Entergy Nuclear Operations, Inc
1340 Echelon Parkway
Jackson, MS 39213

Mandy K. Halter
Director, Nuclear Licensing
Tel: (601) 368-5573
mhalter@entergy.com

CNRO-2018-00019

June 4, 2018

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Director, Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety and Safeguards
11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: **Response to Request for Additional Information regarding ISFSI Decommissioning Funding Plans (10 CFR 72.30)**

Big Rock Point Docket No. 72-043 EPID: L-2017-FPR-0007	Palisades Nuclear Plant Docket No. 72-007 EPID: L-2017-FPR-0050
Indian Point Nuclear Generating Stations 1, 2, & 3 Docket No. 72-051 EPID: L-2017-FPR-0035	James A. FitzPatrick Nuclear Power Plant Docket No. 72-012 EPID: L-2017-FPR-0026
Pilgrim Nuclear Power Station Docket No. 72-1044 EPID: L-2017-FPR-0054	Vermont Yankee Nuclear Power Station Docket No. 72-059 EPID: L-2017-FPR-0071

REFERENCES:

1. Entergy letter CNRO-2015-00028; "ISFSI Decommissioning Funding Plans (10 CFR 72.30)," dated December 17, 2015 (ML15351A524).

2. NRC letter dated April 5, 2018, Request for Additional Information Regarding Entergy [Nuclear] Operations, Inc.'s Decommissioning Funding Plan Update for Big Rock Point, Indian Point Nuclear Generating Stations Units 1, 2, and 3, Pilgrim Nuclear Power Station, Palisades Nuclear Plant, James A. FitzPatrick Nuclear Power Plant, and Vermont Yankee Nuclear Power Station Independent Spent Fuel Storage Installations Docket Nos. 72-43, 72-51, 72-1044, 72-07, 72-12, and 72-59 (CAC No. 001028, ML18094B091, ML18094B093, ML18094B092).

Dear Sir or Madam:

By letter dated December 17, 2015 (Reference 1), Entergy Nuclear Operations, Inc. (ENOI), acting as agent for the owner licensees, submitted Independent Spent Fuel Storage Installation (ISFSI) decommissioning funding plans pursuant to 10 CFR 72.30. By letter dated April 5, 2018 (Reference 2), the NRC issued a Request for Additional Information (RAI) related to the Reference 1 report for Big Rock Point, Indian Point Nuclear Generating Stations Units 1, 2, and 3, Pilgrim Nuclear Power Station, Palisades Nuclear Plant, James A. FitzPatrick Nuclear Power Plant, and Vermont Yankee Nuclear Power Station. The attachments to this letter provide ENOI's responses on behalf of the subject licensees to the RAI as relevant to the period encompassed by the Reference 1 report.

In March 2017, Entergy Corporation sold Entergy Nuclear FitzPatrick, LLC, the owner of the James A. FitzPatrick plant, to Exelon Corporation. The Reference 1 ISFSI decommissioning plans are stated as of December 31, 2015. As the revised decommissioning funding plans provided as attachments to this correspondence are as of the same date, and ENOI was the operator of James A. FitzPatrick as of that date, ENOI is providing the response for the James A. FitzPatrick RAI herein.

This submittal contains no new commitments.

If you have any questions, please contact Mr. Bryan Ford, Senior Manager, Fleet Regulatory Assurance, at 601-368-5516.

Sincerely,

MKH / ljs/chm

Attachments:

1. Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan – Big Rock Point
2. Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan – Palisades Nuclear Plant

3A. Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan – Indian Point Nuclear Power Plant, Units 1 and 2

3B. Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan – Indian Point Nuclear Power Plant, Unit 3

4. Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan – James A. FitzPatrick Nuclear Power Plant
5. Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan – Pilgrim Nuclear Power Station
6. Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan – Vermont Yankee Nuclear Power Station

cc:

Mr. L. Jager Smith (ECH)
Mr. W. A. Cloutier (TLG)

Mr. A. J. Vitale (IPEC)
Mr. C. F. Arnone (PAL)
Mr. B. R. Sullivan (PIL)
Mr. C. R. Daniels (VTY)

USNRC Regional Administrator, Region I
USNRC Regional Administrator, Region III

USNRC Project Manager, Indian Point 1
USNRC Project Manager, Indian Point 2/3
USNRC Project Manager, FitzPatrick
USNRC Project Manager, Big Rock Point
USNRC Project Manager, Palisades
USNRC Project Manager, Pilgrim
USNRC Project Manager, Vermont Yankee

USNRC Resident Inspector, Indian Point
USNRC Resident Inspector, FitzPatrick
USNRC Resident Inspector, Palisades
USNRC Resident Inspector, Pilgrim
USNRC Resident Inspector, Vermont Yankee

State of New York
State of Michigan
State of Vermont
State of Massachusetts

ATTACHMENT 1

CNRO-2018-00019

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
Big Rock Point
ISFSI Docket 72-043

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
Big Rock Point
ISFSI Docket 72-043

1. Background and Introduction

The Nuclear Regulatory Commission (NRC) issued its final rule on Decommissioning Planning on June 17, 2011,[1] with the rule becoming effective on December 17, 2012. Subpart 72.30, "Financial assurance and recordkeeping for decommissioning," requires that each holder of, or applicant for, a license under this part must submit for NRC review and approval a decommissioning funding plan that contains information on how reasonable assurance will be provided that funds will be available to decommission the Independent Spent Fuel Storage Installation (ISFSI).

The rule also requires resubmittal of the decommissioning funding plan at intervals not to exceed 3 years, with adjustments as necessary to account for changes in costs and the extent of contamination. This document is intended to update the funding plans previously submitted by Entergy Nuclear Operations in December 2012.[2]

In accordance with the rule, this letter provides a detailed cost estimate for decommissioning the ISFSI at the Big Rock Point site, in an amount reflecting:

1. The work performed by an independent contractor;
2. An adequate contingency factor; and
3. Release of the facility and dry storage systems for unrestricted use, as specified in 10 CFR Part 20.1402

This letter also provides:

1. Identification of and justification for using the key assumptions contained in the cost estimate;
2. A description of the method of assuring funds for decommissioning; and
3. The volume of onsite subsurface material containing residual radioactivity, if any, that will require remediation to meet the criteria for license termination.

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1 U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70 and 72 "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, Number 117 (p 35512 et seq.), June 17, 2011

2 "ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Big Rock Point, Indian Point Generating Stations 1, 2, & 3, Pilgrim Nuclear Power Station, Palisades Nuclear Plant, James A. FitzPatrick and Vermont Yankee Nuclear Power Station," ENOC-12-00039, dated December 13, 2012 (NRC Accession No. ML12352A126)

2. Spent Fuel Management Strategy

The Big Rock Point nuclear plant was located in Charlevoix County, Michigan. The boiling water reactor operated from 1962 to 1997, when it was permanently shut down on August 29, 1997. The plant was decommissioned and the structures demolished, with all site work completed in 2006.

Approximately 441 spent fuel assemblies were generated over the life of the plant. Because of the breach by the Department of Energy (DOE) of its contract to remove fuel from the site, an ISFSI was constructed for interim storage and fuel casks have been emplaced thereon. The operating license for the ISFSI was subsequently transferred from Consumers Energy to Entergy Nuclear Palisades and site operator Entergy Nuclear Operations (Entergy) in April of 2007.[3] The ISFSI is operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[4]).

Completion of the ISFSI decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site. DOE's repository program assumes that spent fuel allocations will be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor. Entergy's current spent fuel management plan for the Big Rock Point spent fuel is based in general upon: 1) a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the Big Rock Point fuel. The DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. Assuming a maximum rate of transfer of 3,000 metric tons of uranium/year,[5] the spent fuel is projected to be fully removed from the Big Rock Point site in 2038.

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the current administration's Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[6]

The report stated that "[W]ith the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that:

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3 News release "NRC Staff Approves Big Rock Point ISFSI License Transfer," dated April 10, 2007 (Accession Number ML071000477)

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

5 "Acceptance Priority Ranking & Annual Capacity Report," DOE/RW-0567, July 2004

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

…[A]dvances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities."

The DOE has taken the position that under the Standard Contract, it does not have an obligation to accept canistered fuel from licensees. This position, coupled with the DOE's failure to perform, has increased the difficulty of estimating future requirements under 10 CFR 72.30. The estimates presented in this report are for budgeting purposes only, and do not represent any conclusion by the licensee about how the DOE will actually perform in the future. This report should not be taken as any indication that the licensee knows how the DOE will eventually perform its obligations, or has any specific expectation concerning that performance. If DOE's failure to perform results in specific additional costs beyond those reflected in this report, it is expected that the DOE will compensate the licensee for those costs.

Entergy's position is that the DOE has a contractual obligation to accept the spent fuel earlier than the projections set out above consistent with its contract commitments. No assumption made in this study should be interpreted to be inconsistent with this claim.

3. ISFSI Decommissioning Strategy

For purposes of this funding plan, at the conclusion of the spent fuel transfer process the ISFSI will be promptly decommissioned (similar to the power reactor DECON alternative).

4. ISFSI Description

The Big Rock Point ISFSI consists of 7 BNFL FuelSolutions™ W-150 modular concrete overpacks (each containing the spent fuel canister) and a 75 foot by 99 foot reinforced concrete pad. There is also one additional overpack containing Greater-than-Class C (GTCC) waste.

The storage overpack used for the GTCC canister is not expected to have any interior contamination of residual activation and can be reused or disposed of by conventional means after a final status survey.

Table 1 provides the significant quantities and physical dimensions used as the basis in developing the ISFSI decommissioning estimate.

5. Key Assumptions / Estimating Approach

The decommissioning estimate is based on the current configuration of the ISFSI, once all spent fuel and GTCC material has been removed from the site.

The dry storage vendor, BNFL, does not expect the overpacks to have any interior or exterior radioactive surface contamination (that could not be easily removed). Any neutron activation of the steel and concrete is expected to be minimal.[7] The decommissioning estimate is based on the premise 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, 2 of the 7 overpacks are assumed to be affected, i.e., contain residual radioactivity. The allowance quantity is based upon the number of casks required for the final core off-load (i.e., 84 off-loaded assemblies, 64 assemblies per cask) which results in 2 overpacks.

The dry storage vendor, BNFL, expects that any activation of the concrete ISFSI pad would be significantly less than of the storage casks.[8] It would be expected that this assumption would be confirmed as a result of good radiological practice of surveying potentially impacted areas after each spent fuel transfer campaign. It is assumed for this analysis that a small portion of the ISFSI pad (directly underneath the two impacted casks) will be activated to a level that would require remediation for termination of the license. Verification surveys are included for the remainder of the pad. An allowance is also included for surveying any transfer equipment.

The estimate is limited to costs necessary to terminate the ISFSI's NRC license and meet the §20.1402 criteria for unrestricted use. Disposition of released material and structures is outside the scope of the estimate.

Prior to ISFSI pad construction, the NRC took radiological samples of the ground and fill upon which the ISFSI pad was constructed. No significant or unexpected radiological conditions were found, and no nuclear plant-related isotopes were identified in any sample.[9] As such, the decommissioning estimate contains no cost allowance for soil remediation.

Waste volumes are based on estimates provided by FuelSolutions™[10]. Low-level radioactive waste disposal costs are based on Entergy's negotiated rates with Energy*Solutions*.

Decommissioning is assumed to be performed by an independent contractor. As such, labor, equipment, and material costs are based on national averages, i.e., costs from national publications such as R.S. Means' Building Construction Cost Data (adjusted for

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7 FuelSolutions™ Storage System FSAR, Document No. WSNF-220, Rev. 3, June 2005, at page 14.1-2 (Accession Number ML073610500)

8 FuelSolutions™ Storage System FSAR, Document No. WSNF-220, Rev. 3, June 2005, at page 14.1-2 (Accession Number ML073610500)

9 Big Rock Point Restoration Project, NRC Inspection Report 05000155/2001-003 (DNMS), dated June 2001 (Accession Number ML011730211)

10 FuelSolutions™ Storage System FSAR, Document No. WSNF-220, Rev. 3, June 2005, at page 14.3-1 (Accession Number ML073610500)

regional variations), and laboratory service costs are based on vendor price lists. Entergy, as licensee, will oversee the site activities.

Contingency has been added at an overall rate of 25%. This is consistent with the contingency evaluation criteria referenced by the NRC in NUREG-1757.[11] Costs are reported in 2015 dollars and based upon an internal decommissioning analysis prepared for Palisades in 2015.

The effects, if any, since the last submittal of the ISFSI decommissioning funding plan of the following events listed in 10 CFR 72.30(c)(1)-(4) have been specifically considered in the decommissioning cost estimate:

(1) Spills of radioactive material producing additional residual radioactivity in onsite subsurface material: There have been no spills at the ISFSI.

(2) Facility modifications: There have been no facility modifications in the past three years that affect the decommissioning cost estimate.

(3) Changes in authorized possession limits: There are no changes in authorized possession limits that affect the decommissioning cost estimate.

(4) Actual remediation costs that exceed the previous cost estimate: No actual remediation costs have been incurred, so no actual remediation costs exceed the previous cost estimate.

6. Cost Considerations

The estimated cost to decommission the ISFSI and release the facility for unrestricted use is provided in Table 2. The cost includes an initial planning phase. During this phase the empty overpacks, ISFSI pad, and surrounding environs are characterized and the activity specifications and work procedures for the decontamination (overpack disposition) developed.

The next phase includes the cost for craft labor to demolish the activated overpacks, package in certified waste containers, transportation to the Clive, Utah site, disposal, as well as the costs for the supporting equipment, materials and supplies.

The final phase includes the cost for the license termination survey, verification survey, and the associated equipment and laboratory support.

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11 "Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. Nuclear Regulatory Commission's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Volume 3, Revision 1, February 2012.

The estimate also contains costs for the NRC (and NRC contractor to perform the verification survey), Entergy's oversight staff, site security (industrial), and other site operating costs.

For estimating purposes it is conservatively assumed that all expenditures will be incurred in the year 2039, the year following all spent fuel removal.

7. Financial Assurance

ISFSI operations at Big Rock Point are in response to the DOE's failure to remove spent nuclear fuel from the site in a timely manner. The costs for management of the spent fuel are costs for which the DOE is responsible, according to the Standard Contract. It is therefore expected that, once the ISFSI is no longer needed, the cost to decommission the ISFSI would be a DOE-reimbursable expense. Until such time that the costs can be recovered from the DOE, Entergy will rely upon a Parent Guarantee established in the amount of $5 million[12] to terminate the ISFSI license and release the facility for unrestricted use.

The Guarantee is more than sufficient to complete the decommissioning of the ISFSI (estimated cost provided in Table 2).

This certifies that, based on the trust fund balance and costs as shown as of the dates reflected in this report, financial assurance has been provided in the amount of the cost estimate for decommissioning of the ISFSI.

