,800
Fuel and nuclear material	0	0	8,111,819	0	0	0	8,111,819
Dedicated ISFSI for fuel and/or nuclear material	0	0	2,299,525	0	0	0	2,299,525
Transfer of fuel and/or nuclear material away from the ISFSI	0	0	2,299,525	0	0	0	2,299,525
Decommissioning of ISFSI	0	0	5,812,294	0	0	0	5,812,294
Decommissioning of ISFSI	0	0	5,812,294	0	0	0	5,812,294
Decommissioning of ISFSI - Decommissioning of ISFSI - License Termination costs	0	0	5,812,294	0	0	0	5,812,294
Waste	0	0	0	200,014,454	0	0	200,014,454
Waste management system	0	0	0	3,545,890	0	0	3,545,890
Maintenance, surveillance and operational support for waste management system	0	0	0	3,545,890	0	0	3,545,890
Management of decommissioning intermediate-level waste/GTCC	0	0	0	1,445,500	0	0	1,445,500
Containers	0	0	0	1,445,500	0	0	1,445,500
Management of decommissioning low-level waste	0	0	0	29,066,369	0	0	29,066,369

Indian Point Energy Center
Site-Specific Decommissioning Cost Estimate

Activities	Period 1 Pre-decommissioning Planning & Preparation	Period 2 Plant Deactivation	Period 3 Safe Storage Operations	Period 4 Dismantlement	Period 5 Ongoing ISFSI Operations	Program Management Costs	Total
Management of decommissioning exempt waste and materials	0	0	0	165,956,696	0	0	165,956,696
Management and Support	8,807,656	0	0	0	0	136,405,526	145,213,182
Pre-decommissioning actions	8,807,656	0	0	0	0	0	8,807,656
Facility characterization	8,807,656	0	0	0	0	0	8,807,656
Site infrastructure and operation	0	0	0	0	0	35,482,009	35,482,009
Site security and surveillance	0	0	0	0	0	3,757,563	3,757,563
Site operation and maintenance	0	0	0	0	0	4,949,174	4,949,174
Operation of support systems	0	0	0	0	0	15,215,581	15,215,581
Radiation and environmental safety monitoring	0	0	0	0	0	11,559,692	11,559,692
Project management, engineering and support	0	0	0	0	0	50,361,588	50,361,588
Project management	0	0	0	0	0	18,648,632	18,648,632
Support services	0	0	0	0	0	30,505,415	30,505,415
Miscellaneous expenditures	0	0	0	0	0	50,561,929	50,561,929
Owner costs	0	0	0	0	0	32,883,705	32,883,705
Implementation of transition plans	0	0	0	0	0	27,833,250	27,833,250
Payments (fees) to authorities	0	0	0	0	0	5,050,455	5,050,455
Taxes	0	0	0	0	0	14,221,176	14,221,176
Insurances	0	0	0	0	0	3,457,048	3,457,048
Nuclear related insurances	0	0	0	0	0	2,871,694	2,871,694
Other insurances	0	0	0	0	0	585,354	585,354
Spent Fuel Management Activities	**0**	**0**	**66,066,413**	**0**	**0**	**6,314,372**	**72,380,785**
Fuel and nuclear material	0	0	66,066,413	0	0	0	66,066,413
Dedicated ISFSI for fuel and/or nuclear material	0	0	66,066,413	0	0	0	66,066,413
Operation of ISFSI	0	0	56,995,972	0	0	0	56,995,972
Transfer of fuel and/or nuclear material away from the ISFSI	0	0	3,164,800	0	0	0	3,164,800
Management and Support	0	0	0	0	0	6,314,372	6,314,372
Project management, engineering and support	0	0	0	0	0	4,703,539	4,703,539
Project management	0	0	0	0	0	1,820,879	1,820,879
Support services	0	0	0	0	0	2,764,862	2,764,862
Miscellaneous expenditures	0	0	0	0	0	1,610,832	1,610,832
Taxes	0	0	0	0	0	1,295,014	1,295,014
Insurances	0	0	0	0	0	315,819	315,819
Nuclear related insurances	0	0	0	0	0	262,344	262,344
Other insurances	0	0	0	0	0	53,475	53,475
Site Restoration Activities	**0**	**0**	**65,700**	**34,373,769**	**0**	**6,348,356**	**40,787,825**

Indian Point Energy Center
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	Period 1	Period 2	Period 3	Period 4	Period 5		
Activities	**Pre-decommissioning Planning & Preparation**	**Plant Deactivation**	**Safe Storage Operations**	**Dismantlement**	**Ongoing ISFSI Operations**	**Program Management Costs**	**Total**
Conventional dismantling, demolition and site restoration	0	0	0	22,402,300	0	0	22,402,300
Demolition of buildings and structures	0	0	0	22,402,300	0	0	22,402,300
Demolition of buildings and structures outside the controlled area	0	0	0	22,402,300	0	0	22,402,300
Fuel and nuclear material	0	0	65,700	0	0	0	65,700
Decommissioning of ISFSI	0	0	65,700	0	0	0	65,700
Decommissioning of ISFSI	0	0	48,000	0	0	0	48,000
Decommissioning of ISFSI - Decommissioning of ISFSI - Site Restoration costs	0	0	48,000	0	0	0	48,000
Management of waste	0	0	17,700	0	0	0	17,700
Decommissioning of ISFSI - Management of waste - Site Restoration costs	0	0	17,700	0	0	0	17,700
Waste	0	0	0	11,971,469	0	0	11,971,469
Management of decommissioning waste and materials generated outside controlled areas	0	0	0	11,971,469	0	0	11,971,469
Management and Support	0	0	0	0	0	6,348,356	6,348,356
Project management, engineering and support	0	0	0	0	0	4,150,597	4,150,597
Project management	0	0	0	0	0	1,159,945	1,159,945
Support services	0	0	0	0	0	2,888,369	2,888,369
Miscellaneous expenditures	0	0	0	0	0	2,197,759	2,197,759
Taxes	0	0	0	0	0	1,843,745	1,843,745
Insurances	0	0	0	0	0	354,014	354,014
Nuclear related insurances	0	0	0	0	0	294,072	294,072
Other insurances	0	0	0	0	0	59,942	59,942
Grand Total	**8,807,656**	**0**	**74,243,932**	**366,064,054**	**0**	**149,068,253**	**598,183,896**

Table 3-1b
IP2 Decommissioning Activities and Costs by Period

	Period 1	Period 2	Period 3	Period 4	Period 5		
Activities	Pre-decommissioning Planning & Preparation	Plant Deactivation	Safe Storage Operations	Dismantlement	Ongoing ISFSI Operations	Program Management Costs	Total
License Termination (Decommissioning) Activities	**8,807,656**	**0**	**26,957,544**	**265,925,367**	**0**	**167,765,803**	**469,456,370**
Radioactive Component Removal	0	0	0	66,278,019	0	0	66,278,019
Dismantling of main process systems, structures and components	0	0	0	27,928,019	0	0	27,928,019
Dismantling of reactor internals	0	0	0	38,350,000	0	0	38,350,000
Decontamination and Dismantlement	0	0	0	5,949,044	0	0	5,949,044
Procurement of equipment for decontamination and dismantling	0	0	0	5,900,000	0	0	5,900,000
Procurement of general site-dismantling equipment	0	0	0	983,333	0	0	983,333
Procurement of special tools for dismantling the reactor systems	0	0	0	4,916,667	0	0	4,916,667
Dismantling of other systems and components	0	0	0	49,044	0	0	49,044
Conventional dismantling, demolition and site restoration	0	0	0	63,436,800	0	0	63,436,800
Demolition of buildings and structures	0	0	0	63,436,800	0	0	63,436,800
Demolition of buildings and structures from the formerly controlled area	0	0	0	63,436,800	0	0	63,436,800
Fuel and nuclear material	0	0	26,957,544	0	0	0	26,957,544
Dedicated ISFSI for fuel and/or nuclear material	0	0	20,281,250	0	0	0	20,281,250
Transfer of fuel and/or nuclear material away from the ISFSI	0	0	20,281,250	0	0	0	20,281,250
Decommissioning of ISFSI	0	0	6,676,294	0	0	0	6,676,294
Decommissioning of ISFSI	0	0	6,676,294	0	0	0	6,676,294
Decommissioning of ISFSI - Decommissioning of ISFSI - License Termination costs	0	0	6,676,294	0	0	0	6,676,294
Waste	0	0	0	130,261,505	0	0	130,261,505
Waste management system	0	0	0	2,372,405	0	0	2,372,405
Maintenance, surveillance and operational support for waste management system	0	0	0	2,372,405	0	0	2,372,405
Management of decommissioning low-level waste	0	0	0	13,978,756	0	0	13,978,756
Management of decommissioning exempt waste and materials	0	0	0	105,060,343	0	0	105,060,343
Management and Support	8,807,656	0	0	0	0	167,765,803	176,573,459

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	Period 1	Period 2	Period 3	Period 4	Period 5		
Activities	**Pre-decommissioning Planning & Preparation**	**Plant Deactivation**	**Safe Storage Operations**	**Dismantlement**	**Ongoing ISFSI Operations**	**Program Management Costs**	**Total**
Pre-decommissioning actions	8,807,656	0	0	0	0	0	8,807,656
Facility characterization	8,807,656	0	0	0	0	0	8,807,656
Site infrastructure and operation	0	0	0	0	0	53,622,023	53,622,023
Site security and surveillance	0	0	0	0	0	18,975,947	18,975,947
Site operation and maintenance	0	0	0	0	0	6,458,108	6,458,108
Operation of support systems	0	0	0	0	0	16,469,064	16,469,064
Radiation and environmental safety monitoring	0	0	0	0	0	11,718,904	11,718,904
Project management, engineering and support	0	0	0	0	0	47,506,418	47,506,418
Project management	0	0	0	0	0	19,740,712	19,740,712
Support services	0	0	0	0	0	26,520,829	26,520,829
Health and safety	0	0	0	0	0	1,244,878	1,244,878
Miscellaneous expenditures	0	0	0	0	0	66,637,362	66,637,362
Owner costs	0	0	0	0	0	36,217,819	36,217,819
Implementation of transition plans	0	0	0	0	0	27,833,250	27,833,250
Payments (fees) to authorities	0	0	0	0	0	8,384,569	8,384,569
Taxes	0	0	0	0	0	27,554,936	27,554,936
Local, community, federal taxes	0	0	0	0	0	15,541,856	15,541,856
Insurances	0	0	0	0	0	2,864,607	2,864,607
Nuclear related insurances	0	0	0	0	0	2,379,566	2,379,566
Other insurances	0	0	0	0	0	485,041	485,041
Spent Fuel Management Activities	**0**	**60,196,850**	**102,035,675**	**0**	**0**	**26,045,191**	**188,277,716**
Fuel and nuclear material	0	0	102,035,675	0	0	0	102,035,675
Dedicated ISFSI for fuel and/or nuclear material	0	0	102,035,675	0	0	0	102,035,675
Operation of ISFSI	0	0	62,792,155	0	0	0	62,792,155
Waste							
Management and Support	0	60,196,850	0	0	0	26,045,191	86,242,041
Project management, engineering and support	0	0	0	0	0	15,484,155	15,484,155
Project management	0	0	0	0	0	6,565,432	6,565,432
Support services	0	0	0	0	0	8,442,924	8,442,924
Health and safety	0	0	0	0	0	475,799	475,799
Miscellaneous expenditures	0	0	0	0	0	10,561,036	10,561,036
Taxes	0	0	0	0	0	9,678,352	9,678,352
Local, community, federal taxes	0	0	0	0	0	6,153,233	6,153,233
Insurances	0	0	0	0	0	882,684	882,684
Nuclear related insurances	0	0	0	0	0	733,226	733,226
Other insurances	0	0	0	0	0	149,458	149,458
Site Restoration Activities	**0**	**0**	**1,149,259**	**34,389,994**	**0**	**8,548,296**	**44,087,548**

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	Period 1	Period 2	Period 3	Period 4	Period 5		
Activities	**Pre-decommissioning Planning & Preparation**	**Plant Deactivation**	**Safe Storage Operations**	**Dismantlement**	**Ongoing ISFSI Operations**	**Program Management Costs**	**Total**
Fuel and nuclear material	0	0	1,149,259	0	0	0	1,149,259
Decommissioning of ISFSI	0	0	1,149,259	0	0	0	1,149,259
Decommissioning of ISFSI	0	0	1,131,559	0	0	0	1,131,559
Decommissioning of ISFSI - Decommissioning of ISFSI - Site Restoration costs	0	0	1,131,559	0	0	0	1,131,559
Management of waste	0	0	17,700	0	0	0	17,700
Decommissioning of ISFSI - Management of waste - Site Restoration costs	0	0	17,700	0	0	0	17,700
Waste	0	0	0	11,987,694	0	0	11,987,694
Management of decommissioning waste and materials generated outside controlled areas	0	0	0	11,987,694	0	0	11,987,694
Management and Support	0	0	0	0	0	8,548,296	8,548,296
Project management, engineering and support	0	0	0	0	0	5,505,360	5,505,360
Project management	0	0	0	0	0	2,104,275	2,104,275
Support services	0	0	0	0	0	3,285,031	3,285,031
Health and safety	0	0	0	0	0	116,055	116,055
Miscellaneous expenditures	0	0	0	0	0	3,042,936	3,042,936
Taxes	0	0	0	0	0	2,663,345	2,663,345
Local, community, federal taxes	0	0	0	0	0	841,610	841,610
Insurances	0	0	0	0	0	379,590	379,590
Nuclear related insurances	0	0	0	0	0	315,317	315,317
Other insurances	0	0	0	0	0	64,273	64,273
Grand Total	**8,807,656**	**60,196,850**	**130,142,478**	**300,315,361**	**0**	**202,359,290**	**701,821,634**

