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ENOC-12-00039
December 13, 2012

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: **ISFSI Decommissioning Funding Plans (10 CFR 72.30)**

Big Rock Point Docket No. 72-043	Palisades Nuclear Plant Docket No. 72-007
Indian Point Nuclear Generating Stations 1, 2, & 3 Docket 72-051	James A. FitzPatrick Nuclear Power Plant Docket 72-012
Pilgrim Nuclear Power Station Docket No. 50-293	Vermont Yankee Nuclear Power Station Docket No. 72-059

Dear Sir or Madam:

The NRC Final Rule on Decommissioning Planning was published in 76 FR 35512 on June 17, 2011 with an effective date of December 17, 2012. The final rule includes a requirement (10 CFR 72.30) for each holder of a Part 72 License to submit, for NRC review and approval, a decommissioning funding plan for purposes of decommissioning the licensee's Independent Spent Fuel Storage Installation (ISFSI). Entergy Nuclear Operations, Inc (Entergy) is hereby submitting (Attachments 1 through 6) the required Plans for the subject plants. The ISFSI for Pilgrim is in the development phase and is not yet licensed under 10 CFR 72. However, a decommissioning funding plan for Pilgrim is included in this submittal for your information.

The attachment for each plant shows that the surpluses in the 10CFR50.75 Decommissioning Trust Funds exceed the estimated costs of ISFSI decommissioning, as summarized in the following table. The Trust Fund balances account for the 10CFR50 license expiration dates and the ISFSI decommissioning cost estimates (DCE) assume all costs are incurred in the year following the year in which spent fuel has been fully removed from the ISFSI. The values are reported in 2012 dollars. The fund value for Big Rock Point is in the form of a Parent Guarantee, since the 10CFR50.75 Decommissioning Trust Fund is no longer applicable for that

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site. This letter constitutes a certification that financial assurance is provided to cover the estimated costs of ISFSI decommissioning as indicated in the following table:

Plant Site	Trust Fund surplus	DCE
Big Rock Point	$ 5M	$ 1.36M
Palisades	$ 25.0M	$ 3.52M
Indian Point	Unit 1: $ 427M Unit 2: $ 238M Unit 3: $ 162M	$ 3.71M (Units 1, 2 & 3)
James A. FitzPatrick	$ 422M	$ 2.66M
Pilgrim	$ 563M	$ 2.53M
Vermont Yankee	$ 276M	$ 2.53M

The NRC held a public telecom on December 3, 2012 to take questions regarding implementation of the10 CFR 72.30 reporting requirements. Answers to those questions were not provided during the telecom and the attached reports are based on our best efforts to interpret the new regulations prior to receipt of NRC responses to the questions.

This submittal contains no new commitments. Please address any comments or questions to Mr. Dave Mannai, Senior Manager, Nuclear Safety & Licensing at 802-380-1175.

Sincerely,

JFM / bsf / ljs / krk

Attachments:

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

3A. 10 CFR 72.30 ISFSI Decommissioning Funding Plan for Indian Point Nuclear Generating Stations 1 & 2

3B. 10 CFR 72.30 ISFSI Decommissioning Funding Plan for Indian Point Nuclear Generating Station 3

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

cc:

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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

ATTACHMENT 1 TO ENOC-12-00039

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN

FOR

BIG ROCK POINT

ISFSI DOCKET 72-043

ENTERGY NUCLEAR OPERATIONS, INC

10 CFR 72.30 ISFSI Decommissioning Funding Plan

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).

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 is 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.

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

[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

Consumers Energy to Entergy Nuclear Palisades and site operator Entergy Nuclear Operations (Entergy) in April of 2007.[2] The ISFSI is operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[3]).

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 2020 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,[4] the spent fuel is projected to be fully removed from the Big Rock Point site in 2033.

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In a report delivered to Congress in 2009,[5] DOE presented a six-year timeline for siting and constructing an interim storage facility (pending legislation eliminating the linkage in the Nuclear Waste Policy Act of 1982, as amended, between interim storage and the opening of the Yucca Mountain repository). The six-year time span would allow fuel receipt by the 2020 date.