[12] Status of Decommissioning Funding for Plants Operated by Entergy Nuclear Operations, Inc. for Year Ending December 31, 2014, dated March 30, 2015 (Accession Number ML15092A141)

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
ISFSI Pad	99	75	No

ISFSI Storage Overpack

Item	Value	Notes
Overall Height (inches)	230	Dimensions are nominal
Outside Diameter (inches)	138	Dimensions are nominal
Inside Diameter (inches)	73	Dimensions are nominal
Inner Liner Thickness (inches)	2.0	Dimensions are nominal
Quantity (total)	8	7 spent fuel + 1 GTCC
Quantity (with residual radioactivity)	2	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste from Overpack (pounds)	153,979	Concrete and steel
Other Low-Level Radioactive Waste (pounds)	1,273	DAW, filters and other secondary waste
Low-Level Radioactive Waste (total packaged volume)	2,094	Cubic feet
Low-Level Radioactive Waste (packaged density)	74	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Number of Overpacks used for GTCC storage	1	No residual radioactivity

Table 2
ISFSI Decommissioning Costs and Waste Volumes

	Costs (thousands, 2015 dollars)						Waste Volume	Person-Hours	
	Removal	Packaging	Transport	Disposal	Other	Total	Class A (cubic feet)	Craft	Oversight and Contractor
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	157	157	-	-	928
Decontamination/Demolition (activated cask disposition)	59	46	46	320	-	470	2,094	681	-
License Termination (radiological surveys)	-	-	-	-	686	686	-	3,852	-
Subtotal	**59**	**46**	**46**	**320**	**842**	**1,312**	**2,094**	**4,534**	**928**
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	404	404	-	-	776
Insurance	-	-	-	-	37	37	-	-	-
Property Taxes	-	-	-	-	-	-	-	-	-
Plant Energy Budget	-	-	-	-	16	16	-	-	-
Non-Labor Overhead	-	-	-	-	9	9	-	-	-
Corporate A&G	-	-	-	-	4	4	-	-	-
Security (industrial)	-	-	-	-	31	31	-	-	1,710
Entergy Oversight Staff	-	-	-	-	131	131	-	-	1,881
Subtotal	-	-	-	-	632	632	-	-	4,366
Total (w/o contingency)	**59**	**46**	**46**	**320**	**1,474**	**1,944**	**2,094**	**4,534**	**5,294**
Total (w/25% contingency)	**74**	**57**	**57**	**399**	**1,843**	**2,430**			

ATTACHMENT 2

CNRO-2018-00019

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
Palisades Nuclear Point
ISFSI Docket 72-007

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
Palisades Nuclear Point
ISFSI Docket 72-007

1. Background and Introduction

The Nuclear Regulatory Commission (NRC) issued its final rule on Decommissioning Planning on June 17, 2011,[1] with the rule becoming effective on December 17, 2012. Subpart 72.30, "Financial assurance and recordkeeping for decommissioning," requires that each holder of, or applicant for, a license under this part must submit for NRC review and approval a decommissioning funding plan that contains information on how reasonable assurance will be provided that funds will be available to decommission the Independent Spent Fuel Storage Installation (ISFSI).

The rule also requires resubmittal of the decommissioning funding plan at intervals not to exceed 3 years, with adjustments as necessary to account for changes in costs and the extent of contamination. This document is intended to update the funding plans previously submitted by Entergy Nuclear Operations in December 2012.[2]

In accordance with the rule, this letter provides a detailed cost estimate for decommissioning the ISFSI at the Palisades Nuclear Plant (Palisades), in an amount reflecting:

1. The work performed by an independent contractor;
2. An adequate contingency factor; and
3. Release of the facility and dry storage systems for unrestricted use, as specified in 10 CFR Part 20.1402

This letter also provides:

1. Identification of and justification for using the key assumptions contained in the cost estimate;
2. A description of the method of assuring funds for decommissioning; and
3. The volume of onsite subsurface material containing residual radioactivity, if any, that will require remediation to meet the criteria for license termination.

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1 U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70 and 72 "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, Number 117 (p 35512 et seq.), June 17, 2011

2 "ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Big Rock Point, Indian Point Generating Stations 1, 2, & 3, Pilgrim Nuclear Power Station, Palisades Nuclear Plant, James A. FitzPatrick and Vermont Yankee Nuclear Power Station," ENOC-12-00039, dated December 13, 2012 (NRC Accession No. ML12352A126)

2. Spent Fuel Management Strategy

The operating license for Palisades is currently set to expire on March 24, 2031. Approximately 2,442 spent fuel assemblies are currently projected to be generated over the life of the plant. Because of the breach by the Department of Energy (DOE) of its contract to remove fuel from the site, two ISFSI pads have been constructed and fuel casks have been emplaced thereon to support continued plant operations. The ISFSIs are operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[3]).

Because of the DOE's breach, it is envisioned that the spent fuel pool will contain a significant number of spent fuel assemblies at the time of expiration of the current operating license in 2031, assuming the plant operates to that date, including assemblies off-loaded from the reactor vessel. To facilitate immediate dismantling operations or safe-storage operations, the fuel that cannot be transferred directly to the DOE from the pool is assumed to be packaged in dry storage casks for interim storage at the ISFSI. Once the spent fuel pool is emptied, the spent fuel pool systems and fuel pool areas can be either decontaminated and dismantled or prepared for long-term storage.

Completion of the ISFSI decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site. DOE's repository program assumes that spent fuel allocations will be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor. Entergy Nuclear Palisades' (Entergy) current spent fuel management plan for the Palisades spent fuel is based in general upon: 1) a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the Palisades fuel. The DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. Assuming a maximum rate of transfer of 3,000 metric tons of uranium/year,[4] the spent fuel is projected to be fully removed from the Palisades site in 2068.

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the current administration's Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[5]

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

4 "Acceptance Priority Ranking & Annual Capacity Report," DOE/RW-0567, July 2004

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

The report stated that "[W]ith the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that: …[A]dvances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities."

The DOE has taken the position that under the Standard Contract, it does not have an obligation to accept canistered fuel from licensees. This position, coupled with the DOE's failure to perform, has increased the difficulty of estimating future requirements under 10 CFR 72.30. The estimates presented in this report are for budgeting purposes only, and do not represent any conclusion by the licensee about how the DOE will actually perform in the future. This report should not be taken as any indication that the licensee knows how the DOE will eventually perform its obligations, or has any specific expectation concerning that performance. If DOE's failure to perform results in specific additional costs beyond those reflected in this report, it is expected that the DOE will compensate the licensee for those costs.

Entergy's position is that the DOE has a contractual obligation to accept the spent fuel earlier than the projections set out above consistent with its contract commitments. No assumption made in this study should be interpreted to be inconsistent with this claim.

3. ISFSI Decommissioning Strategy

At the conclusion of the spent fuel transfer process the ISFSI will be promptly decommissioned (similar to the power reactor DECON alternative).

For purposes of the funding plan, financial assurance is provided on the basis of a prompt ISFSI decommissioning scenario, i.e., independent of other station decommissioning strategies. ISFSI decommissioning is considered an independent project, regardless of the decommissioning alternative identified for the nuclear power plant.

4. ISFSI Description

There are two ISFSI pads on the Palisades site. The original pad was used to store 18 Sierra Nuclear VSC-24 Ventilated Storage Casks (VSCs). Consumers Power transferred 432 assemblies into the VSCs between 1995 and 1999. It is possible that the spent fuel in these casks will have to be repackaged before it can be shipped off-site. Repackaging is currently assumed to occur immediately after the cessation of plant operations, while the spent fuel pool is still available and the associate fuel handling systems are operable. As such, the VSCs are not expected to be on the pad when it is decommissioned (and not considered in this funding plan).

A horizontal dry storage system is currently in use at the second ISFSI pad. There are 24 modules loaded with spent fuel; 11 NUHOMS®-32PT modules and 13 NUHOMS®-24PTH modules. The system consists of a dry storage canister, with a nominal capacity of 24 or 32 fuel assemblies, and a horizontal concrete storage module. Entergy intends to use Holtec's HI-STORM FW System (with a 37 spent fuel assembly capacity) for storing all future spent fuel on-site. The Holtec dry storage system consists of an inner multi-purpose canister (containing the spent fuel) and an outer concrete and steel overpack.

The current spent fuel management plan for the Palisades spent fuel would result in 51 spent fuel storage modules/casks (24 NUHOMS® and 27 Holtec FW) being placed on the storage pad(s) at the site. This projected configuration is based upon the 2025 DOE spent fuel program start with a 2027 DOE start date for Palisades spent fuel, a 3,000 MTU / year pickup rate, and the current cask capacity (including expansion capability) for the ISFSI pad(s) built to support plant operations. This scenario would allow the spent fuel storage pool to be emptied within approximately five and one-half years following the permanent cessation of operations.

The 51 modules/casks projected to be on the ISFSI pad(s) after shutdown excludes any additional casks that may be used for Greater-than-Class-C (GTCC) storage. The storage overpacks used for the GTCC canisters (estimated quantity of 5) are not expected to have any interior contamination of residual activation and can be reused or disposed of by conventional means after a final status survey.

Table 1 provides the significant quantities and physical dimensions used as the basis in developing the ISFSI decommissioning estimate.

5. Key Assumptions / Estimating Approach

The decommissioning estimate is based on the configuration of the ISFSI expected after all spent fuel and GTCC material has been removed from the site. The configuration of the ISFSI is based on the station operating until the end of its current license (2031) and the DOE's spent fuel acceptance assumptions, as previously described.

The dry storage vendor, Holtec International, does not expect the overpacks to have any interior or exterior radioactive surface contamination. Any neutron activation of the steel and concrete is expected to be extremely small.[6] The decommissioning estimate is based on the premise that some of the inner steel liners and concrete overpacks will contain low levels of neutron-induced residual radioactivity that would necessitate remediation at the time of decommissioning. As an allowance, 6 of the 27 Holtec overpacks are assumed to be affected, i.e., contain residual radioactivity. The allowance quantity is based upon the number of casks required for the final core off-load (i.e., 204 offloaded assemblies, 37 assemblies per cask which results in 6 overpacks). It is assumed

[6] HI-STORM FW FSAR, Holtec International, Report HI-2114830, Rev.0 , at page 2-83 (Accession Number ML11270A045)

that these are the final casks offloaded; consequently they have the least time for radioactive decay of the neutron activation products. The older NUHOMS® modules are not expected to be activated to a level requiring remediation.

The dry storage vendor, Holtec International, does not expect any residual contamination to be left on the concrete ISFSI pad.[7] It would be expected that this assumption would be confirmed as a result of good radiological practice of surveying potentially impacted areas after each spent fuel transfer campaign. It is assumed for this analysis that the ISFSI pad will not be contaminated. As such, only verification surveys are included for the pad in the decommissioning estimate. An allowance is also included for surveying any transfer equipment.

The estimate is limited to costs necessary to terminate the ISFSI's NRC license and meet the §20.1402 criteria for unrestricted use. Disposition of released material and structures is outside the scope of the estimate.

There is no indication the soil in the immediate vicinity of the ISFSI pads would require remediation to meet the criteria for license termination. As such, there is no allowance for soil remediation in the estimate.

Low-level radioactive waste disposal costs are based on Entergy's currently negotiated rates with Energy*Solutions*.

Decommissioning is assumed to be performed by an independent contractor. As such, labor, equipment, and material costs are based on national averages, i.e., costs from national publications such as R.S. Means' Building Construction Cost Data (adjusted for regional variations), and laboratory service costs are based on vendor price lists. Entergy, as licensee, will oversee the site activities.

Contingency has been added at an overall rate of 25%. This is consistent with the contingency evaluation criteria referenced by the NRC in NUREG-1757.[8]

Costs are reported in 2015 dollars and based upon an internal decommissioning analysis prepared for Palisades in 2015.

The effects, if any, since the last submittal of the ISFSI decommissioning funding plan of the following events listed in 10 CFR 72.30(c)(1)-(4) have been specifically considered in the decommissioning cost estimate:

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7 HI-STORM FW FSAR, Holtec International, Report HI-2114830, Rev. 0, at page 2-84 (Accession Number ML11270A045)

8 "Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. Nuclear Regulatory Commission's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Volume 3, Revision 1, February 2012.

(1) Spills of radioactive material producing additional residual radioactivity in onsite subsurface material: There have been no spills at the ISFSI.

(2) Facility modifications: There have been no facility modifications in the past three years that affect the decommissioning cost estimate. However, for purposes of bounding the decommissioning cost estimate, 1) future expansion of the ISFSI is assumed in the current estimate based upon continuing delays by the DOE in removing the spent fuel from the site, and 2) the potential volume of low-level radioactive waste volume generated from storage cask overpack disposition is also increased.

(3) Changes in authorized possession limits: There are no changes in authorized possession limits that affect the decommissioning cost estimate.

(4) Actual remediation costs that exceed the previous cost estimate: No actual remediation costs have been incurred, so no actual remediation costs exceed the previous cost estimate.

6. Cost Considerations

The estimated cost to decommission the ISFSI and release the facility for unrestricted use is provided in Table 2. The cost includes an initial planning phase. During this phase the empty overpacks, ISFSI pad(s), and surrounding environs are characterized and the activity specifications and work procedures for the decontamination (overpack disposition) developed.

The next phase includes the cost for craft labor to remove the activated overpacks, package in certified waste containers, transportation to the Clive, Utah site, disposal, as well as the costs for the supporting equipment, materials and supplies. The final phase includes the cost for the license termination survey, verification survey, and the associated equipment and laboratory support.

The estimate also contains costs for the NRC (and NRC contractor to perform the verification survey), Entergy's oversight staff, site security (industrial), and other site operating costs.

For estimating purposes it is conservatively assumed that all expenditures will be incurred in the year 2069, the year following all spent fuel removal.

7. Financial Assurance

ISFSI operations at the second Palisades ISFSI are in response to the DOE's failure to

remove spent nuclear fuel from the site in a timely manner. The costs for management of the spent fuel are costs for which the DOE is responsible under federal law and the Standard Contract. It is therefore expected that, once the second ISFSI is no longer needed, the cost to decommission the ISFSI would be a DOE-reimbursable expense. Until such time that the costs can be recovered from the DOE, Entergy will rely upon the money available in its decommissioning trust fund to terminate the ISFSI license and release the facility for unrestricted use.

Using the decommissioning trust fund is reasonable based on the following:

- Although the decommissioning trust fund is for radiological decommissioning costs only, the ISFSI decommissioning is a radiological cost. Also, to the extent that the trust fund balance exceeds costs required for Part 50 radiological decommissioning, these funds would be available to address costs incurred by Entergy, including ISFSI decommissioning costs.
- The projected amount necessary for decommissioning Palisades is $484.769 million, based upon the NRC's latest financial assurance funding determination.[9]
- Based upon Palisades' decommissioning trust fund balance as of September 30, 2015 and considering the allowed real rate of return on the fund between October 1, 2015 and the start of Palisades station decommissioning, the trust fund will contain a $60.084 million surplus (refer to Table 3) beyond the NRC minimum funding formula provided in 10CFR50.75(e). This surplus is more than sufficient to complete the decommissioning of the ISFSI (estimated cost provided in Table 2).

This certifies that, based on the trust fund balance and costs as shown as of the dates reflected in this report, financial assurance has been provided in the amount of the cost estimate for decommissioning of the ISFSI.