Table 3-1c
IP3 Decommissioning Activities and Costs by Period

	Period 1	Period 2	Period 3	Period 4	Period 5		
Activities	Pre-decommissioning Planning & Preparation	Plant Deactivation	Safe Storage Operations	Dismantlement	Ongoing ISFSI Operations	Program Management Costs	Total
License Termination (Decommissioning) Activities	**8,807,656**	**0**	**21,063,233**	**334,314,600**	**0**	**218,982,937**	**583,168,426**
Radioactive Component Removal	0	0	0	73,677,725	0	0	73,677,725
Dismantling of main process systems, structures and components	0	0	0	35,327,725	0	0	35,327,725
Dismantling of reactor internals	0	0	0	38,350,000	0	0	38,350,000
Decontamination and Dismantlement	0	0	0	5,949,044	0	0	5,949,044
Procurement of equipment for decontamination and dismantling	0	0	0	5,900,000	0	0	5,900,000
Procurement of general site-dismantling equipment	0	0	0	983,333	0	0	983,333
Procurement of special tools for dismantling the reactor systems	0	0	0	4,916,667	0	0	4,916,667
Removal of materials requiring specific procedures	0	0	0	0	0	0	0
Removal of asbestos	0	0	0	0	0	0	0
Dismantling of other systems and components	0	0	0	49,044	0	0	49,044
Dismantling of remaining components	0	0	0	0	0	0	0
Conventional dismantling, demolition and site restoration	0	0	0	89,193,417	0	0	89,193,417
Demolition of buildings and structures	0	0	0	71,366,400	0	0	71,366,400
Demolition of buildings and structures from the formerly controlled area	0	0	0	71,366,400	0	0	71,366,400
Final radioactivity survey of site	0	0	0	17,827,017	0	0	17,827,017
Final survey	0	0	0	17,827,017	0	0	17,827,017
Fuel and nuclear material	0	0	21,063,233	0	0	0	21,063,233
Dedicated ISFSI for fuel and/or nuclear material	0	0	20,281,250	0	0	0	20,281,250
Transfer of fuel and/or nuclear material away from the ISFSI	0	0	20,281,250	0	0	0	20,281,250
Decommissioning of ISFSI	0	0	781,983	0	0	0	781,983
Decommissioning of ISFSI	0	0	781,983	0	0	0	781,983
Decommissioning of ISFSI - Decommissioning of ISFSI - License Termination costs	0	0	781,983	0	0	0	781,983
Waste	0	0	0	165,494,414	0	0	165,494,414
Waste management system	0	0	0	2,179,018	0	0	2,179,018
Maintenance, surveillance and operational support for waste management system	0	0	0	2,179,018	0	0	2,179,018

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Activities	Period 1 Pre-decommissioning Planning & Preparation	Period 2 Plant Deactivation	Period 3 Safe Storage Operations	Period 4 Dismantlement	Period 5 Ongoing ISFSI Operations	Program Management Costs	Total
Management of decommissioning low-level waste	0	0	0	15,176,111	0	0	15,176,111
Management of decommissioning exempt waste and materials	0	0	0	139,259,784	0	0	139,259,784
Management and Support	8,807,656	0	0	0	0	218,982,937	227,790,593
Pre-decommissioning actions	8,807,656	0	0	0	0	0	8,807,656
Facility characterization	8,807,656	0	0	0	0	0	8,807,656
Safety, security and environmental studies	0	0	0	0	0	0	0
Site infrastructure and operation	0	0	0	0	0	71,261,060	71,261,060
Site security and surveillance	0	0	0	0	0	35,616,098	35,616,098
Site operation and maintenance	0	0	0	0	0	8,220,872	8,220,872
Operation of support systems	0	0	0	0	0	14,341,197	14,341,197
Radiation and environmental safety monitoring	0	0	0	0	0	13,082,892	13,082,892
Project management, engineering and support	0	0	0	0	0	67,453,747	67,453,747
Project management	0	0	0	0	0	37,376,845	37,376,845
Support services	0	0	0	0	0	28,138,204	28,138,204
Health and safety	0	0	0	0	0	1,938,698	1,938,698
Miscellaneous expenditures	0	0	0	0	0	80,268,130	80,268,130
Owner costs	0	0	0	0	0	36,217,819	36,217,819
Implementation of transition plans	0	0	0	0	0	27,833,250	27,833,250
Payments (fees) to authorities	0	0	0	0	0	8,384,569	8,384,569
Specific external services and payments	0	0	0	0	0	0	0
Taxes	0	0	0	0	0	40,890,781	40,890,781
Local, community, federal taxes	0	0	0	0	0	27,189,670	27,189,670
Insurances	0	0	0	0	0	3,159,530	3,159,530
Nuclear related insurances	0	0	0	0	0	2,624,552	2,624,552
Other insurances	0	0	0	0	0	534,977	534,977
Spent Fuel Management Activities	**0**	**106,198,906**	**238,086,472**	**0**	**0**	**27,084,193**	**371,369,571**
Fuel and nuclear material	0	0	238,086,472	0	0	0	238,086,472
Dedicated ISFSI for fuel and/or nuclear material	0	0	235,626,413	0	0	0	235,626,413
Operation of ISFSI	0	0	198,914,733	0	0	0	198,914,733
Waste							
Management and Support	0	106,198,906	0	0	0	27,084,193	133,283,099
Project management, engineering and support	0	0	0	0	0	14,192,876	14,192,876
Project management	0	0	0	0	0	7,740,162	7,740,162
Support services	0	0	0	0	0	6,071,192	6,071,192
Health and safety	0	0	0	0	0	381,523	381,523
Miscellaneous expenditures	0	0	0	0	0	12,891,316	12,891,316
Taxes	0	0	0	0	0	12,293,241	12,293,241

Indian Point Energy Center
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	Period 1	Period 2	Period 3	Period 4	Period 5		
Activities	**Pre-decommissioning Planning & Preparation**	**Plant Deactivation**	**Safe Storage Operations**	**Dismantlement**	**Ongoing ISFSI Operations**	**Program Management Costs**	**Total**
Local, community, federal taxes	0	0	0	0	0	10,509,370	10,509,370
Insurances	0	0	0	0	0	598,075	598,075
Nuclear related insurances	0	0	0	0	0	496,808	496,808
Other insurances	0	0	0	0	0	101,267	101,267
Site Restoration Activities	**0**	**0**	**996,460**	**36,631,994**	**0**	**10,211,626**	**47,840,080**
Fuel and nuclear material	0	0	996,460	0	0	0	996,460
Decommissioning of ISFSI	0	0	996,460	0	0	0	996,460
Decommissioning of ISFSI	0	0	978,760	0	0	0	978,760
Decommissioning of ISFSI - Decommissioning of ISFSI - Site Restoration costs	0	0	978,760	0	0	0	978,760
Management of waste	0	0	17,700	0	0	0	17,700
Decommissioning of ISFSI - Management of waste - Site Restoration costs	0	0	17,700	0	0	0	17,700
Waste	0	0	0	11,964,094	0	0	11,964,094
Management of decommissioning waste and materials generated outside controlled areas	0	0	0	11,964,094	0	0	11,964,094
Management and Support	0	0	0	0	0	10,211,626	10,211,626
Project management, engineering and support	0	0	0	0	0	6,990,644	6,990,644
Project management	0	0	0	0	0	3,750,342	3,750,342
Support services	0	0	0	0	0	3,024,159	3,024,159
Health and safety	0	0	0	0	0	216,143	216,143
Miscellaneous expenditures	0	0	0	0	0	3,220,981	3,220,981
Taxes	0	0	0	0	0	2,851,706	2,851,706
Local, community, federal taxes	0	0	0	0	0	976,753	976,753
Insurances	0	0	0	0	0	369,276	369,276
Nuclear related insurances	0	0	0	0	0	306,749	306,749
Other insurances	0	0	0	0	0	62,526	62,526
Grand Total	**8,807,656**	**106,198,906**	**260,146,165**	**370,946,594**	**0**	**256,278,755**	**1,002,378,076**

Table 3-2a
IP1 Program Management Cost Detail

Cost By Year By WBS - Program Management Cost		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
WBS_Code	WBS_Name														Total
01.02	IPEC Unit 1	19,838,969	23,764,642	15,473,526	15,012,208	9,053,783	9,066,845	9,055,905	8,665,645	8,648,928	8,648,928	8,648,928	8,673,413	4,516,532	**149,068,253**
01.02.06	Site infrastructure and operation	3,464,395	6,222,171	4,682,030	2,923,632	2,199,772	2,212,833	2,207,949	2,212,833	2,212,833	2,212,833	2,212,833	1,856,083	861,813	35,482,009
01.02.06.01	Site security and surveillance	154,875	781,750	265,500	276,563	265,500	265,500	265,500	265,500	265,500	265,500	265,500	276,563	143,813	3,757,563
01.02.06.01.03	Security fencing and protection of remaining entrances against trespassing	0	516,250	0	0	0	0	0	0	0	0	0	0	0	516,250
01.02.06.01.04	Deployment of officers forces	154,875	265,500	265,500	276,563	265,500	265,500	265,500	265,500	265,500	265,500	265,500	276,563	143,813	3,241,313
01.02.06.02	Site operation and maintenance	641,145	1,068,430	893,148	424,352	239,123	239,123	238,114	239,123	239,123	239,123	239,123	173,453	75,796	4,949,174
01.02.06.02.01	Inspection and maintenance of buildings and systems	641,145	1,068,430	893,148	424,352	239,123	239,123	238,114	239,123	239,123	239,123	239,123	173,453	75,796	4,949,174
01.02.06.03	Operation of support systems	1,312,548	2,204,670	2,143,597	1,344,529	957,742	957,742	957,034	957,742	957,742	957,742	957,742	990,653	516,095	15,215,581
01.02.06.03.01	Electricity supply systems	921,506	1,579,725	1,579,725	1,053,150	789,862	789,862	789,862	789,862	789,862	789,862	789,862	822,773	427,842	11,913,759
01.02.06.03.02	Ventilation systems	293,525	504,841	501,515	266,821	167,880	167,880	167,172	167,880	167,880	167,880	167,880	167,880	88,253	2,997,285
01.02.06.03.07	Other systems	97,517	120,104	62,358	24,558	0	0	0	0	0	0	0	0	0	304,536
01.02.06.04	Radiation and environmental safety monitoring	1,355,827	2,167,322	1,379,784	878,189	737,407	750,468	747,301	750,468	750,468	750,468	750,468	415,414	126,109	11,559,692
01.02.06.04.02	Radiation protection and monitoring	1,146,034	1,885,048	1,233,841	829,072	737,407	750,468	747,301	750,468	750,468	750,468	750,468	415,414	126,109	10,872,566
01.02.08	Project management, engineering and support	8,026,904	7,455,962	6,069,938	4,605,486	3,850,395	3,850,395	3,844,339	3,850,395	3,850,395	3,850,395	3,850,395	4,006,158	2,104,569	59,215,724
01.02.08.02	Project management	4,893,115	3,669,470	2,701,461	1,514,305	1,007,558	1,007,558	1,003,822	1,007,558	1,007,558	1,007,558	1,007,558	1,159,050	642,883	21,629,456
01.02.08.02.01	Core management group	1,351,819	2,141,069	2,062,408	1,016,808	540,048	540,048	537,769	540,048	540,048	540,048	540,048	817,919	495,081	11,663,159
01.02.08.02.02	Project implementation planning, detailed ongoing planning	2,564,069	102,915	134,573	135,714	135,143	135,143	134,573	135,143	135,143	135,143	135,143	103,984	47,362	4,034,051
01.02.08.02.03	Scheduling and cost control	151,679	261,123	114,533	65,556	65,281	65,281	65,005	65,281	65,281	65,281	65,281	65,281	34,318	1,149,181
01.02.08.02.05	Quality assurance and quality surveillance	455,323	624,242	115,915	23,442	0	0	0	0	0	0	0	0	0	1,218,922
01.02.08.02.06	General administration and accounting	299,017	418,049	151,961	145,628	145,016	145,016	144,404	145,016	145,016	145,016	145,016	44,708	0	2,073,859
01.02.08.02.07	Public relations and stakeholders involvement	71,208	122,071	122,071	127,157	122,071	122,071	122,071	122,071	122,071	122,071	122,071	127,157	66,122	1,490,283
01.02.08.03	Support services	2,970,682	3,557,594	3,270,464	2,992,337	2,744,407	2,744,407	2,742,503	2,744,407	2,744,407	2,744,407	2,744,407	2,748,679	1,409,943	36,158,647
01.02.08.03.01	Engineering support	459,633	614,841	446,694	296,621	232,388	232,388	231,408	232,388	232,388	232,388	232,388	146,418	56,827	3,646,770
01.02.08.03.02	Information system and computer support	57,238	98,538	56,099	12,279	0	0	0	0	0	0	0	39,128	29,737	293,019
01.02.08.03.03	Waste management support	45,053	0	0	0	0	0	0	0	0	0	0	0	0	45,053
01.02.08.03.04	Decommissioning support including chemistry, decontamination	31,373	54,011	53,783	54,239	54,011	54,011	53,783	54,011	54,011	54,011	54,011	54,011	28,393	653,660
01.02.08.03.05	Personnel management and training	229,914	372,827	309,495	207,870	164,914	164,914	164,218	164,914	164,914	164,914	164,914	90,960	30,489	2,395,260
01.02.08.03.07	Procurement, warehousing, and materials handling	61,483	105,846	105,399	30,967	0	0	0	0	0	0	0	36,607	27,821	368,123
01.02.08.03.08	Housing, office equipment, support services	2,085,988	2,311,532	2,298,994	2,390,360	2,293,094	2,293,094	2,293,094	2,293,094	2,293,094	2,293,094	2,293,094	2,381,556	1,236,676	28,756,763
01.02.08.04	Health and safety	163,107	228,898	98,013	98,844	98,429	98,429	98,013	98,429	98,429	98,429	98,429	98,429	51,743	1,427,621
01.02.08.04.01	Health physics	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01.02.08.04.02	Industrial safety	163,107	228,898	98,013	98,844	98,429	98,429	98,013	98,429	98,429	98,429	98,429	98,429	51,743	1,427,621
01.02.11	Miscellaneous expenditures	8,347,671	10,086,509	4,721,558	7,483,091	3,003,617	3,003,617	3,003,617	2,602,417	2,585,701	2,585,701	2,585,701	2,811,172	1,550,150	54,370,520
01.02.11.01	Owner costs	8,150,482	9,748,471	4,383,520	5,729,717	797,245	797,245	797,245	396,045	379,329	379,329	379,329	590,715	355,032	32,883,705
01.02.11.01.01	Implementation of transition plans	7,854,867	9,369,142	4,004,191	5,334,583	417,917	417,917	417,917	16,717	0	0	0	0	0	27,833,250
01.02.11.01.03	Payments (fees) to authorities	295,615	379,329	379,329	395,134	379,329	379,329	379,329	379,329	379,329	379,329	379,329	590,715	355,032	5,050,455
01.02.11.01.04	Specific external services and payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01.02.11.02	Taxes	0	0	0	1,401,250	1,868,334	1,868,334	1,868,334	1,868,334	1,868,334	1,868,334	1,868,334	1,868,334	1,012,014	17,359,935
01.02.11.02.02	Local, community, federal taxes	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01.02.11.03	Insurances	197,189	338,038	338,038	352,123	338,038	338,038	338,038	338,038	338,038	338,038	338,038	352,123	183,104	4,126,881
01.02.11.03.01	Nuclear related insurances	163,800	280,801	280,801	292,501	280,801	280,801	280,801	280,801	280,801	280,801	280,801	292,501	152,100	3,428,109
01.02.11.03.02	Other insurances	33,388	57,237	57,237	59,622	57,237	57,237	57,237	57,237	57,237	57,237	57,237	59,622	31,003	698,771