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.

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

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 "Report to Congress on the Demonstration of the Interim Storage of Spent Nuclear Fuel from Decommissioned Nuclear Power Reactor Sites," DOE/RW-0596, U.S. Department of Energy Office of Civilian Radioactive Waste Management, December 2008

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.[6] The decommissioning estimate is based on the premise that some of the inner steel-liners 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, 2 of the 7 overpack liners 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.[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

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

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

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.[8] As such, the decommissioning estimate contains no cost allowance for soil remediation.

Waste volumes are based on estimates provided by FuelSolutions™[9]. 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.[10]

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

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

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.

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 (liner removal) developed.

The next phase includes the cost for craft labor to remove the activated liners, 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 2034, 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[11] 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).

[11] Status of Decommissioning Funding for Plants Operated by Entergy Nuclear Operations, Inc. for Year Ending December 31, 2010, dated March 31, 2011 (Accession Number ML110940051)

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)	220	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
Total Surface Area of Overpack Liner with Residual Radioactivity (square feet)	648	
Low-Level Radioactive Waste (cubic feet)	1,282	
Low-Level Radioactive Waste (packaged density)	84	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, 2012 dollars)						Waste Volume	Person-Hours		
	Removal	Packaging	Transport	Disposal	Other	Total	(ft3)	Contractor	Licensee	NRC / NRC Contractor
Decommissioning Contractor										
Planning (characterization, specs and procedures)	-	-	-	-	146	146	-	928	-	-
Decontamination/Demolition (activated liner removal)	13	4	27	72	53	170	1,282	116	-	-
License Termination (radiological surveys)	-	-	-	-	446	446	-	3,574	-	-
Subtotal	13	4	27	72	645	762	1,282	4,618	-	-
Supporting Costs										
NRC and NRC Contractor Fees and Costs	-	-	-	-	209	209		-	-	776
Insurance	-	-	-	-	34	34		-	-	-
Security (industrial)	-	-	-	-	94	94		2,479	-	-
Entergy Oversight Staff	-	-	-	-	141	141		-	1,881	-
Subtotal	-	-	-	-	478	478	-	2,479	1,881	776
Total (w/o contingency)	13	4	27	72	1,123	1,240	1,282	7,097	1,881	776
Total (w/25% contingency)	16	6	34	91	1,404	1,550				

ATTACHMENT 2 TO ENOC-12-00039

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN

FOR

PALISADES NUCLEAR PLANT

ISFSI DOCKET 72-007

ENTERGY NUCLEAR OPERATIONS, INC

10 CFR 72.30 ISFSI Decommissioning Funding Plan

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).

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 is 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.

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 ISFSI is operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[2]).

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

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 2020 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,[3] the spent fuel is projected to be fully removed from the Palisades site in 2060.

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In a report delivered to Congress in 2009,[4] DOE presented a six-year timeline for siting and constructing an interim storage facility (pending legislation eliminating the linkage in the Nuclear Waste Policy Act of 1982, as amended, between interim storage and the opening of the Yucca Mountain repository). The six-year time span would allow fuel receipt by the 2020 date.

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

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

4 "Report to Congress on the Demonstration of the Interim Storage of Spent Nuclear Fuel from Decommissioned Nuclear Power Reactor Sites," DOE/RW-0596, U.S. Department of Energy Office of Civilian Radioactive Waste Management, December 2008

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. Starting in 2014, 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 45 spent fuel storage modules/casks (24 NUHOMS® and 21 Holtec FW) being placed on the storage pad(s) at the site. This projected configuration is based upon the 2020 DOE spent fuel program start with a 2022 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 45 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 3) 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.[5] The decommissioning estimate is based on the premise that some of the inner steel-liners 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 21 Holtec overpack liners 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 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.[6] 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*.

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

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

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.[7]

Costs are reported in 2012 dollars.

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 (liner removal) developed. The next phase includes the cost for craft labor to remove the activated liners, 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 2060, the year following all spent fuel removal.

7. Financial Assurance

ISFSI operations at Palisades 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 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.

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7 "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.