[9] "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 15, January 2013

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
ISFSI Pad No. 1 (old)	200	30	No
ISFSI Pad No. 2 (new)	354	33	No

ISFSI Storage Overpack (Holtec FW)

Item	Value	Notes
Overall Height (inches)	239.5	Dimensions are nominal
Outside Diameter (inches)	139	Dimensions are nominal
Inside Diameter (inches)	81	Dimensions are nominal
Quantity (total, excluding VSCs)	56	51 Spent fuel + 5 GTCC
Quantity (with residual radioactivity)	6	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste from Overpack (pounds)	954,968	Concrete and steel
Low-Level Radioactive Waste from Transfer Cask (pounds)	155,000	
Other Low-Level Radioactive Waste (pounds)	1,584	DAW, filters and other secondary waste
Low-Level Radioactive Waste (total packaged volume)	13,127	Cubic feet
Low-Level Radioactive Waste (packaged density)	85	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Transfer Cask	1	Potentially contaminated
Number of Overpacks used for GTCC storage	5	No residual radioactivity

Table 2
ISFSI Decommissioning Costs and Waste Volumes

	Costs (thousands, 2015 dollars)						Waste Volume	Person-Hours	
	Removal	Packaging	Transport	Disposal	Other	Total	Class A (cubic feet)	Craft	Oversight and Contractor
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	308	308	-	-	1,168
Decontamination/Demolition (activated cask disposition)	626	42	302	1,685	346	3,000	13,127	9,361	-
License Termination (radiological surveys)	-	-	-	-	1,716	1,716	-	13,402	-
Subtotal	**626**	**42**	**302**	**1,685**	**2,370**	**5,025**	**13,127**	**22,763**	**1,168**
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	415	415	-	-	776
Insurance	-	-	-	-	67	67	-	-	-
Property Taxes	-	-	-	-	31	31	-	-	-
Plant Energy Budget	-	-	-	-	63	63	-	-	-
Non-Labor Overhead	-	-	-	-	19	19	-	-	-
Corporate A&G	-	-	-	-	115	115	-	-	-
Security (industrial)	-	-	-	-	120	120	-	-	3,457
Entergy Oversight Staff	-	-	-	-	265	265	-	-	3,803
Subtotal	-	-	-	-	1,094	1,094	-	-	8,036
Total (w/o contingency)	**626**	**42**	**302**	**1,685**	**3,464**	**6,118**	**13,127**	**22,763**	**9,204**
Total (w/25% contingency)	**782**	**52**	**377**	**2,106**	**4,330**	**7,648**			

Table 3

Financial Assurance

Plant name: Palisades Nuclear Plant

	Month	Day	Year
Year of Biennial:	9	30	2015
Termination of Operation:	3	24	2031

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
PWR	2565	$97,572,000	122.1	2.08	0.65	2.54	2.052	1.980	0.13	2.02	0.22	13.885

NRC Minimum: **$484,769,122** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$484,769,122	$373,228,587

Step 1: Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of	Total Earnings:	
$373,228,587	2%	15.48	1.35882	**$507,149,720**	**Total Earnings = Trust Fund balance x (1+RRR)^Years left in license**

Step 2: Accumulation:

Value of Annuity per year	Real Rate of Return per	Years of Annuity:	Total Annuity:
$0	2%	0	$0

Step 3: Decom Period:

Total Earnings:	Real Rate of Return per	Decom Period:	Total Real Rate of	Total Earnings for Decom:	
$507,149,720	2%	7	0.14869	$37,702,947	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Total of Steps 1 - 3:	
$544,852,668	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$**	**60,083,545**	**to NRC minimum**
	$	**(7,648,059)**	**Less ISFSI**
	$	**-**	**Parent Co Guaranty**
	$	**52,435,486**	**Total Excess Financial Assurance**

ATTACHMENT 3A

CNRO-2018-00019

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
Indian Point Nuclear Power Plant, Units 1 and 2
ISFSI Docket 72-051

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
Indian Point Nuclear Power Plant, Units 1 and 2
ISFSI Docket 72-051

1. Background and Introduction

The Nuclear Regulatory Commission (NRC) issued its final rule on Decommissioning Planning on June 17, 2011,[1] with the rule becoming effective on December 17, 2012. Subpart 72.30, "Financial assurance and recordkeeping for decommissioning," requires that each holder of, or applicant for, a license under this part must submit for NRC review and approval a decommissioning funding plan that contains information on how reasonable assurance will be provided that funds will be available to decommission the Independent Spent Fuel Storage Installation (ISFSI).

The rule also requires resubmittal of the decommissioning funding plan at intervals not to exceed 3 years, with adjustments as necessary to account for changes in costs and the extent of contamination. This document is intended to update the funding plans previously submitted by Entergy Nuclear Operations in December 2012.[2]

In accordance with the rule, this letter provides a detailed cost estimate for decommissioning the ISFSI constructed at Indian Point Energy Center (Indian Point), in an amount reflecting:

1. The work performed by an independent contractor;
2. An adequate contingency factor; and
3. Release of the facility and dry storage systems for unrestricted use, as specified in 10 CFR Part 20.1402

This letter also provides:

1. Identification of and justification for using the key assumptions contained in the cost estimate;
2. A description of the method of assuring funds for decommissioning; and
3. The volume of onsite subsurface material containing residual radioactivity, if any, that will require remediation to meet the criteria for license termination.

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1 U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70 and 72 "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, Number 117 (p 35512 et seq.), June 17, 2011

2 "ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Big Rock Point, Indian Point Generating Stations 1, 2, & 3, Pilgrim Nuclear Power Station, Palisades Nuclear Plant, James A. FitzPatrick and Vermont Yankee Nuclear Power Station," ENOC-12-00039, dated December 13, 2012 (NRC Accession No. ML12352A126)

2. Spent Fuel Management Strategy

There are three nuclear units on the Indian Point site, two operating (IP-2 and IP-3) and one permanently shutdown (IP-1). This funding plan addresses the disposition of IP-1 and IP-2 spent fuel, as it relates to on site dry storage (the IP-3 spent fuel is addressed in a separate funding plan).

IP-1 ceased operation on October 31, 1974, generating 404 spent fuel assemblies over its operating life. The operating license for IP-2 was set to expire on September 28, 2013. A license renewal application was submitted in 2007. Because Entergy filed a timely and sufficient application, IP-2 will continue to operate under its current license until the NRC makes a final determination on the license renewal application. However, for purposes of this submittal, permanent cessation of operations is assumed to occur on December 31, 2015.

Approximately 1,805 spent fuel assemblies are projected to be generated if IP-2 ceases operation at the end of 2015. Because of the breach by the Department of Energy (DOE) of its contract to remove fuel from the site, an ISFSI has been constructed and fuel casks have been emplaced thereon to support continued plant operations of IP-2 as well as IP-3 (IP-2 and IP-3 have both applied for license renewal and an additional 20 years of operations). Based upon the current projection of the DOE's ability to remove spent fuel from the site, a second pad will need to be constructed to support decommissioning. Since the projected spent fuel storage requirements for both IP-2 and IP-3 are similar, and the casks will be comingled on the two pads, the funding requirements are assumed to be allocated equally between the two nuclear units (the IP-1 casks are included with the IP-2 inventory). The ISFSI is assumed to be operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[3]).

The IP-1 spent fuel on site (160 assemblies), has been relocated to the current ISFSI pad (in 5 dry storage casks). The remaining 244 assemblies had previously been shipped to West Valley for reprocessing.

Because of the DOE's breach, it is envisioned that the IP-2 spent fuel pool will contain a significant number of spent fuel assemblies at the time operations cease, including assemblies off-loaded from the reactor vessel. To facilitate immediate dismantling operations or safe-storage operations, the IP-2 fuel that cannot be transferred directly to the DOE from the pool is assumed to be packaged in dry storage casks for interim storage at the ISFSI. Once the spent fuel pool is emptied, the spent fuel pool systems and fuel pool areas can be either decontaminated and dismantled or prepared for long-term storage.

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

Completion of the ISFSI decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site. DOE's repository program assumes that spent fuel allocations will be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor. Entergy Nuclear Indian Point 2, LLC's (Entergy) current spent fuel management plan for the IP-2 spent fuel is based in general upon: 1) a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the IP-2 fuel. The DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. Assuming a maximum rate of transfer of 3,000 metric tons of uranium/year,[4] the spent fuel is projected to be fully removed from the Indian Point site in 2059.

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the current administration's Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[5]

The report stated that "[W]ith the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that: …[A]dvances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities."

The DOE has taken the position that under the Standard Contract, it does not have an obligation to accept canistered fuel from licensees. This position, coupled with the DOE's failure to perform, has increased the difficulty of estimating future requirements under 10 CFR 72.30. The estimates presented in this report are for budgeting purposes only, and do not represent any conclusion by the licensee about how the DOE will actually perform in the future. This report should not be taken as any indication that the licensee knows how the DOE will eventually perform its obligations, or has any specific expectation concerning that performance. If DOE's failure to perform results in specific additional costs beyond those reflected in this report, it is expected that the DOE will compensate the licensee for those costs.

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4 "Acceptance Priority Ranking & Annual Capacity Report," DOE/RW-0567, July 2004

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

Entergy's position is that the DOE has a contractual obligation to accept the spent fuel earlier than the projections set out above consistent with its contract commitments. No assumption made in this study should be interpreted to be inconsistent with this claim.

3. ISFSI Decommissioning Strategy

At the conclusion of the spent fuel transfer process the ISFSI will be promptly decommissioned (similar to the power reactor DECON alternative).

For purposes of the funding plan, financial assurance is provided on the basis of a prompt ISFSI decommissioning scenario, i.e., independent of other station decommissioning strategies. ISFSI decommissioning is considered an independent project, regardless of the decommissioning alternative identified for the nuclear power plant.

4. ISFSI Description

The design and capacity of the current Indian Point ISFSI is based upon the Holtec HI-STORM 100S dry cask storage system (IP-1 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.

Entergy's current spent fuel management plan for the IP-2 spent fuel would result in 57 spent fuel storage casks (in addition to the 5 casks for IP-1 spent fuel) being placed on the storage pad(s) at the site. This projected configuration is based upon the 2025 DOE spent fuel program start with a 2026 (based on IP-1's allotment) DOE start date for Indian Point spent fuel, a 3,000 MTU / year pickup rate, and a 78 cask capacity for the current ISFSI pad. This scenario would allow the spent fuel storage pool to be emptied within the twelve years that the pool remains operational following the permanent cessation of operations (twelve years is based upon the need to use the IP-2 pool for packaging IP-3 spent fuel for dry storage).

The 62 casks (57 IP-2 + 5 IP-1 casks) projected to be on the ISFSI pads after shutdown excludes any additional casks that may be used for Greater-than-Class-C (GTCC) storage. The storage overpacks used for the GTCC canisters (estimated quantity of 7, including 1 for IP-1) are not expected to have any interior contamination of residual activation and can be reused or disposed of by conventional means after a final status survey.

Table 1 provides the significant quantities and physical dimensions used as the basis in developing the ISFSI decommissioning estimate.

5. Key Assumptions / Estimating Approach

The decommissioning estimate is based on the configuration of the ISFSI expected after all spent fuel and GTCC material has been removed from the site. The configuration of the ISFSI is based on the IP-2 unit operating until the end of 2015 and the DOE's spent fuel acceptance assumptions, as previously described. The existing ISFSI pad is approximately 96 feet by 208 feet, and has a maximum capacity of 75 casks. The supplemental pad (future) is assumed to have a capacity of 53 casks.

The dry storage vendor, Holtec International, does not expect the overpacks to have any interior or exterior radioactive surface contamination. Any neutron activation of the steel and concrete is expected to be extremely small.[6] The decommissioning estimate is based on the premise 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 57 IP-2 overpacks are assumed to be affected, i.e., contain residual radioactivity. The allowance quantity is based upon the number of casks required for the final core off-load (i.e., 193 assemblies and 32 assemblies per cask) which results in 7 overpacks. It is assumed that these are the final casks offloaded; consequently they have the least time for radioactive decay of the neutron activation products. Due to the age of the IP-1 spent fuel when it was placed in dry storage, the IP-1 casks are not expected to be activated to a level requiring remediation.

The dry storage vendor, Holtec International, does not expect any residual contamination to be left on the concrete ISFSI pad.[7] It would be expected that this assumption would be confirmed as a result of good radiological practice of surveying potentially impacted areas after each spent fuel transfer campaign. It is assumed for this analysis that the ISFSI pad will not be contaminated. As such, only verification surveys are included for the pad in the decommissioning estimate. An allowance is also included for surveying any transfer equipment.

The estimate is limited to costs necessary to terminate the ISFSI's NRC license and meet the §20.1402 criteria for unrestricted use. Disposition of released material and structures is outside the scope of the estimate.

The latest decommissioning cost studies for IP-1 and IP-2 (prepared in 2013) included the cost for the remediation of contaminated (radiological) soil, based upon a detailed characterization of the site and affected areas. The ISFSI was constructed at the north end

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6 HI-STORM FSAR, Holtec International, Report HI-2002444, Rev. 3, at page 2.4-1 (Accession Number ML081350153)

7 HI-STORM FSAR, Holtec International, Report HI-2002444, Rev. 3, at page 2.4-2 (Accession Number ML081350153)

of the site which was previously undeveloped and outside the existing Protected Area.[8] Therefore, there is no allowance for the remediation any additional contaminated soil in the estimate to decommissioning the ISFSI.

Low-level radioactive waste disposal costs are based on Entergy's negotiated rates with Energy*Solutions*.

Decommissioning is assumed to be performed by an independent contractor. As such, labor, equipment, and material costs are based on national averages, i.e., costs from national publications such as R.S. Means' Building Construction Cost Data (adjusted for regional variations), and laboratory service costs are based on vendor price lists. Entergy, as licensee, will oversee the site activities.

Contingency has been added at an overall rate of 25%. This is consistent with the contingency evaluation criteria referenced by the NRC in NUREG-1757.[9]

Costs are reported in 2015 dollars and based upon internal decommissioning analyses prepared in 2013. The original spent fuel management plan for IP-2 was revised to reflect a 2015 cessation of plant operations. Activity costs were updated to 2015 dollars.

The effects, if any, since the last submittal of the ISFSI decommissioning funding plan of the following events listed in 10 CFR 72.30(c)(1)-(4) have been specifically considered in the decommissioning cost estimate:

(1) Spills of radioactive material producing additional residual radioactivity in onsite subsurface material: There have been no spills at the ISFSI.

(2) Facility modifications: There have been no facility modifications in the past three years that affect the decommissioning cost estimate. However, for purposes of bounding the decommissioning cost estimate, 1) future expansion of the ISFSI is assumed in the current estimate based upon continuing delays by the DOE in removing the spent fuel from the site, and 2) the potential volume of low-level radioactive waste volume generated from storage cask overpack disposition is also increased.

(3) Changes in authorized possession limits: There are no changes in authorized possession limits that affect the decommissioning cost estimate.

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8 Indian Point Energy Center, Applicant's Environmental Report, Operating License Renewal Stage, p. 3-6 (Accession Number ML071210530)

9 "Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. Nuclear Regulatory Commission's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Volume 3, Revision 1, February 2012.