Table 3-2b
IP2 Program Management Cost Detail

Cost By Year By WBS - Program Management Cost		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
WBS_Code	WBS_Name														
01.02	IPEC Unit 2	32,785,435	42,913,142	23,872,304	17,767,059	10,355,724	10,368,785	10,352,352	9,967,585	9,950,869	9,950,869	9,950,869	9,377,623	4,746,676	**202,359,290**
01.02.06	Site infrastructure and operation	8,560,612	14,845,638	6,464,804	3,049,150	2,543,694	2,556,755	2,550,420	2,556,755	2,556,755	2,556,755	2,556,755	1,962,115	861,813	53,622,023
01.02.06.01	Site security and surveillance	4,975,512	9,080,716	2,364,281	276,563	265,500	265,500	265,500	265,500	265,500	265,500	265,500	276,563	143,813	18,975,947
01.02.06.01.03	Security fencing and protection of remaining entrances against trespassing	0	516,250	0	0	0	0	0	0	0	0	0	0	0	516,250
01.02.06.01.04	Deployment of officers forces	4,975,512	8,564,466	2,364,281	276,563	265,500	265,500	265,500	265,500	265,500	265,500	265,500	276,563	143,813	18,459,697
01.02.06.02	Site operation and maintenance	1,224,339	1,842,027	1,016,193	453,449	239,123	239,123	238,114	239,123	239,123	239,123	239,123	173,453	75,796	6,458,108
01.02.06.02.01	Inspection and maintenance of buildings and systems	1,224,339	1,842,027	1,016,193	453,449	239,123	239,123	238,114	239,123	239,123	239,123	239,123	173,453	75,796	6,458,108
01.02.06.03	Operation of support systems	1,312,548	2,203,714	2,077,896	1,438,460	1,125,622	1,125,622	1,124,206	1,125,622	1,125,622	1,125,622	1,125,622	1,042,411	516,095	16,469,064
01.02.06.03.01	Electricity supply systems	921,506	1,579,725	1,579,725	1,053,150	789,862	789,862	789,862	789,862	789,862	789,862	789,862	822,773	427,842	11,913,759
01.02.06.03.02	Ventilation systems	293,525	456,109	331,000	336,194	335,760	335,760	334,343	335,760	335,760	335,760	335,760	219,637	88,253	4,073,621
01.02.06.03.07	Other systems	97,517	167,880	167,172	49,116	0	0	0	0	0	0	0	0	0	481,684
01.02.06.04	Radiation and environmental safety monitoring	1,048,212	1,719,181	1,006,434	880,679	913,449	926,510	922,601	926,510	926,510	926,510	926,510	469,688	126,109	11,718,904
01.02.06.04.02	Radiation protection and monitoring	838,419	1,413,020	901,620	796,385	829,509	842,570	839,015	842,570	842,570	842,570	842,570	443,809	126,109	10,400,738
01.02.08	Project management, engineering and support	8,022,689	7,752,642	6,656,525	5,476,238	4,808,413	4,808,413	4,798,315	4,808,413	4,808,413	4,808,413	4,808,413	4,604,336	2,334,713	68,495,934
01.02.08.02	Project management	4,563,869	3,375,196	3,102,083	2,231,279	1,824,748	1,824,748	1,817,564	1,824,748	1,824,748	1,824,748	1,824,748	1,591,709	780,230	28,410,419
01.02.08.02.01	Core management group	1,192,327	1,938,213	2,308,472	1,677,560	1,338,252	1,338,252	1,332,605	1,338,252	1,338,252	1,338,252	1,338,252	1,244,725	632,428	18,355,841
01.02.08.02.02	Project implementation planning, detailed ongoing planning	2,615,335	231,827	134,573	71,597	45,048	45,048	44,858	45,048	45,048	45,048	45,048	76,207	47,362	3,492,046
01.02.08.02.03	Scheduling and cost control	257,580	443,437	296,078	165,353	130,562	130,562	130,011	130,562	130,562	130,562	130,562	85,407	34,318	2,195,553
01.02.08.02.04	Safety and environmental analysis, ongoing studies	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01.02.08.02.05	Quality assurance and quality surveillance	269,151	394,949	115,915	80,464	80,126	80,126	79,788	80,126	80,126	80,126	80,126	24,703	0	1,445,726
01.02.08.02.06	General administration and accounting	158,268	244,699	124,975	109,148	108,690	108,690	108,231	108,690	108,690	108,690	108,690	33,509	0	1,430,969
01.02.08.02.07	Public relations and stakeholders involvement	71,208	122,071	122,071	127,157	122,071	122,071	122,071	122,071	122,071	122,071	122,071	127,157	66,122	1,490,283
01.02.08.03	Support services	3,132,605	3,923,773	3,435,200	3,146,114	2,885,236	2,885,236	2,882,737	2,885,236	2,885,236	2,885,236	2,885,236	2,914,199	1,502,741	38,248,784
01.02.08.03.01	Engineering support	448,947	706,750	538,216	388,919	324,298	324,298	322,929	324,298	324,298	324,298	324,298	174,753	56,827	4,583,127
01.02.08.03.02	Information system and computer support	57,238	98,538	56,099	12,279	0	0	0	0	0	0	0	39,128	29,737	293,019
01.02.08.03.03	Waste management support	176,606	217,512	0	0	0	0	0	0	0	0	0	0	0	394,118
01.02.08.03.04	Decommissioning support including chemistry, decontamination	31,373	54,011	53,783	54,239	54,011	54,011	53,783	54,011	54,011	54,011	54,011	54,011	28,393	653,660
01.02.08.03.05	Personnel management and training	196,225	300,908	254,576	231,703	213,833	213,833	212,931	213,833	213,833	213,833	213,833	65,925	0	2,545,266
01.02.08.03.06	Documentation and records control	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01.02.08.03.07	Procurement, warehousing, and materials handling	136,228	234,523	233,533	68,614	0	0	0	0	0	0	0	198,826	151,108	1,022,830
01.02.08.03.08	Housing, office equipment, support services	2,085,988	2,311,532	2,298,994	2,390,360	2,293,094	2,293,094	2,293,094	2,293,094	2,293,094	2,293,094	2,293,094	2,381,556	1,236,676	28,756,763
01.02.08.04	Health and safety	326,215	453,673	119,242	98,844	98,429	98,429	98,013	98,429	98,429	98,429	98,429	98,429	51,743	1,836,731
01.02.08.04.01	Health physics	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01.02.08.04.02	Industrial safety	326,215	453,673	119,242	98,844	98,429	98,429	98,013	98,429	98,429	98,429	98,429	98,429	51,743	1,836,731
01.02.11	Miscellaneous expenditures	16,202,134	20,314,862	10,750,975	9,241,671	3,003,617	3,003,617	3,003,617	2,602,417	2,585,701	2,585,701	2,585,701	2,811,172	1,550,150	80,241,334
01.02.11.01	Owner costs	9,662,947	11,570,121	4,383,520	5,729,717	797,245	797,245	797,245	396,045	379,329	379,329	379,329	590,715	355,032	36,217,819
01.02.11.01.01	Implementation of transition plans	7,854,867	9,369,142	4,004,191	5,334,583	417,917	417,917	417,917	16,717	0	0	0	0	0	27,833,250
01.02.11.01.03	Payments (fees) to authorities	1,808,080	2,200,978	379,329	395,134	379,329	379,329	379,329	379,329	379,329	379,329	379,329	590,715	355,032	8,384,569
01.02.11.01.04	Specific external services and payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01.02.11.02	Taxes	6,341,999	8,406,704	6,029,417	3,159,830	1,868,334	1,868,334	1,868,334	1,868,334	1,868,334	1,868,334	1,868,334	1,868,334	1,012,014	39,896,634
01.02.11.02.02	Local, community, federal taxes	6,341,999	8,406,704	6,029,417	1,758,580	0	0	0	0	0	0	0	0	0	22,536,699
01.02.11.03	Insurances	197,189	338,038	338,038	352,123	338,038	338,038	338,038	338,038	338,038	338,038	338,038	352,123	183,104	4,126,881
01.02.11.03.01	Nuclear related insurances	163,800	280,801	280,801	292,501	280,801	280,801	280,801	280,801	280,801	280,801	280,801	292,501	152,100	3,428,109
01.02.11.03.02	Other insurances	33,388	57,237	57,237	59,622	57,237	57,237	57,237	57,237	57,237	57,237	57,237	59,622	31,003	698,771

Table 3-2c
IP3 Program Management Cost Detail

Cost By Year By WBS - Program Management Cost		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
WBS_Code	WBS_Name														Total
01.02	IPEC Unit 3	38,183,597	53,718,166	39,014,159	24,750,501	12,453,285	12,466,346	12,441,062	12,065,146	12,048,429	12,048,429	12,048,429	10,177,840	4,863,365	**256,278,755**
01.02.06	Site infrastructure and operation	8,563,512	14,549,325	17,382,809	7,685,123	2,868,590	2,881,652	2,873,946	2,881,652	2,881,652	2,881,652	2,881,652	2,065,350	864,146	71,261,060
01.02.06.01	Site security and surveillance	4,975,512	9,080,716	13,590,409	4,785,865	389,365	389,365	388,843	389,365	389,365	389,365	389,365	314,750	143,813	35,616,098
01.02.06.01.03	Security fencing and protection of remaining entrances against trespassing	0	516,250	0	0	0	0	0	0	0	0	0	0	0	516,250
01.02.06.01.04	Deployment of officers forces	4,975,512	8,564,466	13,590,409	4,785,865	389,365	389,365	388,843	389,365	389,365	389,365	389,365	314,750	143,813	35,099,848
01.02.06.02	Site operation and maintenance	1,281,549	1,773,740	918,740	633,800	478,245	478,245	476,228	478,245	478,245	478,245	478,245	215,568	51,775	8,220,872
01.02.06.02.01	Inspection and maintenance of buildings and systems	1,281,549	1,773,740	918,740	633,800	478,245	478,245	476,228	478,245	478,245	478,245	478,245	215,568	51,775	8,220,872
01.02.06.03	Operation of support systems	1,114,589	1,914,038	1,855,054	1,247,279	957,742	957,742	957,034	957,742	957,742	957,742	957,742	990,653	516,095	14,341,197
01.02.06.03.01	Electricity supply systems	921,506	1,579,725	1,579,725	1,053,150	789,862	789,862	789,862	789,862	789,862	789,862	789,862	822,773	427,842	11,913,759
01.02.06.03.02	Ventilation systems	95,566	166,433	170,515	169,571	167,880	167,880	167,172	167,880	167,880	167,880	167,880	167,880	88,253	2,032,669
01.02.06.03.07	Other systems	97,517	167,880	104,814	24,558	0	0	0	0	0	0	0	0	0	394,769
01.02.06.04	Radiation and environmental safety monitoring	1,191,861	1,780,831	1,018,607	1,018,179	1,043,237	1,056,299	1,051,842	1,056,299	1,056,299	1,056,299	1,056,299	544,378	152,463	13,082,892
01.02.06.04.02	Radiation protection and monitoring	869,793	1,360,276	935,021	933,885	959,297	972,359	968,256	972,359	972,359	972,359	972,359	518,500	152,463	11,559,285
01.02.08	Project management, engineering and support	9,729,448	10,739,887	7,523,086	6,844,498	6,581,077	6,581,077	6,563,499	6,581,077	6,581,077	6,581,077	6,581,077	5,301,318	2,449,069	88,637,267
01.02.08.02	Project management	6,138,627	6,156,554	3,865,474	3,642,732	3,693,900	3,693,900	3,678,829	3,693,900	3,693,900	3,693,900	3,693,900	2,323,385	898,346	48,867,348
01.02.08.02.01	Core management group	2,603,983	4,442,980	2,912,181	3,035,035	3,215,035	3,215,035	3,201,469	3,215,035	3,215,035	3,215,035	3,215,035	1,995,918	763,589	38,245,361
01.02.08.02.02	Project implementation planning, detailed ongoing planning	2,614,267	309,103	179,431	116,835	90,096	90,096	89,715	90,096	90,096	90,096	90,096	27,776	0	3,877,700
01.02.08.02.03	Scheduling and cost control	257,580	443,437	344,574	137,994	65,281	65,281	65,005	65,281	65,281	65,281	65,281	110,436	68,635	1,819,346
01.02.08.02.04	Safety and environmental analysis, ongoing studies	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01.02.08.02.05	Quality assurance and quality surveillance	352,130	479,297	159,576	103,906	80,126	80,126	79,788	80,126	80,126	80,126	80,126	24,703	0	1,680,156
01.02.08.02.06	General administration and accounting	239,459	359,667	147,641	121,804	121,292	121,292	120,781	121,292	121,292	121,292	121,292	37,394	0	1,754,501
01.02.08.02.07	Public relations and stakeholders involvement	71,208	122,071	122,071	127,157	122,071	122,071	122,071	122,071	122,071	122,071	122,071	127,157	66,122	1,490,283
01.02.08.03	Support services	3,427,713	4,302,535	3,440,358	3,004,078	2,690,319	2,690,319	2,688,643	2,690,319	2,690,319	2,690,319	2,690,319	2,781,076	1,447,237	37,233,555
01.02.08.03.01	Engineering support	593,339	827,667	339,051	188,066	124,289	124,289	123,765	124,289	124,289	124,289	124,289	38,318	0	2,855,940
01.02.08.03.02	Information system and computer support	114,476	197,076	196,244	57,658	0	0	0	0	0	0	0	0	0	565,453
01.02.08.03.03	Waste management support	176,606	217,512	0	0	0	0	0	0	0	0	0	0	0	394,118
01.02.08.03.04	Decommissioning support including chemistry, decontamination	62,747	108,022	107,566	108,478	108,022	108,022	107,566	108,022	108,022	108,022	108,022	108,022	56,786	1,307,320
01.02.08.03.05	Personnel management and training	258,330	406,204	264,969	190,902	164,914	164,914	164,218	164,914	164,914	164,914	164,914	90,960	30,489	2,395,558
01.02.08.03.07	Procurement, warehousing, and materials handling	136,228	234,523	233,533	68,614	0	0	0	0	0	0	0	162,219	123,287	958,403
01.02.08.03.08	Housing, office equipment, support services	2,085,988	2,311,532	2,298,994	2,390,360	2,293,094	2,293,094	2,293,094	2,293,094	2,293,094	2,293,094	2,293,094	2,381,556	1,236,676	28,756,763
01.02.08.04	Health and safety	163,107	280,797	217,255	197,688	196,858	196,858	196,027	196,858	196,858	196,858	196,858	196,858	103,486	2,536,364
01.02.08.04.01	Health physics	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01.02.08.04.02	Industrial safety	163,107	280,797	217,255	197,688	196,858	196,858	196,027	196,858	196,858	196,858	196,858	196,858	103,486	2,536,364
01.02.11	Miscellaneous expenditures	19,890,637	28,428,955	14,108,264	10,220,880	3,003,617	3,003,617	3,003,617	2,602,417	2,585,701	2,585,701	2,585,701	2,811,172	1,550,150	96,380,428
01.02.11.01	Owner costs	9,662,947	11,570,121	4,383,520	5,729,717	797,245	797,245	797,245	396,045	379,329	379,329	379,329	590,715	355,032	36,217,819
01.02.11.01.01	Implementation of transition plans	7,854,867	9,369,142	4,004,191	5,334,583	417,917	417,917	417,917	16,717	0	0	0	0	0	27,833,250
01.02.11.01.03	Payments (fees) to authorities	1,808,080	2,200,978	379,329	395,134	379,329	379,329	379,329	379,329	379,329	379,329	379,329	590,715	355,032	8,384,569
01.02.11.02	Taxes	10,030,502	16,520,797	9,386,706	4,139,040	1,868,334	1,868,334	1,868,334	1,868,334	1,868,334	1,868,334	1,868,334	1,868,334	1,012,014	56,035,728
01.02.11.02.02	Local, community, federal taxes	10,030,502	16,520,797	9,386,706	2,737,789	0	0	0	0	0	0	0	0	0	38,675,793
01.02.11.03	Insurances	197,189	338,038	338,038	352,123	338,038	338,038	338,038	338,038	338,038	338,038	338,038	352,123	183,104	4,126,881
01.02.11.03.01	Nuclear related insurances	163,800	280,801	280,801	292,501	280,801	280,801	280,801	280,801	280,801	280,801	280,801	292,501	152,100	3,428,109
01.02.11.03.02	Other insurances	33,388	57,237	57,237	59,622	57,237	57,237	57,237	57,237	57,237	57,237	57,237	59,622	31,003	698,771