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 $452.157 million, based upon the NRC's latest financial assurance funding determination.[8]
- Based upon Palisades' decommissioning trust fund balance as of September 30, 2012 and considering the allowed real rate of return on the fund between October 1, 2012 and the start of Palisades station decommissioning, the trust fund will contain a $24.977 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).

[8] "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 14, November 2010

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
Primary ISFSI Pads	353.5 and 421	32.5 each	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
Inner Liner Thickness (inches)	0.75	Dimensions are nominal
Quantity (total)	48	45 spent fuel + 3 GTCC
Quantity (with residual radioactivity)	6	Equivalent to the number of overpacks used to store last complete core offload
Total Surface Area of Overpack Liner with Residual Radioactivity (square feet)	2,260	
Low-Level Radioactive Waste (cubic feet)	3,668	
Low-Level Radioactive Waste (packaged density)	73	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Number of Overpacks used for GTCC storage	3	No residual radioactivity

Table 2
ISFSI Decommissioning Costs and Waste Volumes

	Costs (thousands, 2012 dollars)						Waste Volume	Person-Hours		
	Removal	Packaging	Transport	Disposal	Other	Total	(ft3)	Contractor	Licensee	NRC / NRC Contractor
Decommissioning Contractor										
Planning (characterization, specs and procedures)	-	-	-	-	218	218	-	13,045	-	-
Decontamination/Demolition (activated liner removal)	141	14	61	207	397	819	3,668	396	-	-
License Termination (radiological surveys)	-	-	-	-	1,196	1,196	-	12,133	-	-
Subtotal	141	14	61	207	1,811	2,234	3,668	25,574	-	-
Supporting Costs										
NRC and NRC Contractor Fees and Costs	-	-	-	-	255	255		-	-	776
Insurance	-	-	-	-	62	62		-	-	-
Security (industrial)	-	-	-	-	190	190		4,999	-	-
Entergy Oversight Staff	-	-	-	-	284	284		-	3,792	-
Subtotal	-	-	-	-	790	790	-	4,999	3,792	776
Total (w/o contingency)	141	14	61	207	2,601	3,023	3,668	30,573	3,792	776
Total (w/25% contingency)	176	17	76	259	3,251	3,779				

Table 3
Financial Assurance

Plant name: **Palisades Nuclear Plant**

	Month	Day	Year
Year of Biennial:	10	1	2012
Termination of Operation:	3	24	2031

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
PWR	2565	$97,572,000	115.7	2.08	0.65	2.41	1.971	4.022	0.13	2.83	0.22	12.28

NRC Minimum: **$452,156,817**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$452,156,817	$308,013,056

Step 1:
Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of	Total Earnings:	
$308,013,056	2%	18.48	1.44188	**$444,117,157**	**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:	
$444,117,157	2%	7	0.14869	$33,016,928	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Total of Steps 1 - 3:	
$477,134,085	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$24,977,267**	**to NRC minimum**

ATTACHMENTS 3A and 3B TO ENOC-12-00039

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLANS

FOR

INDIAN POINT NUCLEAR GENERATING UNITS 1, 2, & 3

ISFSI DOCKET 72-051

ENTERGY NUCLEAR OPERATIONS, INC

10 CFR 72.30 ISFSI Decommissioning Funding Plan

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).

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 is 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.

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 is currently set to expire on September 28, 2013. Approximately 1,721 spent fuel assemblies are projected to be generated over the

[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

life of IP-2. 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 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[2]).

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 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 of expiration of the current operating license in 2013, 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-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.

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 2020 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,[3] the spent fuel is projected to be fully removed from the Indian Point site in 2046.

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

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

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In a report delivered to Congress in 2009,[4] DOE presented a six-year timeline for siting and constructing an interim storage facility (pending legislation eliminating the linkage in the Nuclear Waste Policy Act of 1982, as amended, between interim storage and the opening of the Yucca Mountain repository). The six-year time span would allow fuel receipt by the 2020 date.