(4) Actual remediation costs that exceed the previous cost estimate: No actual remediation costs have been incurred, so no actual remediation costs exceed the previous cost estimate.

6. Cost Considerations

The estimated cost to decommission the IP-1/IP-2 casks and the IP-1/IP-2 allocated cost to decommissioning the ISFSI pads (the remaining portion will be funded by IP-3) and release the facility for unrestricted use is provided in Table 2. The cost includes an initial planning phase. During this phase the empty overpacks, ISFSI pad, and surrounding environs are characterized and the activity specifications and work procedures for the decontamination (overpack disposition) developed.

The next phase includes the cost for craft labor to demolish the activated overpacks, package in certified waste containers, transportation to the Clive, Utah site, disposal, as well as the costs for the supporting equipment, materials and supplies. The final phase includes the cost for the license termination survey, verification survey, and the associated equipment and laboratory support.

The estimate also contains costs for the NRC (and NRC contractor to perform the verification survey), Entergy's oversight staff, site security (industrial), and other site operating costs.

For estimating purposes it is conservatively assumed that all expenditures will be incurred in the year 2061, the year following all spent fuel removal (including any from IP-3 stored on the pads).

7. Financial Assurance

ISFSI operations at Indian Point are in response to the DOE's failure to remove spent nuclear fuel from the site in a timely manner. The costs for management of the spent fuel are costs for which the DOE is responsible according to a judgment entered against the DOE under federal law and the Standard Contract.[10] It is therefore expected that, once the ISFSI is no longer needed, the cost to decommission the ISFSI would be a DOE-reimbursable expense. Until such time that the costs can be recovered from the DOE, Entergy will rely upon the money available in its decommissioning trust fund to terminate the ISFSI license and release the facility for unrestricted use.
Using the decommissioning trust fund is reasonable based on the following:

- Although the decommissioning trust fund is for radiological decommissioning costs only, the ISFSI decommissioning is a radiological cost. Also, to the extent that the trust fund balance exceeds costs required for Part 50 radiological decommissioning,

[10] Entergy Nuclear Indian Point 2, LLC v. United States, Court of Federal Claims, No. 03-2622-C (2005)

these funds would be available to address costs incurred by Entergy, including ISFSI decommissioning costs.

- Since the 5 IP-1 casks are not expected to be activated due to the age of the spent fuel when placed into storage, IP-1's contribution to the ISFSI decommissioning liability is very small. For purposes of this filing, the licensee assumes that the surplus in the IP-2 trust would be used for ISFSI decommissioning purposes.
- The projected amount necessary for decommissioning IP-2 is $524.141 million, based upon the NRC's latest financial assurance funding determination. [11]
- Based upon IP-2's decommissioning trust fund balance as of September 30, 2015 and considering the allowed real rate of return on the fund between October 1, 2015 and the start of IP-2 decommissioning, the trust fund will contain a $33.260 million surplus (refer to Table 3) beyond the NRC minimum funding formula provided in 10CFR50.75(e). This surplus is more than sufficient to complete the decommissioning of the ISFSI (estimated cost provided in Table 2).

This certifies that, based on the trust fund balance and costs as shown as of the dates reflected in this report, financial assurance has been provided in the amount of the cost estimate for decommissioning of the ISFSI.

[11] "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 15, January 2013

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
Current ISFSI Pad	208	96	No

ISFSI Storage Overpack

Item	Value	Notes
HI-STORM 100S-185 Overall Height (inches)	185	Dimensions are nominal
HI-STORM 100S-218 Overall Height (inches)	218	Dimensions are nominal
Outside Diameter (inches)	132.5	Dimensions are nominal
Inside Diameter (inches)	73.5	Dimensions are nominal
Quantity (total)	69	57 IP-2 + 5 IP-1 spent fuel + 7 GTCC
Quantity (with residual radioactivity)		Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste from Overpack (pounds)	1,157,818	Concrete and steel
Other Low-Level Radioactive Waste (pounds)	1,351	DAW, filters and other secondary waste
Low-Level Radioactive Waste (total packaged volume)	15,764	Cubic feet
Low-Level Radioactive Waste (packaged density)	74	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Number of Overpacks used for GTCC storage	7 (IP-1 and 2)	No residual radioactivity

Table 2
ISFSI Decommissioning Costs and Waste Volumes
(50% of total cost)

	Costs (thousands, 2015 dollars)						Waste Volume	Person-Hours	
	Removal	Packaging	Transport	Disposal	Other	Total	Class A (cubic feet)	Craft	Oversight and Contractor
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	193	193	-	-	608
Decontamination/Demolition (activated cask disposition)	210	65	454	2,429	-	3,126	15,764	2,686	-
License Termination (radiological surveys)	-	-	-	-	972	972	-	7,294	-
Subtotal	**210**	**65**	**423**	**2,429**	**1,164**	**4,290**	**15,764**	**9,980**	**608**
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	211	211	-	-	388
Insurance	-	-	-	-	-	-	-	-	-
Property Taxes	-	-	-	-	646	646	-	-	-
Plant Energy Budget	-	-	-	-	-	-	-	-	-
Non-Labor Overhead	-	-	-	-	7	7	-	-	-
Corporate A&G	-	-	-	-	38	38	-	-	-
Security (industrial)	-	-	-	-	73	73	-	-	1,991
Entergy Oversight Staff	-	-	-	-	169	169	-	-	1,949
Subtotal	**-**	**-**	**-**	**-**	**1,142**	**1,142**	**-**	**-**	**4,328**
Total (w/o contingency)	**210**	**65**	**423**	**2,429**	**2,307**	**5,432**	**15,764**	**9,980**	**4,936**
Total (w/25% contingency)	**262**	**81**	**528**	**3,036**	**2,884**	**6,790**			

Table 3
2 Financial Assurance

IP- **Plant name:** **Indian Point Energy Center, Unit 2**

	Month	Day	Year
Year of Biennial:	9	30	2015
Termination of Operation:	12	31	2015

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
PWR	3216	$103,300,800	125.1	2.16	0.65	2.70	2.052	1.980	0.13	2.02	0.22	13.885

NRC Minimum: **$524,141,450** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$524,141,450	$516,240,348

Step 1:
Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of	Total Earnings:	
$516,240,348	2%	0.25	1.00502	**$518,830,561**	**Total Earnings = Trust Fund balance x (1+RRR)^Years left in license**

Step 2:
Accumulation:

Value of Annuity per year	Real Rate of Return per	Years of Annuity:	Total Annuity:
$0	2%	0	$0

Total Annuity	Real Rate of Return per	Years remaining after annuity	Total Step 2
$0	2%	0.252739726	$0

Total Step 1 + Step 2
$518,830,561

Step 3:
Decom Period:

Total Earnings:	Real Rate of Return per	Decom Period:	Total Real Rate of	Total Earnings for Decom:	
$518,830,561	2%	7	0.14869	$38,571,334	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Total of Steps 1 - 3:	
$557,401,895	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$**	**33,260,446**	**to NRC minimum**
	$	**(6,790,496)**	**Less ISFSI**
	$	**-**	**Parent Co Guaranty**
	$	**26,469,950**	**Total Excess Financial Assurance**

ATTACHMENT 3B

CNRO-2018-00019

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
Indian Point Nuclear Power Plant, Unit 3
ISFSI Docket 72-051

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
Indian Point Nuclear Power Plant, Unit 3
ISFSI Docket 72-051

1. Background and Introduction

The Nuclear Regulatory Commission (NRC) issued its final rule on Decommissioning Planning on June 17, 2011,[1] with the rule becoming effective on December 17, 2012. Subpart 72.30, "Financial assurance and recordkeeping for decommissioning," requires that each holder of, or applicant for, a license under this part must submit for NRC review and approval a decommissioning funding plan that contains information on how reasonable assurance will be provided that funds will be available to decommission the Independent Spent Fuel Storage Installation (ISFSI).

The rule also requires resubmittal of the decommissioning funding plan at intervals not to exceed 3 years, with adjustments as necessary to account for changes in costs and the extent of contamination. This document is intended to update the funding plans previously submitted by Entergy Nuclear Operations in December 2012.[2]

In accordance with the rule, this letter provides a detailed cost estimate for decommissioning the ISFSI constructed at Indian Point Energy Center (Indian Point), in an amount reflecting:

1. The work performed by an independent contractor;
2. An adequate contingency factor; and
3. Release of the facility and dry storage systems for unrestricted use, as specified in 10 CFR Part 20.1402

This letter also provides:

1. Identification of and justification for using the key assumptions contained in the cost estimate;
2. A description of the method of assuring funds for decommissioning; and
3. The volume of onsite subsurface material containing residual radioactivity, if any, that will require remediation to meet the criteria for license termination.

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1 U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70 and 72 "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, Number 117 (p 35512 et seq.), June 17, 2011

2 "ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Big Rock Point, Indian Point Generating Stations 1, 2, & 3, Pilgrim Nuclear Power Station, Palisades Nuclear Plant, James A. FitzPatrick and Vermont Yankee Nuclear Power Station," ENOC-12-00039, dated December 13, 2012 (NRC Accession No. ML12352A126)

2. Spent Fuel Management Strategy

There are three nuclear units on the Indian Point site, two operating (IP-2 and IP-3) and one permanently shutdown (IP-1). This funding plan addresses the disposition of IP-3 spent fuel, as it relates to dry storage (the IP-1 and IP-2 spent fuel is addressed in a separate plan).

Approximately 1,676 spent fuel assemblies are currently projected to be generated over the operating life. Because of the breach by the Department of Energy (DOE) of its contract to remove fuel from the site, an ISFSI has been constructed and fuel casks have been emplaced thereon to support continued plant operations of IP-3 as well as IP-2 (IP-3 and IP-2 have both applied for license renewal and an additional 20 years of operations). Based upon the current projection of the DOE's ability to remove spent fuel from the site, a second pad will need to be constructed to support decommissioning. Since the projected spent fuel storage requirements for both IP-3 and IP-2 are similar, and the casks will be comingled on the two pads, the funding requirements are assumed to be allocated equally between the two nuclear units (the IP-1 casks are included with the IP-2 inventory). The ISFSI is assumed to be operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[3]). The operating license for IP-3 is currently set to expire on December 12, 2015, and this submittal assumes that date as an end date for the financial assurance calculations. Because Entergy filed a timely and sufficient application, IP-3 will continue to operate under its current license until the NRC makes a final determination on the license renewal application. However, for purposes of this submittal, permanent cessation of operations is assumed to occur on December 12, 2015.

Because of the DOE's breach, it is envisioned that the IP-3 spent fuel pool will contain a significant number of spent fuel assemblies at the time of expiration of the current operating license in 2015, assuming the plant operates to that date, including assemblies off-loaded from the reactor vessel. To facilitate immediate dismantling operations or safe-storage operations, the IP-3 fuel that cannot be transferred directly to the DOE from the pool is assumed to be packaged in dry storage casks for interim storage at the ISFSI. Once the spent fuel pool is emptied, the spent fuel pool systems and fuel pool areas can be either decontaminated and dismantled or prepared for long-term storage.

Completion of the ISFSI decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site. DOE's repository program assumes that spent fuel allocations will be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor. Entergy Nuclear Indian Point 3, LLC's (Entergy) current spent fuel management plan for the IP-3 spent fuel is based in general upon: 1) a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the IP-3 fuel. The

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

DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. Assuming a maximum rate of transfer of 3,000 metric tons of uranium/year,[4] the spent fuel is projected to be fully removed from the Indian Point site in 2060.

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the current administration's Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[5]

The report stated that "[W]ith the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that: …[A]dvances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities."

The DOE has taken the position that under the Standard Contract, it does not have an obligation to accept canistered fuel from licensees. This position, coupled with the DOE's failure to perform, has increased the difficulty of estimating future requirements under 10 CFR 72.30. The estimates presented in this report are for budgeting purposes only, and do not represent any conclusion by the licensee about how the DOE will actually perform in the future. This report should not be taken as any indication that the licensee knows how the DOE will eventually perform its obligations, or has any specific expectation concerning that performance. If DOE's failure to perform results in specific additional costs beyond those reflected in this report, it is expected that the DOE will compensate the licensee for those costs.

Entergy's position is that the DOE has a contractual obligation to accept the spent fuel earlier than the projections set out above consistent with its contract commitments. No assumption made in this study should be interpreted to be inconsistent with this claim.

3. ISFSI Decommissioning Strategy

At the conclusion of the spent fuel transfer process the ISFSI will be promptly decommissioned (similar to the power reactor DECON alternative).

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4 "Acceptance Priority Ranking & Annual Capacity Report," DOE/RW-0567, July 2004

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

For purposes of the funding plan, financial assurance is provided on the basis of a prompt ISFSI decommissioning scenario, i.e., independent of other station decommissioning strategies. ISFSI decommissioning is considered an independent project, regardless of the decommissioning alternative identified for the nuclear power plant.

4. ISFSI Description

The design and capacity of the current Indian Point ISFSI is based upon the Holtec HI-STORM 100S dry cask storage system. The system consists of a multi-purpose canister, with a nominal capacity of 32 fuel assemblies, and a steel-lined concrete storage overpack.

Entergy's current spent fuel management plan for the IP-3 spent fuel would result in 53 spent fuel storage casks being placed on the storage pad(s) at the site. This projected configuration is based upon the 2025 DOE spent fuel program start with a 2026 (based on IP-1's allotment) DOE start date for Indian Point spent fuel, a 3,000 MTU / year pickup rate, and a 78 cask capacity for the current ISFSI pad. This scenario would allow the spent fuel storage pool to be emptied within the ten years following the permanent cessation of operations (ten years is based upon the need to use the IP-2 pool for packaging IP-3 spent fuel for dry storage).

The 53 IP-3 casks projected to be on the ISFSI pad after shutdown excludes any additional casks that may be used for Greater-than-Class-C (GTCC) storage. The storage overpacks used for the GTCC canisters (estimated quantity of 6) are not expected to have any interior contamination of residual activation and can be reused or disposed of by conventional means after a final status survey.

Table 1 provides the significant quantities and physical dimensions used as the basis in developing the ISFSI decommissioning estimate.

5. Key Assumptions / Estimating Approach

The decommissioning estimate is based on the configuration of the ISFSI expected after all spent fuel and GTCC material has been removed from the site. The configuration of the ISFSI is based on the IP-3 unit operating until the end of its current license (2015) and the DOE's spent fuel acceptance assumptions, as previously described. The existing ISFSI pad is approximately 96 feet by 208 feet, and has a maximum capacity of 75 casks. The supplemental pad (future) is assumed to have a capacity of 53 casks.

The dry storage vendor, Holtec International, does not expect the overpacks to have any interior or exterior radioactive surface contamination. Any neutron activation of the steel and concrete is expected to be extremely small.[6] The decommissioning estimate is

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6 HI-STORM FSAR, Holtec International, Report HI-2002444, Rev. 3, at page 2.4-1 (Accession Number ML081350153)

based on the premise 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 53 IP-3 overpacks are assumed to be affected, i.e., contain residual radioactivity. The allowance quantity is based upon the number of casks required for the final core off-load (i.e., 193 assemblies, 32 assemblies per cask) which results in approximately 7 overpacks. It is assumed that these are the final casks offloaded; consequently they have the least time for radioactive decay of the neutron activation products.