Table 3-3
HDI Decommissioning Cost Estimate Summary (thousands of 2019 dollars)

Decommissioning Activity	IP1	IP2	IP3
Decontamination			
Removal	162,256	186,173	197,721
Packaging	11,175	14,300	15,964
Transportation	41,043	19,637	28,135
Disposal	156,222	105,940	131,180
Off-site Waste Processing			
Program Management	119,726	144,384	182,529
Corporate A&G			
Spent Fuel (Direct Expenditures)	66,066	162,233	344,285
Insurance and Regulatory Fees	9,177	12,511	12,511
Energy	11,914	11,914	11,914
Characterization and Licensing Surveys	8,808	8,808	26,635
Property Taxes		22,537	38,676
Miscellaneous Equipment / Site Services	11,797	13,386	12,827
Spent Fuel Pool Isolation			
Grand Total	**598,184**	**701,822**	**1,002,378**

Cost Category	IP1	IP2	IP3
License Termination	485,015	469,456	583,168
Spent Fuel Management	72,381	188,278	371,370
Site Restoration	40,788	44,088	47,840
Grand Total	**598,184**	**701,822**	**1,002,378**

Table 3-4a
IP1 Labor Costs and Labor Requirements by Year

Labor Category	Labor Costs ($Millions) and Labor Requirements (FTE) per Year																						
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Management Labor Cost	1.59	2.462	2.05	1.098	.675	.675	.672	.675	.675	.675	.675	.8	.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Management Labor FTEs	5.10	7.79	6.24	3.34	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.58	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Professional Labor Cost	4.072	6.435	4.147	2.562	2.089	2.089	2.08	2.089	2.089	2.089	2.089	1.921	1.889	1.905	1.905	1.91	1.905	1.905	1.905	1.91	1.905	1.905	1.905
Professional Labor FTEs	27.18	43.55	29.82	17.59	13.48	13.48	13.48	13.48	13.48	13.48	13.48	12.66	10.65	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67
Craft Labor Cost	2.132	3.439	2.499	1.499	1.123	1.123	1.118	1.123	1.123	1.123	1.123	.679	.253	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Craft Labor FTEs	12.49	20.08	14.82	8.86	6.64	6.64	6.64	6.64	6.64	6.64	6.64	3.96	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Labor Cost	7.794	12.336	8.697	5.16	3.887	3.887	3.87	3.887	3.887	3.887	3.887	3.4	2.592	1.905	1.905	1.91	1.905	1.905	1.905	1.91	1.905	1.905	1.905
Total Labor FTEs	44.77	71.41	50.88	29.79	22.26	22.27	22.27	22.27	22.27	22.27	22.27	19.20	13.53	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67

Labor Category	2044	2045	2046	2047	2048	2049	2050	2052	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	Total Cost
Management Labor Cost	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.17
Management Labor FTEs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Professional Labor Cost	1.91	1.905	2.479	1.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	62.838
Professional Labor FTEs	8.67	8.67	11.28	8.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Craft Labor Cost	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.358
Craft Labor FTEs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Labor Cost	1.91	1.905	2.479	1.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	94.366
Total Labor FTEs	8.67	8.67	11.28	8.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Table 3-4b
IP2 Labor Costs and Labor Requirements by Year

Labor Category	Labor Costs ($Millions) and Labor Requirements (FTE) per Year																						
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2036	2038	2039	2040	2041	2042	2043
Management Labor Cost	1.44	2.27	2.27	1.72	1.44	1.44	1.43	1.44	1.44	1.44	1.44	1.22	.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Management Labor FTEs	4.63	7.19	6.90	5.25	4.57	4.58	4.58	4.58	4.58	4.58	4.58	3.92	1.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Professional Labor Cost	7.41	12.27	5.84	2.76	2.22	2.22	2.21	2.22	2.22	2.22	2.22	2.08	1.98	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91
Professional Labor FTEs	49.43	83.02	41.96	18.98	14.30	14.30	14.30	14.30	14.30	14.30	14.30	13.73	11.17	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67
Craft Labor Cost	2.21	3.49	2.15	1.56	1.38	1.38	1.38	1.38	1.38	1.38	1.38	.76	.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Craft Labor FTEs	12.96	20.40	12.73	9.22	8.17	8.18	8.18	8.18	8.18	8.18	8.18	4.43	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Labor Cost	11.06	18.04	10.25	6.05	5.04	5.04	5.02	5.04	5.04	5.04	5.04	4.06	2.82	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91
Total Labor FTEs	67.0	110.6	61.6	33.4	27.0	27.1	27.1	27.1	27.1	27.1	27.1	22.1	14.5	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7

Labor Category	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	Total Cost
Management Labor Cost	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.56
Management Labor FTEs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Professional Labor Cost	1.91	1.91	.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	71.48
Professional Labor FTEs	8.67	8.67	3.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Craft Labor Cost	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.1
Craft Labor FTEs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Labor Cost	1.91	1.91	.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	111.14
Total Labor FTEs	8.7	8.7	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Table 3-4c
IP3 Labor Costs and Labor Requirements by Year

Labor Category	Labor Costs ($Millions) and Labor Requirements (FTE) per Year																						
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2043	2035	2036	2037	2038	2039	2040	2041	2042	2043
Management Labor Cost	2.61	4.44	3.08	3.01	3.21	3.22	3.21	3.22	3.22	3.22	3.22	2.26	.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Management Labor FTEs	8.36	14.03	9.36	9.16	10.22	10.27	10.27	10.27	10.27	10.27	10.27	7.30	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Professional Labor Cost	8.19	13.28	15.77	6.79	2.36	2.36	2.35	2.36	2.36	2.36	2.36	1.91	1.76	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91
Professional Labor FTEs	54.65	89.89	113.41	46.64	15.22	15.22	15.22	15.22	15.22	15.22	15.22	12.58	9.93	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67
Craft Labor Cost	1.93	2.96	1.91	1.64	2.94	3.75	3.73	3.75	3.75	3.75	3.75	2.61	.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Craft Labor FTEs	11.30	17.26	11.35	9.71	17.39	22.18	22.18	22.18	22.18	22.18	22.18	15.23	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Labor Cost	12.72	20.68	20.76	11.44	8.51	9.33	9.29	9.33	9.33	9.33	9.33	6.78	2.93	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91
Total Labor FTEs	74.3	121.2	134.1	65.5	42.8	47.7	47.7	47.7	47.7	47.7	47.7	35.1	14.3	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7

Labor Category	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	Total Cost
Management Labor Cost	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.84
Management Labor FTEs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Professional Labor Cost	1.91	1.91	2.48	3.88	5.73	5.72	5.72	5.72	5.73	5.72	5.72	5.72	5.73	5.72	5.72	5.72	5.73	5.7	0.00	173.52
Professional Labor FTEs	8.67	8.67	11.28	17.63	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	25.93	0.00	
Craft Labor Cost	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.71
Craft Labor FTEs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Labor Cost	1.91	1.91	2.48	3.88	5.73	5.72	5.72	5.72	5.73	5.72	5.72	5.72	5.73	5.72	5.72	5.72	5.73	5.7	0.00	249.07
Total Labor FTEs	8.7	8.7	11.3	17.6	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	25.9	0.0	

Table 3-5a
IP1 Labor Costs and Labor Requirements by Period

IPEC Unit 1	Labor (FTEs) and Labor Costs ($Millions)													
	Period 1		Period 2		Period 3		Period 4		Period 5		Program Management		Total	
	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost
PWR DECON														
Decommissioning Crews	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.59	12.608	64.59	12.608
Management/Support Staff	0.00	0.00	0.00	0.00	0.00	0.00	20.67	3.154	240.93	46.097	166.53	32.507	428.13	81.758
Total	0.00	0.00	0.00	0.00	0.00	0.00	20.67	3.154	240.93	46.097	231.13	45.116	492.72	94.366

Table 3-5b
IP2 Labor Costs and Labor Requirements by Period

IPEC Unit 2	Labor (FTEs) and Labor Costs ($Millions)													
	Period 1		Period 2		Period 3		Period 4		Period 5		Program Management		Total	
	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost
PWR DECON														
Decommissioning Crews	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	69.35	13.537	69.35	13.537
Management/Support Staff	0.00	0.00	0.00	0.00	0.00	0.00	12.98	1.980	191.62	36.629	302.24	58.999	506.84	97.608
Total	0.00	0.00	0.00	0.00	0.00	0.00	12.98	1.980	191.62	36.629	371.59	72.536	576.19	111.145

Table 3-5c
IP3 Labor Costs and Labor Requirements by Period

IPEC Unit 3	Labor (FTEs) and Labor Costs ($Millions)													
	Period 1		Period 2		Period 3		Period 4		Period 5		Program Management		Total	
	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost	Labor FTE	Labor Cost
PWR DECON														
Decommissioning Crews	0.00	0.00	0.00	0.00	0.00	0.00	81.28	12.401	0.00	0.00	71.02	13.863	152.30	26.264
Management/Support Staff	0.00	0.00	0.00	0.00	0.00	0.00	47.27	7..12	622.83	119.140	494.13	96.454	1164.23	222.806
Total	0.00	0.00	0.00	0.00	0.00	0.00	128.55	19.614	622.83	119.140	565.15	110.316	1316.53	249.070

Table 3-6 IPEC DOE Fuel Acceptance Allocation

YEAR	MTU	Fuel Assemblies	Unit 1	Unit 2	Unit 3
2031	30.58	160		160	
2032	32.73	72		72	
2033	56.24	124		124	
2034	87.38	193		193	
2035	68.49	151		151	
2036	96.48	212		212	
2037	67.14	147		147	
2038	61.45	134		134	
2039	59.52	129		129	
2040	36.50	79		79	
2041	40.17	87		87	
2042	41.00	89		89	
2043				0	
2044	78.33	170		170	
2045	33.19	72		72	
2046	31.46	69		69	
2047	40.54	89		89	
2048	79.56	176	155	21	
2049	80.26	178	5		173
2050	2050	92			92
2051	43.53	97			97
2052	83.49	186			186
2053	43.55	96			96
2054	43.62	96			96
2055	80.76	178			178
2056	43.55	96			96
2057	42.13	92			92
2058	83.50	185			185
2059	41.73	92			92
2060	45.37	101			101
2061	174.30	386			386
			160	**1,998**	**1,870**

Table 3-7 IPEC Waste Volume and Weight

		IP1		IP2		IP3	
Waste	Class	Waste Volume (cubic feet)	Weight (pounds)	Waste Volume (cubic feet)	Weight (pounds)	Waste Volume (cubic feet)	Weight (pounds)
Low-Level Radioactive Waste	A	3,586,546	264,662,579	1,365,109	88,044,580	2,185,120	138,466,106
	B	1,411	87,409	501	50,254	501	50,254
	C	1,088	102,716	574	71,218	574	71,218
Greater than Class C Waste	GTCC	412	73,789	2,061	11,642	2,061	411,642
Total		3,589,457	264,926,493	1,368,245	88,577,694	2,188,256	138,999,220

4 COST ESTIMATING APPROACH

4.1 Estimating Methodology

The CDI estimating methodology is an iterative process which is compatible with the development of integrated scope, schedule, cost, risk, and contingency baselines. Summary highlights of the key steps in the estimating process include:

- Initiating the cost estimate process with a discovery period, and cataloging project specific details, due diligence, applicable industry standards, and available benchmarking data
- Capturing and organizing the work scope into the hierarchical structure of standard decommissioning activities outlined in the major decommissioning elements and sub-elements contained within the ISDC WBS along with a corresponding WBS dictionary
- Identifying the major decommissioning project milestones and developing a Decommissioning Project Milestone Summary Schedule capturing the relationship and sequencing of the milestones
- Assigning each WBS sub-element to subject matter experts to develop a detailed basis of estimate (BOE) for each WBS sub-element capturing the project specific scope of work, technical approach, deliverables, assumptions, existing and verifiable data, judgmental factors, exclusions, and resources
- Identifying and qualitatively ranking the discrete risk events having a potential impact on the project scope, schedule and budget; and populating the risk register
- Developing detailed schedule fragnets for each WBS sub-element, fully defining the activities, durations and logic ties and compiling these detailed schedule fragnets into a detailed activity schedule model in Oracle Primavera, P6
- Identifying quantities, resources, and cost elements to accomplish the detailed scope of work in alignment with the Oracle Primavera, P6 schedule activities
- Compiling the estimate details into the cost model and validating results
- Assigning estimate uncertainty categories to WBS sub-elements
- Developing an integrated estimate and schedule risk model to validate schedule integrity and to establish and define cost and schedule contingency reserves
- Verifying and validating the cost, schedule, and risk models, model input and model results
- Documenting the estimate development details, basis methodologies and assumptions

4.2 Basis of Estimate

The decommissioning scope of work was organized into 39 Level 4 WBS elements, and an individual BOE was developed for each of the elements. These BOEs capture the essential cost estimating and schedule development data; including the site-specific scope, technical approach, key deliverables, assumptions, judgmental factors, existing and verifiable data,

exclusions, and resources (quantities and pricing). Table 4-1 includes the 39 WBS elements for which the detailed BOEs were developed.