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 48 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 2020 DOE spent fuel program start with a 2021 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 that the pool remains operational 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 casks (48 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 4,

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4 "Report to Congress on the Demonstration of the Interim Storage of Spent Nuclear Fuel from Decommissioned Nuclear Power Reactor Sites," DOE/RW-0596, U.S. Department of Energy Office of Civilian Radioactive Waste Management, December 2008

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 its current license (2013) 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 78 casks. The supplemental pad (future) is assumed to have a maximum capacity of 40 casks and dimensions of approximately 52 feet by 238.5 feet (using the Pilgrim pad as a proxy).

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.[5] The decommissioning estimate is based on the premise that some of the inner steel-liners 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, 7 of the 48 IP-2 overpack liners 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.[6] 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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5 HI-STORM FSAR, Holtec International, Report HI-2002444, Rev. 3, at page 2.4-1 (Accession Number ML081350153)

6 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.

The decommissioning cost studies[7] developed for IP-1 and IP-2 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.

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 2012 dollars and based upon preliminary decommissioning cost analyses prepared in 2007[10] and 2010.[11] The original spent fuel management plan for IP-2 was updated from a 2017 DOE start date to year 2020, consistent with the current assumption used for Entergy's fleet, and revised to reflect IP-3's need to use the IP-2 pool for spent fuel packaging for dry storage/transport. Activity costs originally reported in 2010 dollars (in the latest IP-3 study) have been escalated to 2012 dollars using the Consumer Price Index, Services.[12]

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7 Submittal of the Unit 1 & 2 Program for Maintenance of Irradiated Fuel and Preliminary Decommissioning Cost Analysis, dated October 23, 2008 (Accession Number ML083040378)

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.

10 "Preliminary Decommissioning Cost Analysis for the Indian Point Energy Center, Unit 3," December 2010 (Accession Number ML103550608)

11 "Preliminary Decommissioning Cost Analysis for the Indian Point Energy Center, Unit 3," December 2010 (Accession Number ML103550608)

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

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 (liner removal) developed. The next phase includes the cost for craft labor to remove the activated liners, 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 2048, 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.[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.

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

- The projected amount necessary for decommissioning is $403.922 million and $487.675 million for IP-1 and IP-2, respectively, based upon the NRC's latest financial assurance funding determination.[14] The calculations are shown in Table 3.
- On October 23, 2008, Entergy submitted site specific decommissioning cost estimates for IP-1 and IP-2, along with a spent fuel management plan.[15] As can be seen in Tables 4 and 5, the required funding for both units is greater than the NRC formula amount per 10 CFR 50.75(b) and 1(c), therefore, the site-specific analysis complies with the requirement from Regulatory Guide 1.159 section 1.1.1. When the September 30, 2012 decommissioning trust fund balance is escalated at the allowable rate and compared against the annual figures for the associated decommissioning expenditures, that the trust funds will contain a $426.725 million surplus for IP-1 and a $238.447 million surplus for IP-2. This surplus is more than sufficient to complete the decommissioning of the ISFSI (estimated cost provided in Table 2).

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14 "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 14, November 2010

15 Submittal of the Unit 1 & 2 Program for Maintenance of Irradiated Fuel and Preliminary Decommissioning Cost Analysis, dated October 23, 2008 (Accession Number ML083040378)

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)	132.50	Dimensions are nominal
Inside Diameter (inches)	73.50	Dimensions are nominal
Inner Liner Thickness (inches)	1.25	Dimensions are nominal
Quantity (total)	57	53 spent fuel + 4 GTCC
Quantity (with residual radioactivity)		Equivalent to the number of overpacks used to store last complete core offload
Total Surface Area of Overpack Liner with Residual Radioactivity (square feet)	2,385	
Low-Level Radioactive Waste (cubic feet)	1,464	
Low-Level Radioactive Waste (packaged density)	84	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Number of Overpacks used for GTCC storage	3 (IP-2)	No residual radioactivity