The dry storage vendor, Holtec International, does not expect any residual contamination to be left on the concrete ISFSI pad.[7] It would be expected that this assumption would be confirmed as a result of good radiological practice of surveying potentially impacted areas after each spent fuel transfer campaign. It is assumed for this analysis that the ISFSI pad will not be contaminated. As such, only verification surveys are included for the pad in the decommissioning estimate. An allowance is also included for surveying any transfer equipment.

The estimate is limited to costs necessary to terminate the ISFSI's NRC license and meet the §20.1402 criteria for unrestricted use. Disposition of released material and structures is outside the scope of the estimate.

The latest decommissioning cost study for IP-3 (prepared in 2013) included the cost for the remediation of contaminated (radiological) soil, based upon a detailed characterization of the site and affected areas. The ISFSI was constructed at the north end of the site which was previously undeveloped and outside the existing Protected Area.[8] Therefore, there is no allowance for the remediation any additional contaminated soil in the estimate to decommissioning the ISFSI.

Low-level radioactive waste disposal costs are based on Entergy's negotiated rates with Energy*Solutions*.

Decommissioning is assumed to be performed by an independent contractor. As such, labor, equipment, and material costs are based on national averages, i.e., costs from national publications such as R.S. Means' Building Construction Cost Data (adjusted for regional variations), and laboratory service costs are based on vendor price lists. Entergy, as licensee, will oversee the site activities.

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7 HI-STORM FSAR, Holtec International, Report HI-2002444, Rev. 3, at page 2.4-2 (Accession Number ML081350153)

8 Indian Point Energy Center, Applicant's Environmental Report, Operating License Renewal Stage, p. 3-6 (Accession Number ML071210530)

Contingency has been added at an overall rate of 25%. This is consistent with the contingency evaluation criteria referenced by the NRC in NUREG-1757.[9]
Costs are reported in 2015 dollars and based upon internal decommissioning analyses prepared in 2013. Activity costs were updated to 2015 dollars.

The effects, if any, since the last submittal of the ISFSI decommissioning funding plan of the following events listed in 10 CFR 72.30(c)(1)-(4) have been specifically considered in the decommissioning cost estimate:

(1) Spills of radioactive material producing additional residual radioactivity in onsite subsurface material: There have been no spills at the ISFSI.

(2) Facility modifications: There have been no facility modifications in the past three years that affect the decommissioning cost estimate. However, for purposes of bounding the decommissioning cost estimate, 1) future expansion of the ISFSI is assumed in the current estimate based upon continuing delays by the DOE in removing the spent fuel from the site, and 2) the potential volume of low-level radioactive waste volume generated from storage cask overpack disposition is also increased.

(3) Changes in authorized possession limits: There are no changes in authorized possession limits that affect the decommissioning cost estimate.

(4) Actual remediation costs that exceed the previous cost estimate: No actual remediation costs have been incurred, so no actual remediation costs exceed the previous cost estimate.

6. Cost Considerations

The estimated cost to decommission the IP-3 casks and the IP-3 allocated cost to decommissioning the ISFSI pads (the remaining portion will be funded by IP-2) and release the facility for unrestricted use is provided in Table 2. The cost includes an initial planning phase. During this phase the empty overpacks, ISFSI pad, and surrounding environs are characterized and the activity specifications and work procedures for the decontamination (overpack disposition) developed.

The next phase includes the cost for craft labor to demolish the activated overpacks, package in certified waste containers, transportation to the Clive, Utah site, disposal, as well as the costs for the supporting equipment, materials and supplies. The final phase includes the cost for the license termination survey, verification survey, and the associated equipment and laboratory support.

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9 "Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. Nuclear Regulatory Commission's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Volume 3, Revision 1, February 2012.

The estimate also contains costs for the NRC (and NRC contractor to perform the verification survey), Entergy's oversight staff, site security (industrial), and other site operating costs.

For estimating purposes it is conservatively assumed that all expenditures will be incurred in the year 2061, the year following all spent fuel removal.

7. Financial Assurance

ISFSI operations at Indian Point are in response to the DOE's failure to remove spent nuclear fuel from the site in a timely manner. The costs for management of the spent fuel are costs for which the DOE is responsible according to a judgment entered against the DOE under federal law and the Standard Contract.[10] It is therefore expected that, once the ISFSI is no longer needed, the cost to decommission the ISFSI would be a DOE-reimbursable expense. Until such time that the costs can be recovered from the DOE, Entergy will rely upon the money available in its decommissioning trust fund to terminate the ISFSI license and release the facility for unrestricted use.

Using the decommissioning trust fund is reasonable based on the following:

- Although the decommissioning trust fund is for radiological decommissioning costs only, the ISFSI decommissioning is a radiological cost. Also, to the extent that the trust fund balance exceeds costs required for Part 50 radiological decommissioning, these funds would be available to address costs incurred by Entergy, including ISFSI decommissioning costs.
- The projected amount necessary for decommissioning IP-3 is $524.141 million, based upon the NRC's latest financial assurance funding determination.[11]
- Based upon IP-3's decommissioning trust fund balance as of September 30, 2015 and considering the allowed real rate of return on the fund between October 1, 2015 and the start of IP-3 decommissioning, the trust fund will contain a $196.185 million surplus (refer to Table 3) beyond the NRC minimum funding formula provided in 10CFR50.75(e). This surplus is more than sufficient to complete the decommissioning of the ISFSI (estimated cost provided in Table 2).

This certifies that, based on the trust fund balance and costs as shown as of the dates reflected in this report, financial assurance has been provided in the amount of the cost estimate for decommissioning of the ISFSI.

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10 Entergy Nuclear FitzPatrick, LLC, Entergy Nuclear Indian Point 3, and Entergy Nuclear Operations, Inc. v. United States, Court of Federal Claims, No. 03-2627-C (2009)

11 "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 15, January 2013

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
Current ISFSI Pad	208	96	No

ISFSI Storage Overpack

Item	Value	Notes
HI-STORM 100S-218 Overall Height (inches)	218	Dimensions are nominal
Outside Diameter (inches)	132.5	Dimensions are nominal
Inside Diameter (inches)	73.5	Dimensions are nominal
Quantity (total)	59	53 spent fuel + 6 GTCC
Quantity (with residual radioactivity)	7	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste from Overpack (pounds)	1,157,818	Concrete and steel
Other Low-Level Radioactive Waste (pounds)	1,351	DAW, filters and other secondary waste
Low-Level Radioactive Waste (total packaged volume)	15,764	Cubic feet
Low-Level Radioactive Waste (packaged density)	74	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Number of Overpacks used for GTCC storage	6	No residual radioactivity

Table 2
ISFSI Decommissioning Costs and Waste Volumes
(50% of total cost)

	Costs (thousands, 2015 dollars)						Waste Volume	Person-Hours	
	Removal	Packaging	Transport	Disposal	Other	Total	Class A (cubic feet)	Craft	Oversight and Contractor
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	193	193	-	-	608
Decontamination/Demolition (activated cask disposition)	210	65	454	2,429	-	3,126	15,764	2,686	-
License Termination (radiological surveys)	-	-	-	-	972	972	-	7,294	-
Subtotal	**210**	**65**	**423**	**2,429**	**1,164**	**4,290**	**15,764**	**9,980**	**608**
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	211	211	-	-	388
Insurance	-	-	-	-	-	-	-	-	-
Property Taxes	-	-	-	-	646	646	-	-	-
Plant Energy Budget	-	-	-	-	-	-	-	-	-
Non-Labor Overhead	-	-	-	-	7	7	-	-	-
Corporate A&G	-	-	-	-	38	38	-	-	-
Security (industrial)	-	-	-	-	73	73	-	-	1,991
Entergy Oversight Staff	-	-	-	-	169	169	-	-	1,949
Subtotal	**-**	**-**	**-**	**-**	**1,142**	**1,142**	**-**	**-**	**4,328**
Total (w/o contingency)	**210**	**65**	**423**	**2,429**	**2,307**	**5,432**	**15,764**	**9,980**	**4,936**
Total (w/25% contingency)	**262**	**81**	**528**	**3,036**	**2,884**	**6,790**			

Table 3
IP-3 Financial Assurance

Plant name: Indian Point Energy Center, Unit 3

	Month	Day	Year
Year of Biennial:	9	30	2015
Termination of Operation:	12	12	2015

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
PWR	3216	$103,300,800	125.1	2.16	0.65	2.70	2.052	1.980	0.13	2.02	0.22	13.885

NRC Minimum: **$524,141,450** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$524,141,450	$667,821,657

Step 1: Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of	Total Earnings:	
$667,821,657	2%	0.20	1.00398	**$670,480,920**	**Total Earnings = Trust Fund balance x (1+RRR)^Years left in license**

Step 2: Accumulation:

Value of Annuity per year	Real Rate of Return per	Years of Annuity:	Total Annuity:
$0	2%	0	$0

Step 3: Decom Period:

Total Earnings:	Real Rate of Return per	Decom Period:	Total Real Rate of	Total Earnings for Decom:	
$670,480,920	2%	7	0.14869	$49,845,452	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Total of Steps 1 - 3:	
$720,326,372	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$**	**196,184,922**	**to NRC minimum**
	$	**(6,790,496)**	**Less ISFSI**
	$	**-**	**Parent Co Guaranty**
	$	**189,394,426**	**Total Excess Financial Assurance**

ATTACHMENT 4

CNRO-2018-00019

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
James A. Fitzpatrick Nuclear Power Plant
ISFSI Docket 72-012

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
James A. Fitzpatrick Nuclear Power Plant
ISFSI Docket 72-012

1. Background and Introduction

The Nuclear Regulatory Commission (NRC) issued its final rule on Decommissioning Planning on June 17, 2011,[1] with the rule becoming effective on December 17, 2012. Subpart 72.30, "Financial assurance and recordkeeping for decommissioning," requires that each holder of, or applicant for, a license under this part must submit for NRC review and approval a decommissioning funding plan that contains information on how reasonable assurance will be provided that funds will be available to decommission the Independent Spent Fuel Storage Installation (ISFSI).

The rule also requires resubmittal of the decommissioning funding plan at intervals not to exceed 3 years, with adjustments as necessary to account for changes in costs and the extent of contamination. This document is intended to update the funding plans previously submitted by Entergy Nuclear Operations in December 2012.[2]

In accordance with the rule, this letter provides a detailed cost estimate for decommissioning the ISFSI at the James A. FitzPatrick Nuclear Power Station (FitzPatrick), in an amount reflecting:

1. The work performed by an independent contractor;
2. An adequate contingency factor; and
3. Release of the facility and dry storage systems for unrestricted use, as specified in 10 CFR Part 20.1402

This letter also provides:

1. Identification of and justification for using the key assumptions contained in the cost estimate;
2. A description of the method of assuring funds for decommissioning; and
3. The volume of onsite subsurface material containing residual radioactivity, if any, that will require remediation to meet the criteria for license termination.

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1 U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70 and 72 "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, Number 117 (p 35512 et seq.), June 17, 2011

2 "ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Big Rock Point, Indian Point Generating Stations 1, 2, & 3, Pilgrim Nuclear Power Station, Palisades Nuclear Plant, James A. FitzPatrick and Vermont Yankee Nuclear Power Station," ENOC-12-00039, dated December 13, 2012 (NRC Accession No. ML12352A126)

2. Spent Fuel Management Strategy

Entergy Corporation has announced that it will close FitzPatrick in late 2016 or early 2017. Assuming the plant operates through 2016, approximately 4,408 spent fuel assemblies are currently projected to be generated. Because of the breach by the Department of Energy (DOE) of its contract to remove fuel from the site, an ISFSI has been constructed and fuel casks have been emplaced thereon to support continued plant operations. Based upon the current projection of the DOE's ability to remove spent fuel from the site, this estimate includes, for financial planning purposes, construction of additional pad(s) after shutdown to support decommissioning. The ISFSI is operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[3]).

Because of the DOE's breach, it is envisioned that the spent fuel pool will contain a significant number of spent fuel assemblies at the time of operations cease, including assemblies off-loaded from the reactor vessel. To facilitate immediate dismantling operations or safe-storage operations, the fuel that cannot be transferred directly to the DOE from the pool is assumed to be packaged in dry storage casks for interim storage at the ISFSI. Once the spent fuel pool is emptied, the spent fuel pool systems and fuel pool areas can be either decontaminated and dismantled or prepared for long-term storage.

Completion of the ISFSI decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site. DOE's repository program assumes that spent fuel allocations will be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor. Entergy Nuclear FitzPatrick's (Entergy) current spent fuel management plan for the FitzPatrick spent fuel is based in general upon: 1) a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the FitzPatrick fuel. The DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. Assuming a maximum rate of transfer of 3,000 metric tons of uranium/year,[4] the spent fuel is projected to be fully removed from the FitzPatrick site in 2057.

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the current administration's Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[5]

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

4 "Acceptance Priority Ranking & Annual Capacity Report," DOE/RW-0567, July 2004

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

The report stated that "[W]ith the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that: …[A]dvances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities."

The DOE has taken the position that under the Standard Contract, it does not have an obligation to accept canistered fuel from licensees. This position, coupled with the DOE's failure to perform, has increased the difficulty of estimating future requirements under 10 CFR 72.30. The estimates presented in this report are for budgeting purposes only, and do not represent any conclusion by the licensee about how the DOE will actually perform in the future. This report should not be taken as any indication that the licensee knows how the DOE will eventually perform its obligations, or has any specific expectation concerning that performance. If DOE's failure to perform results in specific additional costs beyond those reflected in this report, it is expected that the DOE will compensate the licensee for those costs.

Entergy's position is that the DOE has a contractual obligation to accept the spent fuel earlier than the projections set out above consistent with its contract commitments. No assumption made in this study should be interpreted to be inconsistent with this claim.

3. ISFSI Decommissioning Strategy

At the conclusion of the spent fuel transfer process the ISFSI will be promptly decommissioned (similar to the power reactor DECON alternative).

For purposes of the funding plan, financial assurance is provided on the basis of a prompt ISFSI decommissioning scenario, i.e., independent of other station decommissioning strategies. ISFSI decommissioning is considered an independent project, regardless of the decommissioning alternative identified for the nuclear power plant.

4. ISFSI Description

The design and capacity of the FitzPatrick ISFSI is based upon the Holtec HI-STORM 100S dry cask storage system. The system consists of a multi-purpose canister, with a nominal capacity of 68 fuel assemblies, and a steel-lined concrete storage overpack.

Entergy's current spent fuel management plan for the FitzPatrick spent fuel would result in 65 spent fuel storage casks being placed on the storage pads at the site. This projected configuration is based upon the 2025 DOE spent fuel program start with a 2028 DOE start date for FitzPatrick spent fuel, a 3,000 MTU / year pickup rate, and a 22 cask capacity for the ISFSI pad built to support plant operations. This scenario would allow

the spent fuel storage pool to be emptied within approximately five and one-half years following the permanent cessation of operations.