A site-specific detailed WBS and sequence of work was developed based on current plant commodities that will make up the decommissioning waste streams. The sequence of work was used to define the labor, material, equipment, energy resources and durations required for each activity. In the case of major components, individual work sequence activity analyses were performed based on the physical and radiological characteristics of the component, removal method, packaging requirements, modes of transportation and disposal location together with required system dependencies and logic ties.

In the case of structures, small components and equipment such as piping, pumps and tanks, the work durations and cost were calculated based a review of previous IP1, 2 & 3 decommissioning cost analyses, decommissioning experience, estimates from specialty subcontractors, information on the latest technology applicable to decommissioning, and engineering judgment. After the work activity durations were calculated for all distributed cost activities, a detailed schedule was developed. The DCE and schedule were prepared using information collected by HDI and CDI during the due diligence period in addition to the input and professional judgment of experienced SMEs. The schedule accounts for constraints such as spent fuel cooling periods and regulatory reviews.

The DCE and schedule took into consideration regulatory requirements, site conditions, basis of estimate assumptions, LLRW disposal standards, high-level radioactive waste management options, opportunities identified in walkdowns and site restoration requirements. Cost estimates were based on the professional judgment of experienced SMEs, considering the nature of the work, degree of scope definition, availability of quantifiable cost and pricing data, among other factors.

The estimates of costs associated with license termination in NUREG/CR-5884, "Revised Analyses of Decommissioning for the Reference Pressurized-Water Reactor Power Station," (Reference 7) were reviewed in order to evaluate the reasonableness of the CDI estimates. In addition, CDI compared the IP1, 2 & 3 decommissioning cost estimates for license termination, spent fuel management and site restoration activities to costs from similar activities from seven decommissioned pressurized water reactor nuclear power plants.

The estimates include provisions for storage of spent fuel and GTCC wastes at the on-site ISFSI until acceptance by the DOE. Escalation of future decommissioning costs over the remaining decommissioning project life-cycle are excluded.

4.3 Assumptions

Work planning, schedule development and cost estimating for the decommissioning rely on a set of assumptions regarding the type and quality of inputs and the nature of the work.

Pre-Decommissioning Planning

- Entergy has provided reasonable and accurate information in good faith regarding the history and current condition of the plants and site

- No decontamination efforts will be carried out to free release contaminated material
- In determining the waste management strategy and volume estimates, all contaminated material will be characterized as LLRW, or its respective waste classification
- Waste classification for transport will be supported by an initial site waste characterization effort

Facility Shutdown Activities

- All wastes and waste streams generated during decommissioning have a disposition path
- No orphan waste will be generated during decommissioning

Dismantling Activities within the Radiologically Controlled Area

- Local ventilation will be required for most tasks and building ventilation is adequate for these tasks and will not require upgrading or replacement
- The reactor building overhead crane will be available and has adequate lift capacity for casks containing RPV internals, water and the shielding cover
- The turbine building overhead crane has adequate lift capacity for the low-pressure turbines and the generator

Waste Processing, Storage and Disposal

- Transportation of waste offsite will include truck conveyance to rail
- No radioactive waste systems or processing areas will be refurbished or refit for use during decommissioning
- Waste sampling and data verification/validation is accomplished by a subcontractor

Site Infrastructure and Operation

- Existing site security is adequate for transition and CDI decommissioning activities
- The existing Operations and Maintenance (O&M) procedures are available and adequate for all active plant systems
- SMEs are available in the existing work force and a sufficient number will transition to CDI to support decommissioning

Project Management, Engineering, and Support

- The CDI project management team will mobilize to the site during the pre-decommissioning planning phase to be ready to begin decommissioning following the sale and transfer of the facility licenses

Fuel and Nuclear Material

- All plant systems required to carry out the spent fuel to ISFSI pad transfer campaign are operational

4.4 Inflation

The decommissioning cost estimates presented in this report were developed and reported in 2019 dollars. Escalation of future decommissioning costs over the remaining decommissioning project life-cycle are excluded.

4.5 Contingency

Any project has inherent uncertainty in the estimated quantities, unit rates, productivity, pricing, and schedule durations. Concurrently there are also a vast number of project specific discrete risks, e.g., risk events that may also affect cost and schedule estimates. A sound risk management approach is used to establish the appropriate levels of cost and schedule contingency reserves for establishing achievable target schedules and budgets, making well-informed decisions during the decommissioning project lifecycle.

A Monte-Carlo simulation risk modeling tool is used to quantitatively evaluate the integrated impact of uncertainty and discrete risk events on the project objectives, baseline schedule and costs. Risk analysis tools integrate directly with project schedules and cost estimates and provides simple techniques to model uncertainty and discrete risk events to forecast the cost and schedule impacts. Risk analysis output is used with expert judgement to provide an objective view to validate the integrity of the schedule model, evaluate the effectiveness of risk response plans, identify and prioritize key risk drivers, quantify schedule and cost reserves based on desired levels of confidence, and publish risk-adjusted schedules. CDI used Primavera Risk as a model to evaluate schedule risk. Primavera Risk Analysis is a full lifecycle risk analysis solution for schedule risk management. Primavera Risk Analysis provides a comprehensive means of determining confidence levels for project success together with quick and easy techniques for determining contingency and risk response plans. CDI used the software to help determine schedule uncertainty.

Estimate Uncertainty

Uncertainty in estimates is generally a function of the level of maturity in the project definition. Estimate uncertainty is also a function of various factors including:

- Expected site conditions (physical and radiological)
- Decommissioning processes and tools
- New and/or non-familiar technology
- Complexity
- Labor skills and productivity
- Stakeholder/regulatory requirements
- Quality of cost estimating assumptions and data
- Experience and skill level of the estimator
- Pricing
- Estimating techniques
- Time and level of effort allowed to prepare the cost estimate and schedule

To provide a basis to account for the uncertainty in a decommissioning project schedule

duration and/or cost, subject matter experts assign evaluate segments of decommissioning work as to the low, expected, and high value estimate uncertainty. This assignment was based on estimate methodology, available data, and professional judgement as to the level of confidence of the estimate.

Estimate uncertainty profiles were developed to show the cumulative impacts from the estimate type and level of accuracy on schedules and costs. These estimate uncertainty profiles were used to establish the schedule and cost Uncertainty Allowance that is added to the decommissioning project baseline schedule and cost estimate to address the estimate uncertainty within the defined decommissioning scope of work and execution strategy. Uncertainty Allowance is included in the baseline cost and schedule to cover ill-defined work scope or elements of costs and schedules expected to be incurred, which cannot be explicitly foreseen or estimated because of a lack of complete, accurate or detailed information. The amount of time/duration and costs to be included in the schedule and cost baselines for Uncertainty Allowance to account for these uncertainties is derived using the quantitative risk model in @Risk for the 85% probability or level of confidence.

Discrete Risk Events

Discrete risks events on a project can be either threats or opportunities. Discrete risk events are considered a threat when the risk event may negatively impact the project baseline objectives, such as schedule delays and cost increases. Discrete risk events are considered an opportunity when the event may positively impact the project objectives, such as schedule and/or cost savings. Unlike uncertainty, discrete risk events may or may not occur. The risk analysis process used to evaluate discrete risk events is both qualitative and quantitative.

Qualitative risk analysis is the process of examining each identified risk event to refine the description of the risk event, isolate the contributing factors, define the risk event probability of occurrence, measure impacts (positive or negative) to the cost and schedule baseline should the risk event occur, and assessment of the manageability of exposure to the risk event. CDI uses a risk event scoring matrix to qualitatively grade/prioritize the discrete risk events as extremely high, high, medium, and low based on the probability of occurrence and impacts. This qualitative assessment is used to prioritize the discrete risk events for more detailed risk analysis and risk response planning with primary focus on the medium, high and extremely high-risk events.

In addition to a qualitative analysis of discrete risk events, a quantitative analysis is performed on all the active discrete risk events classified as threats. The quantitative risk analysis process relies on risk modeling/risk simulation tools to evaluate the individual and cumulative effects of the identified discrete risk events in concert with estimate uncertainty on overall project objectives and baseline schedule and costs. The primary goal of quantitative analysis is to produce measurable risk information to establish appropriate levels of reserves in the cost and schedule baselines and to support management decision making to increase project certainty.

Risk Allowance is funds added to the baseline schedule and estimate to account for discrete

risk events (both threats and opportunities) that may or may not occur during the decommissioning project lifecycle. The amount of time/duration and costs to be included in the schedule and cost baselines for Risk Allowance to account for discrete risk events that may materialize during the decommissioning project lifecycle is also derived from the quantitative risk model Stature, for the 85% probability or level of confidence. Stature, a licensed proprietary software from SNC-Lavalin, in combination with @Risk was used on IPEC to determine Risk and contingency levels. A risk log was built within Stature in order to assess the magnitude of Risks and level of confidence in managing those risks. Output from the model was then used to run a Monte Carlo in @Risk to determine the P85 or 85th percentile probability of confidence an output contingency value would give.

Contingency Allowance

Based on an integrated evaluation of estimate uncertainty and discrete risk events utilizing industry accepted risk modeling tools and techniques in addition to a review of industry experience with similar decommissioning projects, a Contingency Allowance of 18 percent was determined to be reasonable for the IPEC decommissioning project. This Contingency Allowance is incorporated into the estimate of License Termination, Spent Fuel Management and Site Restoration costs presented herein. The exception is ISFSI decommissioning costs, which include a **25%** Contingency Allowance consistent with the contingency evaluation criteria referenced by the NRC in NUREG-1757 (Reference 12).

The Contingency Allowance is an integral part of the cost to complete the IPEC decommissioning and is expected to be fully consumed. Contingency does not account for inflation or escalation of the price of goods and services over the course of the project.

Table 4-1 Work Breakdown Structure

WBS Code	WBS Name
01.02.01.01	Decommissioning planning
01.02.01.02	Facility characterization
01.02.01.03	Safety, security and environmental studies
01.02.01.04	Waste management planning
01.02.01.05	Authorization
01.02.01.06	Preparing management group and contracting
01.02.02.01	Plant shutdown and inspection
01.02.02.02	Drainage and drying of systems
01.02.02.05	Removal of system fluids, operational waste and redundant material
01.02.04.01	Procurement of equipment for decontamination and dismantling
01.02.04.02	Preparations and support for dismantling
01.02.04.04	Removal of materials requiring specific procedures
01.02.04.05	Dismantling of main process systems, structures and components
01.02.04.06	Dismantling of other systems and components
01.02.04.08	Removal of contamination from areas outside buildings
01.02.04.09	Final radioactivity survey for release of buildings
01.02.05.01	Waste management system
01.02.05.08	Management of decommissioning intermediate-level waste/GTCC
01.02.05.09	Management of decommissioning low-level waste
01.02.05.12	Management of decommissioning exempt waste and materials
01.02.05.13	Management of decommissioning waste and materials generated outside controlled areas
01.02.06.01	Site security and surveillance
01.02.06.02	Site operation and maintenance
01.02.06.03	Operation of support systems
01.02.06.04	Radiation and environmental safety monitoring
01.02.07.02	Dismantling of systems and building components outside the controlled area
01.02.07.03	Demolition of buildings and structures
01.02.07.04	Final cleanup, landscaping and refurbishment
01.02.07.05	Final radioactivity survey of site
01.02.08.01	Mobilization and preparatory work
01.02.08.02	Project management
01.02.08.03	Support services
01.02.08.04	Health and safety
01.02.10.01	Removal of fuel or nuclear material from facility to be decommissioned
01.02.10.02	Dedicated storage for fuel and/or nuclear material
01.02.10.03	Decommissioning of the ISFSI
01.02.11.01	Owner costs
01.02.11.02	Taxes
01.02.11.03	Insurances

5 DECOMMISSIONING SCHEDULE AND FUNDING

5.1 Decommissioning Schedule

The schedule and cost estimate to decommission IP1, 2 & 3 is based on the DECON method. The detailed decommissioning project schedule, developed in Primavera P6, is used as the foundation for developing the decommissioning cost estimate and risk model. The schedule baseline is a detailed CPM schedule model built with input from the key decommissioning subcontractors and subject matter experts.

The major steps in the decommissioning project schedule development methodology include the following:

1. Identify and define the major decommissioning project milestones
2. Develop a decommissioning project MSS in Oracle Primavera P6, capturing the relationship and sequencing of the key project milestones
3. Prepare milestone-focused, activity-based schedule fragnets by WBS, comprised of detailed activities, durations, sequencing, and constraints in alignment with the technical solutions and MSS
4. Capture all the activity-based schedule fragnets into an integrated, logically linked master decommissioning project schedule model in Oracle Primavera P6
5. Verify and validate the integrated master decommissioning project schedule model in Oracle P6 against the MSS. Confirm the schedule integrity/reasonableness of the overall project primary/secondary critical paths as well as for each MSS milestone

Figure 5-1 provides the Master Summary Schedule, which is based on the assumption that the IP1, 2 & 3 licenses are transferred to HDI by May 31, 2021.

As described in Subsection 3.2, HDI's spent fuel management is based in general upon: 1) a 2030 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE beginning in 2031. All spent fuel is expected to be removed from the site by 2061.

5.2 Decommissioning Funds

10 CFR 50.82(a)(6)(iii) states that, "Licensees shall not perform any decommissioning activities," as defined in 10 CFR 50.2 that, "Result in there no longer being reasonable assurance that adequate funds will be available for decommissioning." HDI does not intend to perform any decommissioning activities that would jeopardize the availability of adequate funds for the completion of decommissioning.