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

	Costs (thousands, 2012 dollars)						Waste Volume	Person-Hours		
	Removal	Packaging	Transport	Disposal	Other	Total	(ft3)	Contractor	Licensee	NRC / NRC Contractor
Decommissioning Contractor										
Planning (characterization, specs and procedures)	-	-	-	-	179	179	-	596	-	-
Decontamination/Demolition (activated liner removal)	115	7	36	83	27	267	1,464	416	-	-
License Termination (radiological surveys)	-	-	-	-	749	749	-	5,772	-	-
Subtotal	115	7	36	83	954	1,195	1,464	6,784	-	-
Supporting Costs										
NRC and NRC Contractor Fees and Costs	-	-	-	-	134	134	-	-	-	388
Insurance	-	-	-	-	31	31	-	-	-	-
Security (industrial)	-	-	-	-	102	102	-	2,500	-	-
Entergy Oversight Staff	-	-	-	-	118	118	-	-	1,896	-
Subtotal	-	-	-	-	385	385	-	2,500	1,896	388
Total (w/o contingency)	115	7	36	83	1,339	1,580	1,464	9,283	1,896	388
Total (w/25% contingency)	144	9	45	103	1,674	1,975	-	-	-	-

Table 3
NRC Minimum

Plant name: **Indian Point, Unit 1**

	Month	Day	Year	
Year of Biennial:	1	1	2012	
Termination of Operation:	9	28	2066	SAFSTOR Site Specific

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
PWR	615	$85,560,000	117.6	2.16	0.65	2.54	1.971	4.022	0.13	2.832	0.22	12.28

NRC Minimum: **$403,922,234** **Site Specific:** **See Table 4**

Plant name: **Indian Point, Unit 2**

	Month	Day	Year	
Year of Biennial:	1	1	2012	
Termination of Operation:	9	28	2064	SAFSTOR Site Specific

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
PWR	3216	$103,300,800	117.6	2.16	0.65	2.54	1.971	4.022	0.13	2.832	0.22	12.28

NRC Minimum: **$487,675,198** **Site Specific:** **See Table 5**

Table 4
Indian Point 1
Radiological (License Termination) Cost
($ millions)

	2007 $ Unit 1 Radiological	2012 $ Unit 1 Radiological	Ending DTF Balance
2012			329.812
2013	1.059	1.168	335.240
2014	4.236	4.673	337.272
2015	4.236	4.673	339.344
2016	2.656	2.930	343.201
2017	2.649	2.922	347.143
2018	2.649	2.922	351.163
2019	2.649	2.922	355.265
2020	2.656	2.930	359.440
2021	2.649	2.922	363.707
2022	2.649	2.922	368.059
2023	2.649	2.922	372.498
2024	2.656	2.930	377.018
2025	2.649	2.922	381.637
2026	2.649	2.922	386.347
2027	2.649	2.922	391.152
2028	2.656	2.930	396.045
2029	2.649	2.922	401.044
2030	2.649	2.922	406.143
2031	2.649	2.922	411.344
2032	2.656	2.930	416.641
2033	2.649	2.922	422.052
2034	2.649	2.922	427.571
2035	2.649	2.922	433.200
2036	2.656	2.930	438.934
2037	2.649	2.922	444.791
2038	2.649	2.922	450.765
2039	2.649	2.922	456.858
2040	2.656	2.930	463.065
2041	2.649	2.922	469.405
2042	2.649	2.922	475.871
2043	2.649	2.922	482.466
2044	2.656	2.930	489.185
2045	2.611	2.880	496.089

Table 4 (continued)
Indian Point 1
Radiological (License Termination) Cost
($ millions)

	2007 $ Unit 1 Radiological	2012 $ Unit 1 Radiological	Ending DTF Balance
2046	1.826	2.017	503.994
2047	1.826	2.017	512.056
2048	1.831	2.023	520.274
2049	1.826	2.017	528.662
2050	1.826	2.017	537.218
2051	1.826	2.017	545.945
2052	1.831	2.023	554.841
2053	1.826	2.017	563.920
2054	1.826	2.017	573.181
2055	1.826	2.017	582.627
2056	1.831	2.023	592.257
2057	1.826	2.017	602.084
2058	1.826	2.017	612.109
2059	1.826	2.017	622.333
2060	1.831	2.023	632.757
2061	1.826	2.017	643.395
2062	1.826	2.017	654.245
2063	1.826	2.017	665.313
2064	1.831	2.023	676.596
2065	1.826	2.017	688.110
2066	18.899	20.825	681.048
2067	68.313	74.554	620.115
2068	148.490	162.372	470.145
2069	17.216	18.981	460.567
2070	17.216	18.981	450.798
2071	17.216	18.981	440.833
2072	17.235	19.001	430.649
2073	11.400	12.537	426.725
Total	441.549	484.804	