The 65 casks projected to be on the ISFSI pads after shutdown excludes any additional casks that may be used for Greater-than-Class-C (GTCC) storage. The storage overpacks used for the GTCC canisters (estimated quantity of 5) are not expected to have any interior contamination of residual activation and can be reused or disposed of by conventional means after a final status survey.

Table 1 provides the significant quantities and physical dimensions used as the basis in developing the ISFSI decommissioning estimate.

5. Key Assumptions / Estimating Approach

The decommissioning estimate is based on the configuration of the ISFSI expected after all spent fuel and GTCC material has been removed from the site. The configuration of the ISFSI is based on the station operating until the end of 2016 and the DOE's spent fuel acceptance assumptions, as previously described. For purposes of this analysis, the additional ISFSI pads would be constructed to accommodate the casks needed to off load the spent fuel pool after the cessation of plant operations. Based upon the additional capacity needed, a second ISFSI pad is assumed to be constructed to accommodate the additional 48 casks.

The dry storage vendor, Holtec International, does not expect the overpacks to have any interior or exterior radioactive surface contamination. Any neutron activation of the steel and concrete is expected to be extremely small.[6] The decommissioning estimate is based on the premise 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, 9 of the 65 overpacks are assumed to be affected, i.e., contain residual radioactivity. The allowance quantity is based upon the number of casks required for the final core off-load (i.e., 560 offloaded assemblies, 68 assemblies per cask) which results in 9 overpacks. It is assumed that these are the final casks offloaded; consequently they have the least time for radioactive decay of the neutron activation products.

The dry storage vendor, Holtec International, does not expect any residual contamination to be left on the concrete ISFSI pads.[7] It would be expected that this assumption would be confirmed as a result of good radiological practice of surveying potentially impacted areas after each spent fuel transfer campaign. It is assumed for this analysis that the ISFSI

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6 HI-STORM FSAR, Holtec International, Report HI-2002444, Rev. 3, at page 2.4-1 (Accession Number ML081350153)

7 HI-STORM FSAR, Holtec International, Report HI-2002444, Rev. 3, at page 2.4-2 (Accession Number ML081350153)

pads will not be contaminated. As such, only verification surveys are included for the pads in the decommissioning estimate. An allowance is also included for surveying any transfer equipment.

The estimate is limited to costs necessary to terminate the ISFSI's NRC license and meet the §20.1402 criteria for unrestricted use. Disposition of released material and structures is outside the scope of the estimate.

The latest decommissioning cost study for FitzPatrick (prepared in 2014) included an allowance for the remediation of contaminated (radiological) soil as being required to terminate the site operating license. However, there is no indication that any additional remediation of the soil in the vicinity of the current ISFSI pad would be necessary. As such, there is no allowance for the remediation of contaminated soil included with the decommissioning cost of the current ISFSI pad. There has also been no decision on the location of the future pad, but it is reasonable to assume that the site would be free of plant-related radionuclides or remediated prior to construction. Therefore, there is no allowance for the remediation of any additional contaminated soil in the estimate to decommission the second pad.

Low-level radioactive waste disposal costs are based on Entergy's negotiated rates with Energy*Solutions*.

Decommissioning is assumed to be performed by an independent contractor. As such, labor, equipment, and material costs are based on national averages, i.e., costs from national publications such as R.S. Means' Building Construction Cost Data (adjusted for regional variations), and laboratory service costs are based on vendor price lists. Entergy, as licensee, will oversee the site activities.

Contingency has been added at an overall rate of 25%. This is consistent with the contingency evaluation criteria referenced by the NRC in NUREG-1757.[8]

Costs are reported in 2015 dollars and based upon an internal decommissioning analysis prepared for FitzPatrick in 2014. The spent fuel management assumptions were revised to reflect a 2016 shutdown. Activity costs with the exception of those associated with low-level radioactive waste disposal, have been escalated to 2015 dollars using the Consumer Price Index, Services.[9] Low-level radioactive waste disposal costs have been escalated to 2015 dollars using the Consumer Price Index, All Items.[10]

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8 "Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. Nuclear Regulatory Commission's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Volume 3, Revision 1, February, 2012.

9 Bureau of Labor Statistics, Consumer Price Index - All Urban Consumers, Services, Series ID: CUUR0000SAS

10 Bureau of Labor Statistics, Consumer Price Index - All Urban Consumers, All Items, Series ID: CUUR0000AA0

The effects, if any, since the last submittal of the ISFSI decommissioning funding plan of the following events listed in 10 CFR 72.30(c)(1)-(4) have been specifically considered in the decommissioning cost estimate:

(1) Spills of radioactive material producing additional residual radioactivity in onsite subsurface material: There have been no spills at the ISFSI.

(2) Facility modifications: In 2015, the ISFSI was expanded, and this expansion has been accounted for in the decommissioning cost estimate. For purposes of bounding the decommissioning cost estimate, 1) future expansion of the ISFSI is assumed in the current estimate based upon continuing delays by the DOE in removing the spent fuel from the site, and 2) the potential volume of low-level radioactive waste volume generated from storage cask overpack disposition is also increased.

(3) Changes in authorized possession limits: There are no changes in authorized possession limits that affect the decommissioning cost estimate.

(4) Actual remediation costs that exceed the previous cost estimate: No actual remediation costs have been incurred, so no actual remediation costs exceed the previous cost estimate.

6. Cost Considerations

The estimated cost to decommission the ISFSI pads and release the facility for unrestricted use is provided in Table 2. The cost includes an initial planning phase. During this phase the empty overpacks, ISFSI pads, and surrounding environs are characterized and the activity specifications and work procedures for the decontamination (overpack disposition) developed.

The next phase includes the cost for craft labor to demolish the activated overpacks, package in certified waste containers, transportation to the Clive, Utah site, disposal, as well as the costs for the supporting equipment, materials and supplies. The final phase includes the cost for the license termination surveys, verification surveys, and the associated equipment and laboratory support.

The estimate also contains costs for the NRC (and NRC contractor), Entergy's oversight staff, site security (industrial), and other site operating costs.

For estimating purposes it is conservatively assumed that all expenditures will be incurred in the year 2058, the year following all spent fuel removal.

7. Financial Assurance

ISFSI operations at FitzPatrick are in response to the DOE's failure to remove spent nuclear fuel from the site in a timely manner. The costs for management of the spent fuel are costs for which the DOE is responsible according to a judgment entered against the DOE under federal law and the Standard Contract.[11] It is therefore expected that, once the ISFSI is no longer needed, the cost to decommission the ISFSI would be a DOE-reimbursable expense. Until such time that the costs can be recovered from the DOE, Entergy will rely upon the money available in its decommissioning trust fund to terminate the ISFSI license and release the facility for unrestricted use.

Using the decommissioning trust fund is reasonable based on the following:

- Although the decommissioning trust fund is for radiological decommissioning costs only, the ISFSI decommissioning is a radiological cost. Also, to the extent that the trust fund balance exceeds costs required for Part 50 radiological decommissioning, these funds would be available to address costs incurred by Entergy, including ISFSI decommissioning costs.
- The projected amount necessary for decommissioning FitzPatrick is $651.122 million, based upon the NRC's latest financial assurance funding determination.[12]
- Based upon FitzPatrick's decommissioning trust fund balance as of September 30, 2015 and considering the allowed real rate of return on the fund between October 1, 2015 and the start of FitzPatrick station decommissioning, the trust fund will contain a $151.432 million surplus (refer to Table 3) beyond the NRC minimum funding formula provided in 10CFR50.75(e). This surplus is more than sufficient to complete the decommissioning of the ISFSI (estimated cost provided in Table 2).

This certifies that, based on the trust fund balance and costs as shown as of the dates reflected in this report, financial assurance has been provided in the amount of the cost estimate for decommissioning of the ISFSI.

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11 Entergy Nuclear FitzPatrick, LLC, Entergy Nuclear Indian Point 3, and Entergy Nuclear Operations, Inc. v. United States, Court of Federal Claims, No. 03-2627-C (2009)

12 "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 15, January 2013

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
Existing ISFSI Pad	170	35	No

ISFSI Storage Overpack

Item	Value	Notes
Overall Height (inches)	218	Dimensions are nominal
Outside Diameter (inches)	132.5	Dimensions are nominal
Inside Diameter (inches)	73.5	Dimensions are nominal
Quantity (total)	70	65 spent fuel + 5 GTCC
Quantity (with residual radioactivity)	9	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste from Overpack (pounds)	1,488,623	Concrete and steel
Other Low-Level Radioactive Waste (pounds)	2,146	DAW, filters and other secondary waste
Low-Level Radioactive Waste (total packaged volume)	20,288	Cubic feet
Low-Level Radioactive Waste (packaged density)	73	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Number of Overpacks used for GTCC storage	5	No residual radioactivity

Table 2
ISFSI Decommissioning Costs and Waste Volumes

	Costs (thousands, 2015 dollars)						Waste Volume	Person-Hours	
	Removal	Packaging	Transport	Disposal	Other	Total	Class A (cubic feet)	Craft	Oversight and Contractor
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	269	269	-	1,072	-
Decontamination/Demolition (activated cask disposition)	244	85	580	3,124	-	4,033	20,288	3,384	-
License Termination (radiological surveys)	-	-	-	-	1,123	1,123	-	8,954	-
Subtotal	**244**	**85**	**580**	**3,124**	**1,392**	**5,425**	**20,288**	**13,410**	**-**
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	412	412	-	-	776
Insurance	-	-	-	-	69	69	-	-	-
Property Taxes	-	-	-	-	1	1	-	-	-
Plant Energy Budget	-	-	-	-	77	77	-	-	-
Non-Labor Overhead	-	-	-	-	29	29	-	-	-
Corporate A&G	-	-	-	-	96	96	-	-	-
Security (industrial)	-	-	-	-	139	139	-	-	5,137
Entergy Oversight Staff	-	-	-	-	290	290	-	-	3,897
Subtotal	-	-	-	-	1,112	1,112	-	-	9,810
Total (w/o contingency)	**244**	**85**	**580**	**3,124**	**2,504**	**6,537**	**20,288**	**11,675**	**9,810**
Total (w/25% contingency)	**305**	**107**	**725**	**3,904**	**3,130**	**8,172**			

Table 3

Financial Assurance

Plant name: James A. FitzPatrick

	Month	Day	Year
Year of Biennial:	9	30	2015
Termination of Operation:	12	31	2016

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
BWR	2536	$126,824,000	125.1	2.16	0.65	2.70	2.052	1.980	0.13	2.02	0.22	14.16

NRC Minimum: **$651,122,528** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$651,122,528	$728,714,927

Step 1: Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of	Total Earnings:	
$728,714,927	2%	1.25	1.02512	**$747,018,647**	**Total Earnings = Trust Fund balance x (1+RRR)^Years left in license**

Step 2: Accumulation:

Value of Annuity per year	Real Rate of Return per	Years of Annuity:	Total Annuity:
$0	2%	0	$0

Step 3: Decom Period:

Total Earnings:	Real Rate of Return per	Decom Period:	Total Real Rate of	Total Earnings for Decom:	
$747,018,647	2%	7	0.14869	$55,535,483	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Total of Steps 1 - 3:	
$802,554,130	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$**	**151,431,601**	**to NRC minimum**
	$	**(8,171,509)**	**Less ISFSI**
	$	**-**	**Parent Co Guaranty**
	$	**143,260,092**	**Total Excess Financial Assurance**

ATTACHMENT 5

CNRO-2018-00019

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
Pilgrim Nuclear Power Station
ISFSI Docket 72-1044

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
Pilgrim Nuclear Power Station
ISFSI Docket 72-1044

1. Background and Introduction

The Nuclear Regulatory Commission (NRC) issued its final rule on Decommissioning Planning on June 17, 2011,[1] with the rule becoming effective on December 17, 2012. Subpart 72.30, "Financial assurance and recordkeeping for decommissioning," requires that each holder of, or applicant for, a license under this part must submit for NRC review and approval a decommissioning funding plan that contains information on how reasonable assurance will be provided that funds will be available to decommission the Independent Spent Fuel Storage Installation (ISFSI).

The rule also requires resubmittal of the decommissioning funding plan at intervals not to exceed 3 years, with adjustments as necessary to account for changes in costs and the extent of contamination. This document is intended to update the funding plans previously submitted by Entergy Nuclear Operations in December 2012.[2]

In accordance with the rule, this letter provides a detailed cost estimate for decommissioning the ISFSI at Pilgrim Nuclear Power Station (Pilgrim), in an amount reflecting:

1. The work performed by an independent contractor;
2. An adequate contingency factor; and
3. Release of the facility and dry storage systems for unrestricted use, as specified in 10 CFR Part 20.1402

This letter also provides:

1. Identification of and justification for using the key assumptions contained in the cost estimate;
2. A description of the method of assuring funds for decommissioning; and
3. The volume of onsite subsurface material containing residual radioactivity, if any, that will require remediation to meet the criteria for license termination.

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1 U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70 and 72 "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, Number 117 (p 35512 et seq.), June 17, 2011

2 "ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Big Rock Point, Indian Point Generating Stations 1, 2, & 3, Pilgrim Nuclear Power Station, Palisades Nuclear Plant, James A. FitzPatrick and Vermont Yankee Nuclear Power Station," ENOC-12-00039, dated December 13, 2012 (NRC Accession No. ML12352A126)

2. Spent Fuel Management Strategy

Entergy Corporation announced that it will close Pilgrim no later than June 1, 2019. Assuming the plant operates to that date, approximately 4,118 spent fuel assemblies are currently projected to be generated. Because of the breach by the Department of Energy (DOE) of its contract to remove fuel from the site, an ISFSI is needed to support continued plant operations. Based upon the current projection of the DOE's ability to remove spent fuel from the site, this estimate includes, for financial planning purposes, the construction of a second ISFSI after shutdown to support decommissioning. The ISFSI(s) is assumed to be operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[3]).

Because of the DOE's breach, it is envisioned that the spent fuel pool will contain a significant number of spent fuel assemblies at the time operations cease, including assemblies off-loaded from the reactor vessel. To facilitate immediate dismantling operations or safe-storage operations, the fuel that cannot be transferred directly to the DOE from the pool is assumed to be packaged in dry storage casks for interim storage at the ISFSI. Once the spent fuel pool is emptied, the spent fuel pool systems and fuel pool areas can be either decontaminated and dismantled or prepared for long-term storage.

Completion of the ISFSI decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site. DOE's repository program assumes that spent fuel allocations will be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor. Entergy Nuclear Generation Company's (Entergy) current spent fuel management plan for the Pilgrim spent fuel is based in general upon: 1) a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the Pilgrim fuel. The DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. Assuming a maximum rate of transfer of 3,000 metric tons of uranium/year,[4] the spent fuel is projected to be fully removed the Pilgrim site in 2062.

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the current administration's Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[5]

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

4 "Acceptance Priority Ranking & Annual Capacity Report," DOE/RW-0567, July 2004

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

The report stated that "[W]ith the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that: …[A]dvances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities."