Tables 5-1a, 5-1b and 5-1c show the amount of decommissioning funds expected to be available at the time the licenses are transferred, the accumulation of additional funds, and the expenditure of the funds for IP1, IP2 and IP3 respectively.

Prior to the license transfers, ENIP2 and ENIP are expected to seek reimbursement from the NDTs to pay for accrued but un-reimbursed decommissioning expenses, including

decommissioning planning and other decommissioning activities. The 2021 beginning of year (BOY) Trust Fund Values (analysis starting trust fund balances) in Tables 5-1a, 5-1b and 5-1c are the fund amounts expected to be in the NDT funds for IP1, 2 & 3 at the date of sale of the units to Holtec (targeted for May 31, 2021). These values are exclusive of funds expected to be withdrawn from the NDT by ENIP2 and ENIP3 for reimbursable expenses incurred prior to transaction closing.

Figure 5-1 Master Summary Schedule

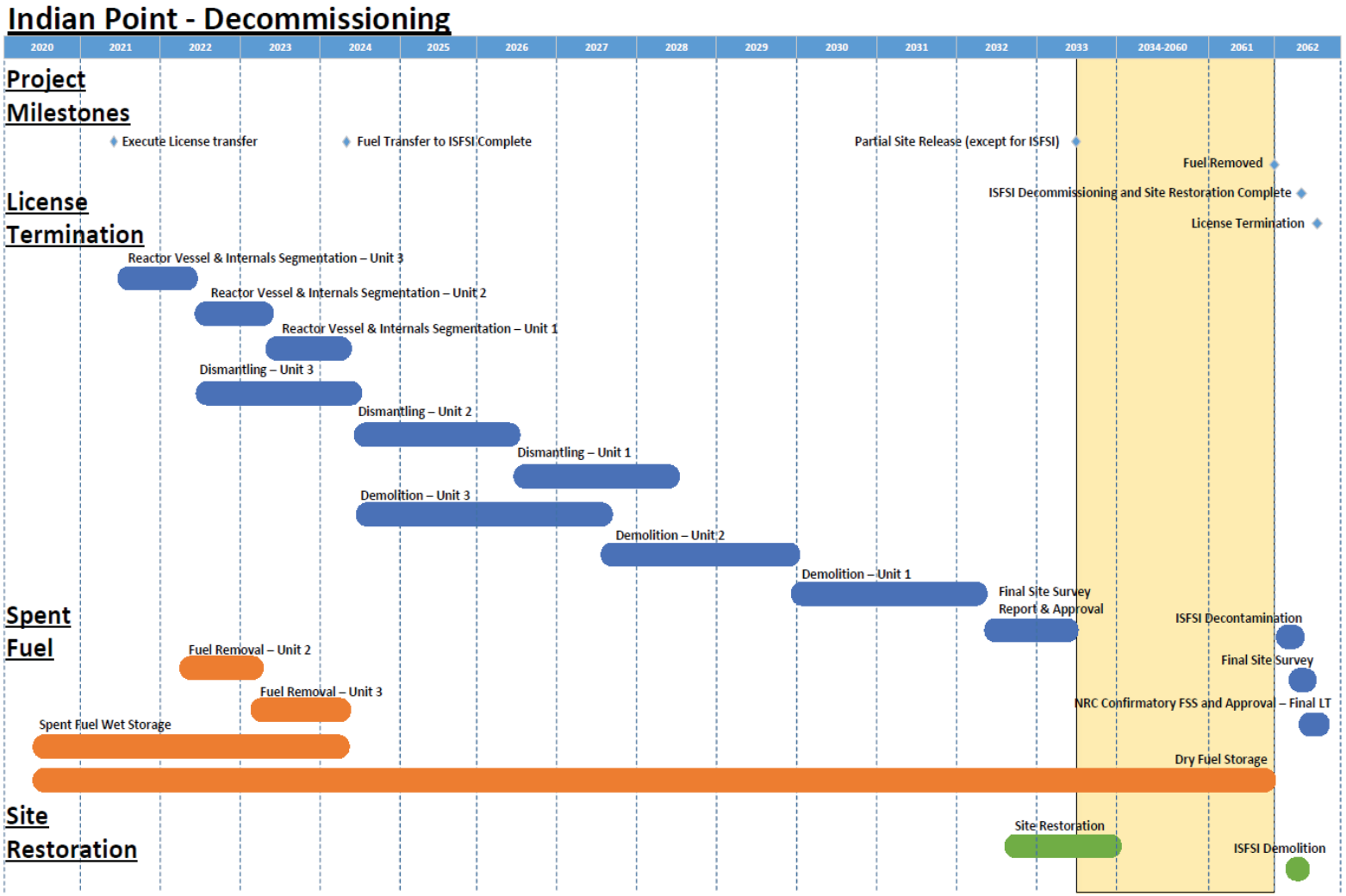

Table 5-1a
IP1 Decommissioning Funding Cash Flow Analysis

IPEC Unit 1 - DECON Method
Annual Cash Flow in Thousands of 2019 Dollars
No DOE Reimbursement of Spent Fuel Management Costs

Year	50.75 License Termination Cost [2]	50.54 (bb) Spent Fuel Management Cost [2]	Site Restoration Cost [2]	Total Cost [2]	Beginning of Year Trust Fund Balance[1]	Withdraw	Trust Fund Earnings [3]	Year Ending Trust Fund Balance
2021	29,941	2,676		32,617	533,532	-32,617	5,844	506,759
2022	27,637	4,546		32,183	506,759	-32,183	9,492	484,068
2023	52,768	2,516	2,113	57,397	484,068	-57,397	8,533	435,204
2024	65,344	1,654	4,550	71,547	435,204	-71,547	7,273	370,930
2025	22,059	1,708	5,224	28,992	370,930	-28,992	6,839	348,777
2026	25,850	1,660	5,076	32,586	348,777	-32,586	6,324	322,515
2027	34,183	1,582	4,850	40,615	322,515	-40,615	5,638	287,538
2028	30,731	1,613	4,943	37,287	287,538	-37,287	5,005	255,256
2029	22,503	1,702	5,204	29,410	255,256	-29,410	4,517	230,363
2030	50,400	1,523	1,804	53,727	230,363	-53,727	3,533	180,169
2031	75,149	1,465	1,498	78,112	180,169	-78,112	2,041	104,097
2032	37,915	1,569	5,460	44,944	104,097	-44,944	1,183	60,336
2033	2,422	4,209		6,631	60,336	-6,631	1,074	54,779
2034		2,870		2,870	54,779	-2,870	1,038	52,948
2035		2,870		2,870	52,948	-2,870	1,002	51,079
2036		2,875		2,875	51,079	-2,875	964	49,169
2037		2,870		2,870	49,169	-2,870	926	47,225
2038		2,870		2,870	47,225	-2,870	887	45,242
2039		2,870		2,870	45,242	-2,870	847	43,220
2040		2,875		2,875	43,220	-2,875	807	41,152
2041		2,870		2,870	41,152	-2,870	766	39,048
2042		2,870		2,870	39,048	-2,870	724	36,902
2043		2,870		2,870	36,902	-2,870	681	34,713
2044		2,875		2,875	34,713	-2,875	637	32,474
2045		2,870		2,870	32,474	-2,870	592	30,197
2046		5,162		5,162	30,197	-5,162	501	25,536
2047	145	4,343		4,488	25,536	-4,488	421	21,468
2048	386			386	21,468	-386	422	21,503
2049	386			386	21,503	-386	422	21,539
2050	386			386	21,539	-386	423	21,576

[1] The 2021 Beginning of Year NDT balance reflects the fund value post-closure of the sale transition. The value used is based on the October 31, 2019 Unit 1 NDT fund balance and includes deductions for estimated ENOI and HDI pre-closure costs of approximately $59.3M.
[2] The 2021 costs include HDI estimated 2021 post-closure costs.
[3] NDT earnings reflect an assumed 2% Real Rate of Return (RRR).

IPEC Unit 1 - DECON Method

Annual Cash Flow in Thousands of 2019 Dollars
No DOE Reimbursement of Spent Fuel Management Costs

Year	50.75 License Termination Cost [2]	50.54 (bb) Spent Fuel Management Cost [2]	Site Restoration Cost [2]	Total Cost [2]	Beginning of Year Trust Fund Balance[1]	Withdraw	Trust Fund Earnings [3]	Year Ending Trust Fund Balance
2051	386			386	21,576	-386	424	21,613
2052	386			386	21,613	-386	425	21,651
2053	386			386	21,651	-386	425	21,690
2054	386			386	21,690	-386	426	21,730
2055	714			714	21,730	-714	420	21,436
2056	715			715	21,436	-715	414	21,136
2057	715			715	21,136	-715	408	20,829
2058	715			715	20,829	-715	402	20,516
2059	715			715	20,516	-715	396	20,197
2060	715			715	20,197	-715	390	19,871
2061	715			715	19,871	-715	383	19,539
2062	257		66	323	19,539	-323	384	19,601
2063					19,601		392	19,993
Total [4]	**485,015**	**72,381**	**40,788**	**598,184**		**-598,184**	**84,645**	

[1] The 2021 Beginning of Year NDT balance reflects the fund value post-closure of the sale transition. The value used is based on the October 31, 2019 Unit 1 NDT fund balance and includes deductions for estimated ENOI and HDI pre-closure costs of approximately $59.3M.
[2] The 2021 costs include HDI estimated 2021 post-closure costs.
[3] NDT earnings reflect an assumed 2% Real Rate of Return (RRR).
[4] Columns may not add due to rounding.

Table 5-1b
IP2 Decommissioning Funding Cash Flow Analysis

IPEC Unit 2 - DECON Method
Annual Cash Flow in Thousands of 2019 Dollars
No DOE Reimbursement of Spent Fuel Management Costs

Year	50.75 License Termination Cost [2]	50.54 (bb) Spent Fuel Management Cost [2]	Site Restoration Cost [2]	Total Cost [2]	Beginning of Year Trust Fund Balance[1]	Withdraw	Trust Fund Earnings [3]	Year Ending Trust Fund Balance
2021	42,737	27,287		70,024	654,078	-70,024	6,814	590,868
2022	69,990	34,019	1,825	105,834	590,868	-105,834	9,701	494,735
2023	67,919	11,439	6,137	85,496	494,735	-85,496	8,185	417,424
2024	33,157	4,337	6,618	44,113	417,424	-44,113	7,466	380,777
2025	36,136	1,608	6,250	43,993	380,777	-43,993	6,736	343,520
2026	32,379	1,636	6,358	40,373	343,520	-40,373	6,063	309,210
2027	32,796	1,635	5,266	39,697	309,210	-39,697	5,390	274,903
2028	51,731	1,548	1,884	55,164	274,903	-55,164	4,395	224,134
2029	50,554	1,553	1,853	53,960	224,134	-53,960	3,403	173,577
2030	8,592	6,857		15,449	173,577	-15,449	3,163	161,291
2031	8,592	6,857		15,449	161,291	-15,449	2,917	148,758
2032	5,994	5,905	6,747	18,646	148,758	-18,646	2,602	132,714
2033	1,922	7,701		9,623	132,714	-9,623	2,462	125,553
2034		5,990		5,990	125,553	-5,990	2,391	121,954
2035		6,000		6,000	121,954	-6,000	2,319	118,274
2036		6,014		6,014	118,274	-6,014	2,245	114,505
2037		6,000		6,000	114,505	-6,000	2,170	110,675
2038		5,990		5,990	110,675	-5,990	2,094	106,779
2039		6,000		6,000	106,779	-6,000	2,016	102,795
2040		6,005		6,005	102,795	-6,005	1,936	98,725
2041		6,000		6,000	98,725	-6,000	1,855	94,580
2042		6,000		6,000	94,580	-6,000	1,772	90,352
2043		6,000		6,000	90,352	-6,000	1,687	86,040
2044		6,005		6,005	86,040	-6,005	1,601	81,636
2045		5,990		5,990	81,636	-5,990	1,513	77,158
2046		3,152		3,152	77,158	-3,152	1,480	75,486
2047	145	749		894	75,486	-894	1,492	76,084
2048	386			386	76,084	-386	1,514	77,212
2049	386			386	77,212	-386	1,537	78,362

[1] The 2021 Beginning of Year NDT balance reflects the fund value post-closure of the sale transition. The value used is based on the October 31, 2019 Unit 2 NDT fund balance and includes deductions for estimated ENOI and HDI pre-closure costs of approximately $15.15M.
[2] The 2021 costs include HDI estimated 2021 post-closure costs.
[3] NDT earnings reflect an assumed 2% Real Rate of Return (RRR).

IPEC Unit 2 - DECON Method

Annual Cash Flow in Thousands of 2019 Dollars
No DOE Reimbursement of Spent Fuel Management Costs

Year	50.75 License Termination Cost [2]	50.54 (bb) Spent Fuel Management Cost [2]	Site Restoration Cost [2]	Total Cost [2]	Beginning of Year Trust Fund Balance[1]	Withdraw	Trust Fund Earnings [3]	Year Ending Trust Fund Balance
2050	386			386	78,362	-386	1,560	79,535
2051	386			386	79,535	-386	1,583	80,731
2052	386			386	80,731	-386	1,607	81,952
2053	386			386	81,952	-386	1,631	83,196
2054	386			386	83,196	-386	1,656	84,466
2055	3,274			3,274	84,466	-3,274	1,624	82,816
2056	3,285			3,285	82,816	-3,285	1,591	81,121
2057	3,285			3,285	81,121	-3,285	1,557	79,393
2058	3,285			3,285	79,393	-3,285	1,522	77,629
2059	3,285			3,285	77,629	-3,285	1,487	75,831
2060	3,285			3,285	75,831	-3,285	1,451	73,996
2061	3,285			3,285	73,996	-3,285	1,414	72,125
2062	1,121		1,149	2,270	72,125	-2,270	1,397	71,252
2063					71,252		1,425	72,677
Total [4]	**469,456**	**188,278**	**44,088**	**701,822**		**-701,822**	**120,420**	

[1] The 2021 Beginning of Year NDT balance reflects the fund value post-closure of the sale transition. The value used is based on the October 31, 2019 Unit 2 NDT fund balance and includes deductions for estimated ENOI and HDI pre-closure costs of approximately $15.15M.
[2] The 2021 costs include HDI estimated 2021 post-closure costs.
[3] NDT earnings reflect an assumed 2% Real Rate of Return (RRR).
[4] Columns may not add due to rounding.