Table 5
Indian Point 2
Radiological (License Termination) Cost
($ millions)

	2007 $ Unit 2 Radiological	2007 $ Unit 2 Updated Radiological	2012 $ Unit 2 Radiological	Ending DTF Balance
2012				427.699
2013	11.164	11.164	12.382	423.871
2014	49.271	49.271	54.494	377.855
2015	25.307	25.307	27.920	357.492
2016	3.711	3.711	4.106	360.536
2017	3.701	3.701	4.095	363.652
2018	3.701	3.701	4.095	366.830
2019	3.701	3.701	4.095	370.072
2020	3.711	3.711	4.106	373.368
2021	3.688	3.701	4.095	376.740
2022	3.676	3.701	4.095	380.180
2023	3.676	3.701	4.095	383.689
2024	3.686	3.686	4.079	387.284
2025	3.676	3.676	4.068	390.962
2026	3.676	3.676	4.068	394.713
2027	3.676	3.676	4.068	398.539
2028	3.686	3.686	4.079	402.430
2029	3.676	3.676	4.068	406.411
2030	3.676	3.676	4.068	410.471
2031	3.676	3.676	4.068	414.613
2032	3.686	3.686	4.079	418.826
2033	3.676	3.676	4.068	423.134
2034	3.676	3.676	4.068	427.529
2035	3.676	3.676	4.068	432.011
2036	3.686	3.686	4.079	436.572
2037	3.676	3.676	4.068	441.236
2038	3.676	3.676	4.068	445.992
2039	3.676	3.676	4.068	450.844
2040	3.686	3.686	4.079	455.782
2041	3.676	3.676	4.068	460.830
2042	3.676	3.676	4.068	465.978
2043	3.676	3.676	4.068	471.230
2044	3.686	3.686	4.079	476.575
2045	3.675	3.676	4.068	482.038

Table 5 (continued)
Indian Point 2
Radiological (License Termination) Cost
($ millions)

	2007 $ Unit 2 Radiological	2007 $ Unit 2 Updated Radiological	2012 $ Unit 2 Radiological	Ending DTF Balance
2046	3.668	3.676	4.068	487.611
2047	3.668	3.675	4.068	493.296
2048	3.678	3.678	4.071	499.091
2049	3.668	3.668	4.060	505.013
2050	3.668	3.668	4.060	511.053
2051	3.668	3.668	4.060	517.214
2052	3.678	3.678	4.071	523.488
2053	3.668	3.668	4.060	529.898
2054	3.668	3.668	4.060	536.436
2055	3.668	3.668	4.060	543.105
2056	3.678	3.678	4.071	549.896
2057	3.668	3.668	4.060	556.834
2058	3.668	3.668	4.060	563.911
2059	3.668	3.668	4.060	571.129
2060	3.678	3.678	4.071	578.481
2061	3.668	3.668	4.060	585.991
2062	3.668	3.668	4.060	593.651
2063	3.668	3.668	4.060	601.464
2064	24.751	24.751	27.436	586.057
2065	55.625	55.625	61.435	536.343
2066	168.560	168.560	184.998	362.072
2067	71.834	71.834	79.170	290.143
2068	25.113	25.113	27.692	268.254
2069	6.046	6.046	6.659	266.961
2070	6.046	6.046	6.659	265.641
2071	6.046	6.046	6.659	264.296
2072	6.547	6.547	7.210	262.372
2073	26.485	26.485	29.173	238.447
Total	659.351	659.430	727.366	

10 CFR 72.30 ISFSI Decommissioning Funding Plan

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).

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 is 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.

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).

The operating license for IP-3 is currently set to expire on December 12, 2015. Approximately 1,683 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

[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

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 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[2]).

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 2020 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 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,[3] the spent fuel is projected to be fully removed from the Indian Point site in 2047.