The DOE has taken the position that under the Standard Contract, it does not have an obligation to accept canistered fuel from licensees. This position, coupled with the DOE's failure to perform, has increased the difficulty of estimating future requirements under 10 CFR 72.30. The estimates presented in this report are for budgeting purposes only, and do not represent any conclusion by the licensee about how the DOE will actually perform in the future. This report should not be taken as any indication that the licensee knows how the DOE will eventually perform its obligations, or has any specific expectation concerning that performance. If DOE's failure to perform results in specific additional costs beyond those reflected in this report, it is expected that the DOE will compensate the licensee for those costs.

Entergy's position is that the DOE has a contractual obligation to accept the spent fuel earlier than the projections set out above consistent with its contract commitments. No assumption made in this study should be interpreted to be inconsistent with this claim.

3. ISFSI Decommissioning Strategy

At the conclusion of the spent fuel transfer process the ISFSIs will be promptly decommissioned (similar to the power reactor DECON alternative).

For purposes of the funding plan, financial assurance is provided on the basis of a prompt ISFSI decommissioning scenario, i.e., independent of other station decommissioning strategies. ISFSI decommissioning is considered an independent project, regardless of the decommissioning alternative identified for the nuclear power plant.

4. ISFSI Description

The design and capacity of the Pilgrim ISFSI(s) is based upon the Holtec HI-STORM 100S dry cask storage system. The system consists of a multi-purpose canister, with a nominal capacity of 68 fuel assemblies, and a steel-lined concrete storage overpack.

Entergy's current spent fuel management plan for the Pilgrim spent fuel would result in 61 spent fuel storage casks being placed on two separate storage pads at the site. This projected configuration is based upon the 2025 DOE spent fuel program start with a 2027 DOE start date for Pilgrim spent fuel, a 3,000 MTU / year pickup rate, and a 40 cask capacity for the ISFSI pad built to support plant operations. This scenario would allow

the spent fuel storage pool to be emptied within approximately five and one-half years following the permanent cessation of operations.

The 61 casks projected to be on the ISFSI pad after shutdown excludes any additional casks that may be used for Greater-than-Class-C (GTCC) storage. The storage overpacks used for the GTCC canisters (estimated quantity of 4) are not expected to have any interior contamination of residual activation and can be reused or disposed of by conventional means after a final status survey.

Table 1 provides the significant quantities and physical dimensions used as the basis in developing the ISFSI decommissioning estimate.

5. Key Assumptions / Estimating Approach

The decommissioning estimate is based on the configuration of the ISFSI(s) expected after all spent fuel and GTCC material has been removed from the site. The configuration of the ISFSI(s) is based on the station operating until mid-2019 and the DOE's spent fuel acceptance assumptions, as previously described. The current Pilgrim ISFSI pad is approximately 52 feet by 239 feet, with a maximum capacity of 40 casks.
The dry storage vendor, Holtec International, does not expect the overpacks to have any interior or exterior radioactive surface contamination. Any neutron activation of the steel and concrete is expected to be extremely small.[6] The decommissioning estimate is based on the premise 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, nine of the 61 overpacks are assumed to be affected, i.e., contain residual radioactivity. The allowance quantity is based upon the number of casks required for the final core off-load (i.e., 580 offloaded assemblies, 68 assemblies per cask) which results in 9 overpacks. It is assumed that these are the final casks offloaded; consequently they have the least time for radioactive decay of the neutron activation products.

The dry storage vendor, Holtec International, does not expect any residual contamination to be left on the concrete ISFSI pad.[7] It would be expected that this assumption would be confirmed as a result of good radiological practice of surveying potentially impacted areas after each spent fuel transfer campaign. It is assumed for this analysis that the ISFSI pad will not be contaminated. As such, only verification surveys are included for the pad in the decommissioning estimate. An allowance is also included for surveying any transfer equipment.

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6 HI-STORM FSAR, Holtec International, Report HI-2002444, Rev. 3, at page 2.4-1 (Accession Number ML081350153)

7 HI-STORM FSAR, Holtec International, Report HI-2002444, Rev. 3, at page 2.4-2 (Accession Number ML081350153)

The estimate is limited to costs necessary to terminate the ISFSI's NRC license and meet the §20.1402 criteria for unrestricted use. Disposition of released material and structures is outside the scope of the estimate.

During the construction of the ISFSI, the top six inches of soil at the excavation was sampled and analyzed. [8] There was no plant-related radioactive material in the samples, only naturally-occurring isotopes and background levels of ^{137}Cs in the soil. Therefore, there is no allowance for the remediation of any contaminated soil in the estimate to decommission the ISFSI. There has also been no decision on the location of the future pad, but it is reasonable to assume that the site would be free of plant-related radionuclides or remediated prior to construction. Therefore, there is no allowance for the remediation of any additional contaminated soil in the estimate to decommission the second pad.

Low-level radioactive waste disposal costs are based on Entergy's currently negotiated rates with Energy*Solutions*.

Decommissioning is assumed to be performed by an independent contractor. As such, labor, equipment, and material costs are based on national averages, i.e., costs from national publications such as R.S. Means' Building Construction Cost Data (adjusted for regional variations), and laboratory service costs are based on vendor price lists. Entergy, as licensee, will oversee the site activities.

Contingency has been added at an overall rate of 25%. This is consistent with the contingency evaluation criteria referenced by the NRC in NUREG-1757.[9]

Costs are reported in 2015 dollars and based upon an internal decommissioning analysis prepared for Pilgrim in 2012. Activity costs were updated to 2015 dollars.

The effects, if any, since the last submittal of the ISFSI decommissioning funding plan of the following events listed in 10 CFR 72.30(c)(1)-(4) have been specifically considered in the decommissioning cost estimate:

(1) Spills of radioactive material producing additional residual radioactivity in onsite subsurface material: There have been no spills at the ISFSI.

(2) Facility modifications: There have been no facility modifications in the past three years that affect the decommissioning cost estimate. However, for purposes of bounding the decommissioning cost estimate, 1) future expansion of the ISFSI is assumed in the current estimate based upon continuing delays by the DOE in

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8 Addendum to Radiological Engineering Evaluation 12-017, ISFSI On-Site Soil Sample Results, June 2012

9 "Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. Nuclear Regulatory Commission's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Volume 3, Revision 1, February 2012.

removing the spent fuel from the site, and 2) the potential volume of low-level radioactive waste volume generated from storage cask overpack disposition is also increased.

(3) Changes in authorized possession limits: There are no changes in authorized possession limits that affect the decommissioning cost estimate.

(4) Actual remediation costs that exceed the previous cost estimate: No actual remediation costs have been incurred, so no actual remediation costs exceed the previous cost estimate.

6. Cost Considerations

The estimated cost to decommission the ISFSI and release the facility for unrestricted use is provided in Table 2. The cost includes an initial planning phase. During this phase the empty overpacks, ISFSI pad(s), and surrounding environs are characterized and the activity specifications and work procedures for the decontamination (overpack disposition) developed.

The next phase includes the cost for craft labor to remove the activated overpacks, package in certified waste containers, transportation to the Clive, Utah site, disposal, as well as the costs for the supporting equipment, materials and supplies.
The final phase includes the cost for the license termination survey, verification survey, and the associated equipment and laboratory support.

The estimate also contains costs for the NRC (and NRC contractor to perform the verification survey), Entergy's oversight staff, site security (industrial), and other site operating costs.

For estimating purposes it is conservatively assumed that all expenditures will be incurred in the year 2063, the year following all spent fuel removal.

7. Financial Assurance

ISFSI operations at Pilgrim are in response to the DOE's failure to remove spent nuclear fuel from the site in a timely manner. The costs for management of the spent fuel are costs for which the DOE is responsible according to a judgment entered against the DOE under federal law and the Standard Contract.[10] It is therefore expected that, once the ISFSI is no longer needed, the cost to decommission the ISFSI would be a DOE-reimbursable expense.

Until such time that the costs can be recovered from the DOE, Entergy will rely upon the money available in its decommissioning trust fund to terminate the ISFSI license and release the facility for unrestricted use.

Using the decommissioning trust fund is reasonable based on the following:

- Although the decommissioning trust fund is for radiological decommissioning costs only, the ISFSI decommissioning is a radiological cost. Also, to the extent that the trust fund balance exceeds costs required for Part 50 radiological decommissioning, these funds would be available to address costs incurred by Entergy, including ISFSI decommissioning costs.
- The projected amount necessary for decommissioning Pilgrim is $627.650 million, based upon the NRC's latest financial assurance funding determination.[11]
- Based upon Pilgrim's decommissioning trust fund balance as of September 30, 2015 and considering the allowed real rate of return on the fund between October 1, 2015 and the start of Pilgrim station decommissioning, the trust fund will contain a $378.840 million surplus (refer to Table 3) beyond the NRC minimum funding formula provided in 10CFR50.75(e). This surplus is more than sufficient to complete the decommissioning of the ISFSI (estimated cost provided in Table 2).

This certifies that, based on the trust fund balance and costs as shown as of the dates reflected in this report, financial assurance has been provided in the amount of the cost estimate for decommissioning of the ISFSI.

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10 For Pilgrim, *sub nom. Boston Edison Co. v. United States*, 64 Fed. Cl. 167 (2005).

11 "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 15, January 2013

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
Primary ISFSI Pad	238.5	52	No

ISFSI Storage Overpack

Item	Value	Notes
Overall Height (inches)	218	Dimensions are nominal
Outside Diameter (inches)	132.50	Dimensions are nominal
Inside Diameter (inches)	73.50	Dimensions are nominal
Quantity (total)	65	61 spent fuel + 4 GTCC
Quantity (with residual radioactivity)	9	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste from Overpack (pounds)	1,488,623	Concrete and steel
Other Low-Level Radioactive Waste (pounds)	2,166	DAW, filters and other secondary waste
Low-Level Radioactive Waste (total packaged volume)	20,289	Cubic feet
Low-Level Radioactive Waste (packaged density)	73	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Number of Overpacks used for GTCC storage	4	No residual radioactivity

Table 2
ISFSI Decommissioning Costs and Waste Volumes

	Costs (thousands, 2015 dollars)						Waste Volume	Person-Hours	
	Removal	Packaging	Transport	Disposal	Other	Total	Class A (cubic feet)	Craft	Oversight and Contractor
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	269	269	-	1,072	-
Decontamination/Demolition (activated cask disposition)	245	84	632	3,124	-	4,085	20,289	3,456	-
License Termination (radiological surveys)	-	-	-	-	1,216	1,216	-	9,700	-
Subtotal	**245**	**84**	**632**	**3,124**	**1,485**	**5,569**	**20,289**	**14,228**	**-**
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	412	412	-	-	776
Insurance	-	-	-	-	209	209	-	-	-
Property Taxes	-	-	-	-	246	246	-	-	-
Plant Energy Budget	-	-	-	-	-	-	-	-	-
Non-Labor Overhead	-	-	-	-	-	-	-	-	-
Corporate A&G	-	-	-	-	98	98	-	-	-
Security (industrial)	-	-	-	-	321	321	-	-	5,013
Entergy Oversight Staff	-	-	-	-	325	325	-	-	3,803
Subtotal	-	-	-	-	1,611	1,611	-	-	9,592
Total (w/o contingency)	**245**	**84**	**632**	**3,124**	**3,096**	**7,180**	**20,289**	**14,228**	**9,592**
Total (w/25% contingency)	**306**	**105**	**790**	**3,904**	**3,869**	**8,975**			

Table 3

Financial Assurance

Plant name: Pilgrim Nuclear Generating Station

	Month	Day	Year
Year of Biennial:	9	30	2015
Termination of Operation:	5	31	2019

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
BWR	2028	$122,252,000	125.1	2.16	0.65	2.70	2.052	1.980	0.13	2.02	0.22	14.16

NRC Minimum: **$627,649,588** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$627,649,588	$871,181,920

Step 1:
Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of	Total Earnings:	
$871,181,920	2%	3.67	1.07537	**$936,842,057**	**Total Earnings = Trust Fund balance x (1+RRR)^Years left in license**

Step 2:
Accumulation:

Value of Annuity per year	Real Rate of Return per	Years of Annuity:	Total Annuity:
$0	2%	0	$0

Step 3:
Decom Period:

Total Earnings:	Real Rate of Return per	Decom Period:	Total Real Rate of	Total Earnings for Decom:	
$936,842,057	2%	7	0.14869	$69,647,493	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Total of Steps 1 - 3:	
$1,006,489,551	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$**	**378,839,963**	**to NRC minimum**
	$	**(8,975,100)**	**Less ISFSI**
	$	**-**	**Parent Co Guaranty**
	$	**369,864,863**	**Total Excess Financial Assurance**

ATTACHMENT 6

CNRO-2018-00019

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
Vermont Yankee Nuclear Power Station
ISFSI Docket 72-059

Revised 10 CFR 72.30 ISFSI Decommissioning Funding Plan
Vermont Yankee Nuclear Power Station
ISFSI Docket 72-059

1. Background and Introduction

The Nuclear Regulatory Commission (NRC) issued its final rule on Decommissioning Planning on June 17, 2011,[1] with the rule becoming effective on December 17, 2012. Subpart 72.30, "Financial assurance and recordkeeping for decommissioning," requires that each holder of, or applicant for, a license under this part must submit for NRC review and approval a decommissioning funding plan that contains information on how reasonable assurance will be provided that funds will be available to decommission the Independent Spent Fuel Storage Installation (ISFSI).

The rule also requires resubmittal of the decommissioning funding plan at intervals not to exceed 3 years, with adjustments as necessary to account for changes in costs and the extent of contamination. This document is intended to update the funding plans previously submitted by Entergy Nuclear Operations in December 2012.[2]

In accordance with the rule, this letter provides a detailed cost estimate for decommissioning the ISFSI at the Vermont Yankee Nuclear Power Station (Vermont Yankee), in an amount reflecting:

1. The work performed by an independent contractor;
2. An adequate contingency factor; and
3. Release of the facility and dry storage systems for unrestricted use, as specified in 10 CFR Part 20.1402

This letter also provides:

1. Identification of and justification for using the key assumptions contained in the cost estimate;
2. A description of the method of assuring funds for decommissioning; and
3. The volume of onsite subsurface material containing residual radioactivity, if any, that will require remediation to meet the criteria for license termination.

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1 U.S. Code of Federal Regulations, Title 10, Parts 20, 30, 40, 50, 70 and 72 "Decommissioning Planning," Nuclear Regulatory Commission, Federal Register Volume 76, Number 117 (p 35512 et seq.), June 17, 2011

2 "ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Big Rock Point, Indian Point Generating Stations 1, 2, & 3, Pilgrim Nuclear Power Station, Palisades Nuclear Plant, James A. FitzPatrick and Vermont Yankee Nuclear Power Station," ENOC-12-00039, dated December 13, 2012 (NRC Accession No. ML12352A126)

2. Spent Fuel Management Strategy

Vermont Yankee permanently ceased reactor operations on December 29, 2014.[3] Approximately 3,880 spent fuel assemblies (3,879 assemblies and 1 fuel debris canister) were generated over the life of the plant. Because of the breach by the Department of Energy (DOE) of its contract to remove fuel from the site, an ISFSI had been constructed and fuel casks have been emplaced thereon to support plant operations. Based upon the current projection of the DOE's ability to remove spent fuel from the site, a second pad will need to be constructed to support decommissioning. The ISFSI is operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[4]).