Table 5-1c
IP3 Decommissioning Funding Cash Flow Analysis

IPEC Unit 3 - DECON Method
Annual Cash Flow in Thousands of 2019 Dollars
No DOE Reimbursement of Spent Fuel Management Costs

Year	50.75 License Termination Cost [2]	50.54 (bb) Spent Fuel Management Cost [2]	Site Restoration Cost [2]	Total Cost [2]	Beginning of Year Trust Fund Balance[1]	Withdraw	Trust Fund Earnings[3]	Year Ending Trust Fund Balance
2021	63,590	46,741	442	110,773	916,100	-110,773	9,395	814,722
2022	103,657	16,745	3,833	124,235	814,722	-124,235	13,810	704,297
2023	68,921	35,203	3,616	107,740	704,297	-107,740	11,931	608,488
2024	51,552	30,858	3,514	85,924	608,488	-85,924	10,451	533,016
2025	49,120	1,421	3,630	54,171	533,016	-54,171	9,577	488,421
2026	52,082	1,407	3,594	57,084	488,421	-57,084	8,627	439,964
2027	42,955	1,451	3,714	48,119	439,964	-48,119	7,837	399,682
2028	26,334	1,638	4,192	32,164	399,682	-32,164	7,350	374,868
2029	26,318	1,638	4,185	32,142	374,868	-32,142	6,855	349,581
2030	26,314	1,638	4,186	32,138	349,581	-32,138	6,349	323,792
2031	26,314	1,638	4,186	32,138	323,792	-32,138	5,833	297,487
2032	22,366	1,561	7,751	31,679	297,487	-31,679	5,316	271,124
2033	2,581	4,763		7,343	271,124	-7,343	5,276	269,057
2034		3,607		3,607	269,057	-3,607	5,309	270,759
2035		3,607		3,607	270,759	-3,607	5,343	272,494
2036		3,612		3,612	272,494	-3,612	5,378	274,260
2037		3,607		3,607	274,260	-3,607	5,413	276,066
2038		3,607		3,607	276,066	-3,607	5,449	277,907
2039		3,607		3,607	277,907	-3,607	5,486	279,786
2040		3,612		3,612	279,786	-3,612	5,523	281,697
2041		3,607		3,607	281,697	-3,607	5,562	283,652
2042		3,607		3,607	283,652	-3,607	5,601	285,646
2043		3,607		3,607	285,646	-3,607	5,641	287,679
2044		3,612		3,612	287,679	-3,612	5,681	289,748
2045		3,607		3,607	289,748	-3,607	5,723	291,864
2046		4,433		4,433	291,864	-4,433	5,749	293,179
2047		7,453		7,453	293,179	-7,453	5,715	291,441
2048		11,953		11,953	291,441	-11,953	5,590	285,078
2049		11,917		11,917	285,078	-11,917	5,463	278,624

[1] The 2021 Beginning of Year NDT balance reflects the fund value post-closure of the sale transition. The value used is based on the October 31, 2019 Unit 3 NDT fund balance and includes deductions for estimated ENOI and HDI pre-closure costs of approximately $15.15M.
[2] The 2021 costs include HDI estimated 2021 post-closure costs.
[3] NDT earnings reflect an assumed 2% Real Rate of Return (RRR).

IPEC Unit 3 - DECON Method

Annual Cash Flow in Thousands of 2019 Dollars
No DOE Reimbursement of Spent Fuel Management Costs

Year	50.75 License Termination Cost [2]	50.54 (bb) Spent Fuel Management Cost [2]	Site Restoration Cost [2]	Total Cost [2]	Beginning of Year Trust Fund Balance[1]	Withdraw	Trust Fund Earnings[3]	Year Ending Trust Fund Balance
2050		11,927		11,927	278,624	-11,927	5,334	272,030
2051		11,917		11,917	272,030	-11,917	5,202	265,315
2052		11,953		11,953	265,315	-11,953	5,067	258,429
2053		11,927		11,927	258,429	-11,927	4,930	251,432
2054		11,927		11,927	251,432	-11,927	4,790	244,294
2055	2,888	11,917		14,805	244,294	-14,805	4,590	234,079
2056	2,899	11,943		14,842	234,079	-14,842	4,385	223,622
2057	2,899	11,927		14,826	223,622	-14,826	4,176	212,972
2058	2,899	11,927		14,826	212,972	-14,826	3,963	202,108
2059	2,899	11,927		14,826	202,108	-14,826	3,746	191,028
2060	2,899	11,943		14,842	191,028	-14,842	3,524	179,709
2061	2,899	11,912		14,811	179,709	-14,811	3,298	168,196
2062	782	2,459	996	4,238	168,196	-4,238	3,279	167,237
2063					167,237		3,345	170,582
Total [4]	**583,168**	**371,370**	**47,840**	**1,002,378**		**-1,002,378**	**256,860**	

[1] The 2021 Beginning of Year NDT balance reflects the fund value post-closure of the sale transition. The value used is based on the October 31, 2019 Unit 3 NDT fund balance and includes deductions for estimated ENOI and HDI pre-closure costs of approximately $15.15M.
[2] The 2021 costs include HDI estimated 2021 post-closure costs.
[3] NDT earnings reflect an assumed 2% Real Rate of Return (RRR).
[4] Columns may not add due to rounding

6 CONCLUSION

The submittal of this DECON DCE complies with NRC requirements set forth in 10 CFR 50.82(a)(8)(iii), which requires the licensee to submit a site-specific Decommissioning Cost Estimate within 2 years of permanent cessation of operation. CDI prepared this cost estimate and schedule on behalf of HDI using several sources, including information compiled during a due diligence period and the input and professional judgment of experienced specialty subcontractors and SMEs.

The estimate is based on regulatory requirements, site conditions, baseline assumptions, low-level radioactive waste disposal standards, high-level radioactive waste management options and site restoration requirements. The cost to decommission the site, safeguard the spent fuel until it can be transferred to the DOE and restore the affected area of the site is estimated to be $598 million for IP1, $702 million for IP2 and $1,002 million for IP3. The majority of these costs are associated with decommissioning and license termination. A significant amount of the remaining cost is associated with spent fuel management since the fuel will be removed from the SFPs and remain in storage at the ISFSI until acceptance by DOE. A relatively small amount of the decommissioning cost is for the demolition of uncontaminated structures and restoration of the site. The summary of the costs estimated for License Termination, Spent Fuel Management and Site Restoration activities for each unit are presented in Table 6-1a, 6-1b and 6-1c.

The largest contributors to the overall decommissioning costs are removal of contaminated components and buildings, disposal costs, and program management costs. 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. The disposal of low-level radioactive waste that is generated from dismantling activities makes up the bulk of the disposal cost category. The magnitude of the program management costs is a function of both the size of the organization needed to manage the decommissioning, as well as the duration.

In accordance with 10 CFR 50.82(a)(8)(v), decommissioning funding assurance will be reviewed and reported to the NRC annually until residual radioactivity has been reduced to a level that permits termination of the licenses. The site-specific DCE adjusted for inflation, in accordance with applicable regulatory requirements, will be used to demonstrate funding assurance. In addition, actual radiological and spent fuel management expenses will be included in the annual report in accordance with applicable regulatory requirements.

If the funding assurance demonstration shows that the NDTs are not sufficient, then an alternate funding mechanism allowed by 10 CFR 50.75(e) and the guidance provided in Regulatory Guide 1.159 (Reference 13) will be put in place.

Table 6-1a
IP1 Estimated Decommissioning Cost (thousands of 2019 dollars)

WBS_Code	WBS_Name	License Termination	Spent Fuel	Site Restoration	Total
01.02	IPEC Unit 1	485,015	72,381	40,788	598,184
01.02.01	Pre-decommissioning actions	8,808			8,808
01.02.01.02.01	Detailed facility characterization	8,808			8,808
01.02.04	Dismantling activities within the controlled area	68,239			68,239
01.02.04.01	Procurement of equipment for decontamination and dismantling	5,900			5,900
01.02.04.01.01	Procurement of general site-dismantling equipment	983			983
01.02.04.01.03	Procurement of special tools for dismantling the reactor systems	4,917			4,917
01.02.04.05	Dismantling of main process systems, structures and components	62,290			62,290
01.02.04.05.01	Dismantling of reactor internals	38,350			38,350
01.02.04.06	Dismantling of other systems and components	49			49
01.02.05	Waste processing, storage and disposal	200,014		11,971	211,986
01.02.05.01	Waste management system	3,546			3,546
01.02.05.08	Management of decommissioning intermediate-level waste/GTCC	1,446			1,446
01.02.05.08.07	Containers	1,446			1,446
01.02.05.09	Management of decommissioning low-level waste	29,066			29,066
01.02.05.12	Management of decommissioning exempt waste and materials	165,957			165,957
01.02.05.13	Management of decommissioning waste and materials generated outside controlled areas			11,971	11,971
01.02.06	Site infrastructure and operation	35,482			35,482
01.02.06.01	Site security and surveillance	3,758			3,758
01.02.06.01.03	Security fencing and protection of remaining entrances against trespassing	516			516
01.02.06.01.04	Deployment of officers forces	3,241			3,241
01.02.06.02	Site operation and maintenance	4,949			4,949
01.02.06.02.01	Inspection and maintenance of buildings and systems	4,949			4,949
01.02.06.02.02	Site upkeep activities				
01.02.06.03	Operation of support systems	15,216			15,216
01.02.06.03.01	Electricity supply systems	11,914			11,914
01.02.06.03.02	Ventilation systems	2,997			2,997
01.02.06.03.07	Other systems	305			305
01.02.06.04	Radiation and environmental safety monitoring	11,560			11,560
01.02.06.04.02	Radiation protection and monitoring	10,873			10,873
01.02.06.04.03	Environmental protection and radiation environmental monitoring	687			687
01.02.07	Conventional dismantling, demolition and site restoration	63,437		22,402	85,839
01.02.07.03	Demolition of buildings and structures	63,437		22,402	85,839
01.02.07.03.01	Demolition of buildings and structures from the formerly controlled area	63,437			63,437
01.02.07.03.02	Demolition of buildings and structures outside the controlled area			22,402	22,402
01.02.07.03.02.10	Phase I Demolition			4,278	4,278
01.02.08	Project management, engineering and support	50,362	4,704	4,151	59,216
01.02.08.02	Project management	18,649	1,821	1,160	21,629
01.02.08.02.01	Core management group	9,952	1,030	681	11,663
01.02.08.02.02	Project implementation planning, detailed ongoing planning	3,590	308	137	4,034
01.02.08.02.03	Scheduling and cost control	980	99	70	1,149
01.02.08.02.04	Safety and environmental analysis, ongoing studies				
01.02.08.02.05	Quality assurance and quality surveillance	1,082	131	6	1,219

WBS_Code	WBS_Name	License Termination	Spent Fuel	Site Restoration	Total
01.02.08.02.06	General administration and accounting	1,797	138	139	2,074
01.02.08.02.07	Public relations and stakeholders involvement	1,248	114	128	1,490
01.02.08.03	Support services	30,505	2,765	2,888	36,159
01.02.08.03.01	Engineering support	3,143	261	243	3,647
01.02.08.03.02	Information system and computer support	244	42	8	293
01.02.08.03.03	Waste management support	41	4		45
01.02.08.03.04	Decommissioning support including chemistry, decontamination	548	50	56	654
01.02.08.03.05	Personnel management and training	2,063	161	170	2,395
01.02.08.03.06	Documentation and records control				
01.02.08.03.07	Procurement, warehousing, and materials handling	314	44	10	368
01.02.08.03.08	Housing, office equipment, support services	24,153	2,203	2,401	28,757
01.02.08.04	Health and safety	1,208	118	102	1,428
01.02.08.04.01	Health physics				
01.02.08.04.02	Industrial safety	1,208	118	102	1,428
01.02.08.05	Demobilization - NOT USED				
01.02.10	Fuel and nuclear material	8,112	66,066	66	74,244
01.02.10.02	Dedicated ISFSI for fuel and/or nuclear material	2,300	66,066		68,366
01.02.10.02.01	Construction of ISFSI		5,906		5,906
01.02.10.02.02	Operation of ISFSI		56,996		56,996
01.02.10.02.03	Transfer of fuel and/or nuclear material away from the ISFSI	2,300	3,165		5,464
01.02.10.02.03.01	Transfer of fuel and/or nuclear material away from the ISFSI - License Termination costs	2,300			2,300
01.02.10.02.03.02	Transfer of fuel and/or nuclear material away from the ISFSI - Spent Fuel Management costs		3,165		3,165
01.02.10.03	Decommissioning of ISFSI	5,812		66	5,878
01.02.10.03.01	Decommissioning of ISFSI	5,812		48	5,860
01.02.10.03.01.01	Decommissioning of ISFSI - Decommissioning of ISFSI - License Termination costs	5,812			5,812
01.02.10.03.01.03	Decommissioning of ISFSI - Decommissioning of ISFSI - Site Restoration costs			48	48
01.02.10.03.02	Management of waste			18	18
01.02.10.03.02.03	Decommissioning of ISFSI - Management of waste - Site Restoration costs			18	18
01.02.11	Miscellaneous expenditures	50,562	1,611	2,198	54,371
01.02.11.01	Owner costs	32,884			32,884
01.02.11.01.03	Payments (fees) to authorities	5,050			5,050
01.02.11.01.04	Specific external services and payments				
01.02.11.02	Taxes	14,221	1,295	1,844	17,360
01.02.11.03	Insurances	3,457	316	354	4,127
01.02.11.03.01	Nuclear related insurances	2,872	262	294	3,428
01.02.11.03.02	Other insurances	585	53	60	699

Table 6-1b
IP2 Estimated Decommissioning Cost (thousands of 2019 dollars)

WBS_Code	WBS_Name	License Termination	Spent Fuel	Site Restoration	Total
01.02	IPEC Unit 2	469,456	188,278	44,088	701,822
01.02.01	Pre-decommissioning actions	8,808			8,808
01.02.01.02.01	Detailed facility characterization	8,808			8,808
01.02.02	Facility shutdown activities		60,197		60,197
01.02.02.01	Plant shutdown and inspection		60,197		60,197
01.02.02.01.04	Management of fuel, fissile and other nuclear materials		60,197		60,197
01.02.04	Dismantling activities within the controlled area	72,227			72,227
01.02.04.01	Procurement of equipment for decontamination and dismantling	5,900			5,900
01.02.04.01.01	Procurement of general site-dismantling equipment	983			983
01.02.04.01.03	Procurement of special tools for dismantling the reactor systems	4,917			4,917
01.02.04.05	Dismantling of main process systems, structures and components	66,278			66,278
01.02.04.05.01	Dismantling of reactor internals	38,350			38,350
01.02.04.06	Dismantling of other systems and components	49			49
01.02.05	Waste processing, storage and disposal	130,262		11,988	142,249
01.02.05.01	Waste management system	2,372			2,372
01.02.05.08	Management of decommissioning intermediate-level waste/GTCC	8,850			8,850
01.02.05.08.07	Containers	8,850			8,850
01.02.05.09	Management of decommissioning low-level waste	13,979			13,979
01.02.05.12	Management of decommissioning exempt waste and materials	105,060			105,060
01.02.05.13	Management of decommissioning waste and materials generated outside controlled areas			11,988	11,988
01.02.06	Site infrastructure and operation	53,622			53,622
01.02.06.01	Site security and surveillance	18,976			18,976
01.02.06.01.03	Security fencing and protection of remaining entrances against trespassing	516			516
01.02.06.01.04	Deployment of officers forces	18,460			18,460
01.02.06.02	Site operation and maintenance	6,458			6,458
01.02.06.02.01	Inspection and maintenance of buildings and systems	6,458			6,458
01.02.06.03	Operation of support systems	16,469			16,469
01.02.06.03.01	Electricity supply systems	11,914			11,914
01.02.06.03.02	Ventilation systems	4,074			4,074
01.02.06.03.07	Other systems	482			482
01.02.06.04	Radiation and environmental safety monitoring	11,719			11,719
01.02.06.04.02	Radiation protection and monitoring	10,401			10,401
01.02.06.04.03	Environmental protection and radiation environmental monitoring	1,318			1,318
01.02.07	Conventional dismantling, demolition and site restoration	63,437		22,402	85,839
01.02.07.03	Demolition of buildings and structures	63,437		22,402	85,839
01.02.07.03.01	Demolition of buildings and structures from the formerly controlled area	63,437			63,437
01.02.07.03.02	Demolition of buildings and structures outside the controlled area			22,402	22,402
01.02.07.03.02.10	Phase I Demolition			4,278	4,278
01.02.08	Project management, engineering and support	47,506	15,484	5,505	68,496
01.02.08.02	Project management	19,741	6,565	2,104	28,410
01.02.08.02.01	Core management group	12,901	3,884	1,571	18,356

WBS_Code	WBS_Name	License Termination	Spent Fuel	Site Restoration	Total
01.02.08.02.02	Project implementation planning, detailed ongoing planning	2,189	1,229	75	3,492
01.02.08.02.03	Scheduling and cost control	1,554	492	150	2,196
01.02.08.02.04	Safety and environmental analysis, ongoing studies				
01.02.08.02.05	Quality assurance and quality surveillance	1,021	348	76	1,446
01.02.08.02.06	General administration and accounting	1,041	294	96	1,431
01.02.08.02.07	Public relations and stakeholders involvement	1,034	319	137	1,490
01.02.08.03	Support services	26,521	8,443	3,285	38,249
01.02.08.03.01	Engineering support	3,291	958	335	4,583
01.02.08.03.02	Information system and computer support	172	99	22	293
01.02.08.03.03	Waste management support	252	139	4	394
01.02.08.03.04	Decommissioning support including chemistry, decontamination	455	139	59	654
01.02.08.03.05	Personnel management and training	1,878	478	189	2,545
01.02.08.03.07	Procurement, warehousing, and materials handling	569	350	103	1,023
01.02.08.03.08	Housing, office equipment, support services	19,904	6,280	2,573	28,757
01.02.08.04	Health and safety	1,245	476	116	1,837
01.02.08.04.02	Industrial safety	1,245	476	116	1,837
01.02.10	Fuel and nuclear material	26,958	102,036	1,149	130,142
01.02.10.02	Dedicated ISFSI for fuel and/or nuclear material	20,281	102,036		122,317
01.02.10.02.02	Operation of ISFSI		62,792		62,792
01.02.10.02.03	Transfer of fuel and/or nuclear material away from the ISFSI	20,281	39,244		59,525
01.02.10.02.03.01	Transfer of fuel and/or nuclear material away from the ISFSI - License Termination costs	20,281			20,281
01.02.10.02.03.02	Transfer of fuel and/or nuclear material away from the ISFSI - Spent Fuel Management costs		39,244		39,244
01.02.10.03	Decommissioning of ISFSI	6,676		1,149	7,826
01.02.10.03.01	Decommissioning of ISFSI	6,676		1,132	7,808
01.02.10.03.01.01	Decommissioning of ISFSI - Decommissioning of ISFSI - License Termination costs	6,676			6,676
01.02.10.03.01.03	Decommissioning of ISFSI - Decommissioning of ISFSI - Site Restoration costs			1,132	1,132
01.02.10.03.02	Management of waste			18	18
01.02.10.03.02.03	Decommissioning of ISFSI - Management of waste - Site Restoration costs			18	18
01.02.11	Miscellaneous expenditures	66,637	10,561	3,043	80,241
01.02.11.01	Owner costs	36,218			36,218
01.02.11.01.03	Payments (fees) to authorities	8,385			8,385
01.02.11.01.04	Specific external services and payments				
01.02.11.02	Taxes	27,555	9,678	2,663	39,897
01.02.11.02.02	Local, community, federal taxes	15,542	6,153	842	22,537
01.02.11.03	Insurances	2,865	883	380	4,127
01.02.11.03.01	Nuclear related insurances	2,380	733	315	3,428
01.02.11.03.02	Other insurances	485	149	64	699

Table 6-1c
IP3 Estimated Decommissioning Cost (thousands of 2019 dollars)

WBS_Code	WBS_Name	License Termination	Spent Fuel	Site Restoration	Total
01.02	IPEC Unit 3	583,168	371,370	47,840	1,002,378
01.02.01	Pre-decommissioning actions	8,808			8,808
01.02.01.02.01	Detailed facility characterization	8,808			8,808
01.02.02	Facility shutdown activities		106,199		106,199
01.02.02.01	Plant shutdown and inspection		106,199		106,199
01.02.02.01.04	Management of fuel, fissile and other nuclear materials		106,199		106,199
01.02.04	Dismantling activities within the controlled area	79,627			79,627
01.02.04.01	Procurement of equipment for decontamination and dismantling	5,900			5,900
01.02.04.01.01	Procurement of general site-dismantling equipment	983			983
01.02.04.01.03	Procurement of special tools for dismantling the reactor systems	4,917			4,917
01.02.04.05	Dismantling of main process systems, structures and components	73,678			73,678
01.02.04.05.01	Dismantling of reactor internals	38,350			38,350
01.02.04.06	Dismantling of other systems and components	49			49
01.02.05	Waste processing, storage and disposal	165,494		11,964	177,459
01.02.05.01	Waste management system	2,179			2,179
01.02.05.08	Management of decommissioning intermediate-level waste/GTCC	8,880			8,880
01.02.05.08.07	Containers	8,880			8,880
01.02.05.09	Management of decommissioning low-level waste	15,176			15,176
01.02.05.12	Management of decommissioning exempt waste and materials	139,260			139,260
01.02.05.13	Management of decommissioning waste and materials generated outside controlled areas			11,964	11,964
01.02.06	Site infrastructure and operation	71,261			71,261
01.02.06.01	Site security and surveillance	35,616			35,616
01.02.06.01.03	Security fencing and protection of remaining entrances against trespassing	516			516
01.02.06.01.04	Deployment of officers forces	35,100			35,100
01.02.06.02	Site operation and maintenance	8,221			8,221
01.02.06.02.01	Inspection and maintenance of buildings and systems	8,221			8,221
01.02.06.03	Operation of support systems	14,341			14,341
01.02.06.03.01	Electricity supply systems	11,914			11,914
01.02.06.03.02	Ventilation systems	2,033			2,033
01.02.06.03.07	Other systems	395			395
01.02.06.04	Radiation and environmental safety monitoring	13,083			13,083
01.02.06.04.02	Radiation protection and monitoring	11,559			11,559
01.02.06.04.03	Environmental protection and radiation environmental monitoring	1,524			1,524
01.02.07	Conventional dismantling, demolition and site restoration	89,193		24,668	113,861
01.02.07.03	Demolition of buildings and structures	71,366		24,668	96,034
01.02.07.03.01	Demolition of buildings and structures from the formerly controlled area	71,366			71,366
01.02.07.03.02	Demolition of buildings and structures outside the controlled area			24,668	24,668
01.02.07.03.02.10	Phase I Demolition			4,278	4,278
01.02.07.05	Final radioactivity survey of site	17,827			17,827
01.02.07.05.01	Final survey	17,827			17,827
01.02.08	Project management, engineering and support	67,454	14,193	6,991	88,637
01.02.08.02	Project management	37,377	7,740	3,750	48,867
01.02.08.02.01	Core management group	29,799	5,248	3,198	38,245

WBS_Code	WBS_Name	License Termination	Spent Fuel	Site Restoration	Total
01.02.08.02.02	Project implementation planning, detailed ongoing planning	2,502	1,272	103	3,878
01.02.08.02.03	Scheduling and cost control	1,314	399	106	1,819
01.02.08.02.05	Quality assurance and quality surveillance	1,263	327	90	1,680
01.02.08.02.06	General administration and accounting	1,357	278	119	1,755
01.02.08.02.07	Public relations and stakeholders involvement	1,141	216	133	1,490
01.02.08.03	Support services	28,138	6,071	3,024	37,234
01.02.08.03.01	Engineering support	2,132	578	147	2,856
01.02.08.03.02	Information system and computer support	390	160	15	565
01.02.08.03.03	Waste management support	283	104	7	394
01.02.08.03.04	Decommissioning support including chemistry, decontamination	1,003	188	117	1,307
01.02.08.03.05	Personnel management and training	1,833	390	173	2,396
01.02.08.03.06	Documentation and records control				
01.02.08.03.07	Procurement, warehousing, and materials handling	622	278	58	958
01.02.08.03.08	Housing, office equipment, support services	21,876	4,374	2,507	28,757
01.02.08.04	Health and safety	1,939	382	216	2,536
01.02.08.04.02	Industrial safety	1,939	382	216	2,536
01.02.10	Fuel and nuclear material	21,063	238,086	996	260,146
01.02.10.02	Dedicated ISFSI for fuel and/or nuclear material	20,281	235,626		255,908
01.02.10.02.01	Construction of ISFSI				
01.02.10.02.02	Operation of ISFSI		198,915		198,915
01.02.10.02.03	Transfer of fuel and/or nuclear material away from the ISFSI	20,281	36,712		56,993
01.02.10.02.03.01	Transfer of fuel and/or nuclear material away from the ISFSI - License Termination costs	20,281			20,281
01.02.10.02.03.02	Transfer of fuel and/or nuclear material away from the ISFSI - Spent Fuel Management costs		36,712		36,712
01.02.10.03	Decommissioning of ISFSI	782	2,460	996	4,239
01.02.10.03.01	Decommissioning of ISFSI	782	2,442	979	4,203
01.02.10.03.01.01	Decommissioning of ISFSI - Decommissioning of ISFSI - License Termination costs	782			782
01.02.10.03.01.02	Decommissioning of ISFSI - Decommissioning of ISFSI - Spent Fuel Management costs		2,442		2,442
01.02.10.03.01.03	Decommissioning of ISFSI - Decommissioning of ISFSI - Site Restoration costs			979	979
01.02.10.03.02	Management of waste		18	18	35
01.02.10.03.02.02	Decommissioning of ISFSI - Management of waste - Spent Fuel Management costs		18		18
01.02.10.03.02.03	Decommissioning of ISFSI - Management of waste - Site Restoration costs			18	18
01.02.11	Miscellaneous expenditures	80,268	12,891	3,221	96,380
01.02.11.01	Owner costs	36,218			36,218
01.02.11.01.03	Payments (fees) to authorities	8,385			8,385
01.02.11.02	Taxes	40,891	12,293	2,852	56,036
01.02.11.02.02	Local, community, federal taxes	27,190	10,509	977	38,676
01.02.11.03	Insurances	3,160	598	369	4,127
01.02.11.03.01	Nuclear related insurances	2,625	497	307	3,428
01.02.11.03.02	Other insurances	535	101	63	699

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5. NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors," (GEIS).
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12. NUREG-1757, “Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness,” U.S. Nuclear Regulatory Commission’s Office of Nuclear Material Safety and Safeguards, Volume 3, Revision 1, February 2012.
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Appendix A

ISFSI Decommissioning Cost Estimate

Table A-1
IP1 ISFSI Decommissioning Cost Estimate

Activity	Removal Costs	Packaging Costs	Transport Costs	LLRW Disposal Costs	Other Costs	Total Costs
Decommissioning Contractor						
Planning (characterization, specs and procedures)					17,700	17,700
Decontamination (Overpack disposition)						0
License Termination (radiological Surveys)					42,344	42,344
Subtotal					60,044	60,044
Supporting Costs						
NRC and NRC Contractor Costs					3,638	3,638
Site O&M						0
Insurance						0
NRC Regulatory Fees					224,706	224,706
Subtotal					228,345	228,345
Total w/25% Contingency					288,389	288,389

Table A-2
IP2 ISFSI Decommissioning Cost Estimate

Activity	Removal Costs	Packaging Costs	Transport Costs	LLRW Disposal Costs	Other Costs	Total Costs
Decommissioning Contractor						
Planning (characterization, specs and procedures)					17,700	17,700
Decontamination (Overpack disposition)	864,000	19,492	171,301	340,766		1,395,559
License Termination (radiological Surveys)					42,344	42,344
Subtotal	864,000	19,492	171,301	340,766	48,244	1,455,604
Supporting Costs						
NRC and NRC Contractor Costs					3,638	3,638
Site O&M						0
Insurance						0
NRC Regulatory Fees					224,706	224,706
Subtotal					228,345	228,345
Total w/25% Contingency	864,000	19,492	171,301	340,766	276,589	1,683,948

Table A-3
IP3 ISFSI Decommissioning Cost Estimate

Activity	Removal Costs	Packaging Costs	Transport Costs	LLRW Disposal Costs	Other Costs	Total Costs
Decommissioning Contractor						
Planning (characterization, specs and procedures)					35,400	35,400
Decontamination (Overpack disposition)	736,000	13,924	122,360	290,476		1,162,760
License Termination (radiological Surveys)					42,344	42,344
Subtotal	736,000	13,924	122,360	290,476	77,744	1,240,505
Supporting Costs						
NRC and NRC Contractor Costs					3,638	3,638
Site O&M					1,692,563	1,692,563
Insurance					538,748	538,748
NRC Regulatory Fees					211,048	211,048
Subtotal					2,445,997	2,445,997
Total w/25% Contingency	736,000	13,924	122,360	290,476	2,523,741	3,686,501