Because of the DOE's breach, the spent fuel pool contains a significant number of spent fuel assemblies. To facilitate immediate dismantling operations or safe-storage operations, the fuel that cannot be transferred directly to the DOE from the pool is assumed to be packaged in dry storage casks for interim storage at the ISFSI. Once the spent fuel pool is emptied, the spent fuel pool systems and fuel pool areas can be either decontaminated and dismantled or prepared for long-term storage.

Completion of the ISFSI decommissioning process is dependent upon the DOE's ability to remove spent fuel from the site. DOE's repository program assumes that spent fuel allocations will be accepted for disposal from the nation's commercial nuclear plants, with limited exceptions, in the order (the "queue") in which it was discharged from the reactor. Entergy Nuclear Vermont Yankee's (Entergy) current spent fuel management plan for the Vermont spent fuel is based in general upon: 1) a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the Vermont fuel. The DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. Assuming a maximum rate of transfer of 3,000 metric tons of uranium/year,[5] the spent fuel is projected to be fully removed from the Vermont Yankee site in 2052.

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In January 2013, the DOE issued the "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," in response to the recommendations made by the current administration's Blue Ribbon

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3 SVY 15-001 Certifications of Permanent Cessation of Power Operations and Permanent Removal of Fuel from the Reactor Vessel, January 12, 2015 (Accession Number ML15085A047)

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

5 "Acceptance Priority Ranking & Annual Capacity Report," DOE/RW-0567, July 2004

Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[6] The report stated that "[W]ith the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that: …[A]dvances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities."

The DOE has taken the position that under the Standard Contract, it does not have an obligation to accept canistered fuel from licensees. This position, coupled with the DOE's failure to perform, has increased the difficulty of estimating future requirements under 10 CFR 72.30. The estimates presented in this report are for budgeting purposes only, and do not represent any conclusion by the licensee about how the DOE will actually perform in the future. This report should not be taken as any indication that the licensee knows how the DOE will eventually perform its obligations, or has any specific expectation concerning that performance. If DOE's failure to perform results in specific additional costs beyond those reflected in this report, it is expected that the DOE will compensate the licensee for those costs.

Entergy's position is that the DOE has a contractual obligation to accept the spent fuel earlier than the projections set out above consistent with its contract commitments. No assumption made in this study should be interpreted to be inconsistent with this claim.

3. ISFSI Decommissioning Strategy

At the conclusion of the spent fuel transfer process the ISFSI will be promptly decommissioned (similar to the power reactor DECON alternative).

For purposes of the funding plan, financial assurance is provided on the basis of a prompt ISFSI decommissioning scenario, i.e., independent of other station decommissioning strategies. ISFSI decommissioning is considered an independent project, regardless of the decommissioning alternative identified for the nuclear power plant.

4. ISFSI Description

The design and capacity of the Vermont Yankee ISFSI(s) is based upon the Holtec HI-STORM 100S dry cask storage system. The system consists of a multi-purpose canister, with a nominal capacity of 68 fuel assemblies, and a steel-lined concrete storage overpack.

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

Entergy's current spent fuel management plan for the Vermont Yankee spent fuel would result in 58 spent fuel storage casks being placed on the storage pads at the site (including the casks generated during plant operations). This projected configuration is based upon the 2025 DOE spent fuel program start with a 2026 DOE start date for Vermont Yankee spent fuel, a 3,000 MTU / year pickup rate, and a 36 cask capacity for the ISFSI pad built to support plant operations. This scenario would allow the spent fuel storage pool to be emptied within approximately five and one-half years following the permanent cessation of operations.

The 58 casks projected to be on the pad excludes any additional casks that may be used for Greater-than-Class-C (GTCC) storage. The storage overpacks used for the GTCC canisters (estimated quantity of 1) are not expected to have any interior contamination of residual activation and can be reused or disposed of by conventional means after a final status survey.

Table 1 provides the significant quantities and physical dimensions used as the basis in developing the ISFSI decommissioning estimate.

5. Key Assumptions / Estimating Approach

The decommissioning estimate is based on the configuration of the ISFSI expected after all spent fuel and GTCC material has been removed from the site. The configuration of the ISFSI is based on the current spent fuel inventory at the site (3,880 assemblies) and the DOE's spent fuel acceptance assumptions, as previously described. For purposes of this analysis, the second pad is needed to accommodate all the casks used to store spent fuel at the site, including those casks placed on the initial ISFSI pad during plant operations. The second ISFSI pad is expected to be approximately 93 feet by 106 feet, and have a maximum capacity of 25 casks.

The dry storage vendor, Holtec International, does not expect the overpacks to have any interior or exterior radioactive surface contamination. Any neutron activation of the steel and concrete is expected to be extremely small.[7] The decommissioning estimate is based on the premise that some of the concrete overpacks will contain low levels of neutron-induced residual radioactivity that would necessitate remediation at the time of decommissioning. As an allowance, 6 of the 58 overpacks are assumed to be affected, i.e., contain residual radioactivity. The allowance quantity is based upon the number of casks required for the final core off-load (i.e., 368 offloaded assemblies, 68 assemblies per cask) which results in 6 overpacks. It is assumed that these are the final casks offloaded; consequently they have the least time for radioactive decay of the neutron activation products.

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7 HI-STORM FSAR, Holtec International, Report HI-2002444, Rev. 3, at page 2.4-1 (Accession Number ML081350153)

The dry storage vendor, Holtec International, does not expect any residual contamination to be left on the concrete ISFSI pads.[8] It would be expected that this assumption would be confirmed as a result of good radiological practice of surveying potentially impacted areas after each spent fuel transfer campaign. It is assumed for this analysis that the ISFSI pads will not be contaminated. As such, only verification surveys are included for the pads in the decommissioning estimate. An allowance is also included for surveying any transfer equipment.

The estimate is limited to costs necessary to terminate the ISFSI's NRC license and meet the §20.1402 criteria for unrestricted use. Disposition of released material and structures is outside the scope of the estimate.

The decommissioning cost study[9] developed for Vermont Yankee and filed with the NRC, included the cost for the remediation of contaminated (radiological) soil, based upon a review of the site's radiological records and associated affected areas. During the construction of the existing ISFSI, the soil excavated was replaced with engineered fill. This material is not expected to become contaminated from the operation of the ISFSI. The second pad is expected to be located adjacent to the first. Soil removed during construction will be sampled and analyzed for both radiological and non-radiological contaminants. Entergy does not expect to find contamination in the soil beneath the excavation. Therefore, there is no allowance for the remediation any additional contaminated soil in the estimate to decommission the ISFSI.

Low-level radioactive waste disposal costs are based on Entergy's currently negotiated rates with Energy*Solutions*.

Decommissioning is assumed to be performed by an independent contractor. As such, labor, equipment, and material costs are based on national averages, i.e., costs from national publications such as R.S. Means' Building Construction Cost Data (adjusted for regional variations), and laboratory service costs are based on vendor price lists. Entergy, as licensee, will oversee the site activities.

Contingency has been added at an overall rate of 25%. This is consistent with the contingency evaluation criteria referenced by the NRC in NUREG-1757.[10]

Costs are reported in 2015 dollars and based upon the estimate included with the Post Shutdown Decommissioning Activities Report[8] in 2014. Activity costs with the

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8 HI-STORM FSAR, Holtec International, Report HI-2002444, Rev. 3, at page 2.4-2 (Accession Number ML081350153)

9 Site Specific Decommissioning Cost Estimate for the Vermont Yankee Nuclear Power Station, dated December 2014 (Accession Number ML14357A110)

10 "Consolidated Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," U.S. Nuclear Regulatory Commission's Office of Nuclear Material Safety and Safeguards, NUREG-1757, Volume 3, Revision 1, February 2012.

exception of those associated with low-level radioactive waste disposal, have been escalated to 2015 dollars using the Consumer Price Index, Services.[11] Low-level radioactive waste disposal costs have been escalated to 2015 dollars using the Consumer Price Index, All Items.[12]

The effects, if any, since the last submittal of the ISFSI decommissioning funding plan of the following events listed in 10 CFR 72.30(c)(1)-(4) have been specifically considered in the decommissioning cost estimate:

(1) Spills of radioactive material producing additional residual radioactivity in onsite subsurface material: There have been no spills at the ISFSI.

(2) Facility modifications: There have been no facility modifications in the past three years that affect the decommissioning cost estimate. However, for purposes of bounding the decommissioning cost estimate, 1) future expansion of the ISFSI is assumed in the current estimate based upon continuing delays by the DOE in removing the spent fuel from the site, and 2) the potential volume of low-level radioactive waste volume generated from storage cask overpack disposition is also increased.

(3) Changes in authorized possession limits: There are no changes in authorized possession limits that affect the decommissioning cost estimate.

(4) Actual remediation costs that exceed the previous cost estimate: No actual remediation costs have been incurred, so no actual remediation costs exceed the previous cost estimate.

6. Cost Considerations

The estimated cost to decommission the ISFSI pads and release the facility for unrestricted use is provided in Table 2. The cost includes an initial planning phase. During this phase the empty overpacks, ISFSI pads, and surrounding environs are characterized and the activity specifications and work procedures for the decontamination (overpack disposition) developed.

The next phase includes the cost for craft labor to demolish the activated overpacks, package in certified waste containers, transportation to the Andrews, TX site, disposal, as well as the costs for the supporting equipment, materials and supplies. The final phase includes the cost for the license termination survey, verification survey, and the associated equipment and laboratory support.

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11 Bureau of Labor Statistics, Consumer Price Index - All Urban Consumers, Services, Series ID: CUUR0000SAS

12 Bureau of Labor Statistics, Consumer Price Index - All Urban Consumers, All Items, Series ID: CUUR0000AA0

The estimate also contains costs for the NRC (and NRC contractor), Entergy's oversight staff, site security (industrial), and other site operating costs.

For estimating purposes it is conservatively assumed that all expenditures will be incurred in the year 2053, the year following all spent fuel removal.

7. Financial Assurance

ISFSI operations at Vermont Yankee are in response to the DOE's failure to remove spent nuclear fuel from the site in a timely manner. The costs for management of the spent fuel are costs for which the DOE is responsible according to a judgment entered against the DOE under federal law and the Standard Contract.[13] It is therefore expected that, once the ISFSI is no longer needed, the cost to decommission the ISFSI would be a DOE-reimbursable expense. Until such time that the costs can be recovered from the DOE, Entergy will rely upon the money available in its decommissioning trust fund to terminate the ISFSI license and release the facility for unrestricted use.

Using the decommissioning trust fund is reasonable based on the following:

- Although the decommissioning trust fund is for radiological decommissioning costs only, the ISFSI decommissioning is a radiological cost. Also, to the extent that the trust fund balance exceeds costs required for Part 50 radiological decommissioning, these funds would be available to address costs incurred by Entergy, including ISFSI decommissioning costs.
- The projected amount necessary for decommissioning Vermont Yankee is $622.290 million, based upon the NRC's latest financial assurance funding determination.[14]
- Thus, considering the current fund balance of $596 million (as of October 31, 2015), projected fund earnings during the SAFSTOR period (assuming an annual 2% growth rate), the trust fund is expected to have an excess of $17.775 million over the estimated license termination and spent fuel management costs.
- This surplus is more than sufficient to complete the decommissioning of the ISFSI (estimated cost provided in Table 2).

This certifies that, based on the trust fund balance and costs as shown as of the dates reflected in this report, financial assurance has been provided in the amount of the cost estimate for decommissioning of the ISFSI.

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13 Vermont Yankee Nuclear Power Corporation and Entergy Nuclear Vermont Yankee, LLC v. United States, Court of Federal Claims, Nos. 02-898C and 03-2663C (2006)

14 "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 15, January 2013

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
Existing ISFSI Pad	132	76	No

ISFSI Storage Overpack

Item	Value	Notes
Overall Height (inches)	218	Dimensions are nominal
Outside Diameter (inches)	132.5	Dimensions are nominal
Inside Diameter (inches)	73.5	Dimensions are nominal
Quantity (total)	59	58 spent fuel + 1 GTCC
Quantity (with residual radioactivity)	6	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste from Overpack (pounds)	876,621	Concrete and steel
Transfer Cask (pounds)	202,400	
Other Low-Level Radioactive Waste (pounds)	1,350	DAW, filters and other secondary waste
Low-Level Radioactive Waste (total packaged volume)	12,370	Cubic feet
Low-Level Radioactive Waste (packaged density)	87	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Transfer Cask	1	Potentially contaminated
Number of Overpacks used for GTCC storage	1	No residual radioactivity

Table 2
ISFSI Decommissioning Costs and Waste Volumes

	Costs (thousands, 2015 dollars)						Waste Volume	Person-Hours	
	Removal	Packaging	Transport	Disposal	Other	Total	Class A (cubic feet)	Craft	Oversight and Contractor
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	252	252	-	-	1,048
Decontamination/Demolition (activated cask disposition)	149	142	375	639	-	1,306	12,370	1,537	-
License Termination (radiological surveys)	-	-	-	-	1,223	1,223	-	10,260	-
Subtotal	**149**	**142**	**375**	**639**	**1,475**	**2,781**	**12,370**	**11,797**	**1,048**
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	407	407	-	-	776
Insurance	-	-	-	-	50	50	-	-	-
Property Taxes	-	-	-	-	2	2	-	-	-
Plant Energy Budget	-	-	-	-	55	55	-	-	-
Non-Labor Overhead	-	-	-	-	283	283	-	-	-
Corporate A&G	-	-	-	-	51	51	-	-	-
Security (industrial)	-	-	-	-	226	226	-	-	4,996
Entergy Oversight Staff	-	-	-	-	187	187	-	-	2,067
Subtotal	-	-	-	-	1,261	1,261	-	-	7,839
Total (w/o contingency)	**149**	**142**	**375**	**639**	**2,736**	**4,042**	**12,370**	**11,797**	**8,887**
Total (w/25% contingency)	**187**	**178**	**469**	**799**	**3,420**	**5,053**			

Table 3
Financial Assurance

Plant name: Vermont Yankee Power Station

	Month	Day	Year
Year of Biennial:	9	30	2015
Termination of Operation:	12	29	2014

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
BWR	1912	$121,208,000	125.1	2.16	0.65	2.70	2.052	1.980	0.13	2.02	0.22	14.16

NRC Minimum: $622,289,625 **Site Specific:** $817,219,461

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$817,219,461	$595,773,175

Step 1:
Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of	Total Earnings:	
$595,773,175	2%	0.00	1.00000	**$595,773,175**	**Total Earnings = Trust Fund balance x (1+RRR)^Years left in license**

Step 2:
Accumulation:

Value of Annuity per year	Real Rate of Return per	Years of Annuity:	Total Annuity:
$0	2%	0	$0

Step 3:
Decom Period:

Total Earnings:	Real Rate of Return per	Decom Period:	Total Real Rate of	Total Earnings for Decom:	
$595,773,175	2%	7	0.14869	$44,291,466	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Total of Steps 1 - 3:	
$640,064,641	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$**	**17,775,016**	**to NRC minimum**
	$	**(5,052,565)**	**Less ISFSI**
	$	**-**	**Parent Co Guaranty**
	$	**12,722,451**	**Total Excess Financial Assurance**