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In a report delivered to Congress in 2009,[4] DOE presented a six-year timeline for siting and constructing an interim storage facility (pending legislation eliminating the linkage in the Nuclear Waste Policy Act of 1982, as amended, between interim storage and the opening of the Yucca Mountain repository). The six-year time span would allow fuel receipt by the 2020 date.

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

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

4 "Report to Congress on the Demonstration of the Interim Storage of Spent Nuclear Fuel from Decommissioned Nuclear Power Reactor Sites," DOE/RW-0596, U.S. Department of Energy Office of Civilian Radioactive Waste Management, December 2008

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. 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 51 spent fuel storage casks being placed on the storage pad(s) at the site. This projected configuration is based upon the 2020 DOE spent fuel program start with a 2021 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 eight years following the permanent cessation of operations (eight years is based upon the need to use the IP-2 pool for packaging IP-3 spent fuel for dry storage).

The 51 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 3) 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 78 casks. The supplemental pad (future) is assumed to have a maximum capacity of 40 casks and dimensions of approximately 52 feet by 238.5 feet (using the Pilgrim pad as a proxy).

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.[5] The decommissioning estimate is based on the premise that some of the inner steel-liners 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, 7 of the 51 overpack liners 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.[6] 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 decommissioning cost study[7] developed for IP-3 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

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

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

7 Preliminary Decommissioning Cost Analysis for the Indian Point Energy Center, Unit 3, dated December 2010 (Accession Number ML1035500608)

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 2012 dollars and based upon a preliminary decommissioning cost analyses prepared in 2010.[10] Activity costs originally reported in 2010 dollars have been escalated to 2012 dollars using the Consumer Price Index, Services.[11]

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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.

10 "Preliminary Decommissioning Cost Analysis for the Indian Point Energy Center, Unit 3," December 2010 (Accession Number ML103550608)

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

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 (liner removal) developed. The next phase includes the cost for craft labor to remove the activated liners, 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 2048, 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.[12] 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.

[12] 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)

- The projected amount necessary for decommissioning IP-3 is $487.675 million, based upon the NRC's latest financial assurance funding determination.[13]
- Based upon IP-3's decommissioning trust fund balance as of September 30, 2012 and considering the allowed real rate of return on the fund between October 1, 2012 and the start of IP-3 decommissioning, the trust fund will contain a $161.680 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).

13 "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 14, November 2010

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)	132.50	Dimensions are nominal
Inside Diameter (inches)	73.50	Dimensions are nominal
Inner Liner Thickness (inches)	1.25	Dimensions are nominal
Quantity (total)	54	51 spent fuel + 3 GTCC
Quantity (with residual radioactivity)	7	Equivalent to the number of overpacks used to store last complete core offload
Total Surface Area of Overpack Liner with Residual Radioactivity (square feet)	2,385	
Low-Level Radioactive Waste (cubic feet)	1,464	
Low-Level Radioactive Waste (packaged density)	84	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Number of Overpacks used for GTCC storage	3	No residual radioactivity

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

	Costs (thousands, 2012 dollars)						Waste Volume	Person-Hours		
	Removal	Packaging	Transport	Disposal	Other	Total	(ft3)	Contractor	Licensee	NRC / NRC Contractor
Decommissioning Contractor										
Planning (characterization, specs and procedures)	-	-	-	-	179	179	-	596	-	-
Decontamination/Demolition (activated liner removal)	115	7	36	83	27	267	1,464	416	-	-
License Termination (radiological surveys)	-	-	-	-	749	749	-	5,772	-	-
Subtotal	115	7	36	83	954	1,195	1,464	6,784	-	-
Supporting Costs										
NRC and NRC Contractor Fees and Costs	-	-	-	-	134	134	-	-	-	388
Insurance	-	-	-	-	31	31	-	-	-	-
Security (industrial)	-	-	-	-	102	102	-	2,500	-	-
Entergy Oversight Staff	-	-	-	-	118	118	-	-	1,896	-
Subtotal	-	-	-	-	385	385	-	2,500	1,896	388
Total (w/o contingency)	115	7	36	83	1,339	1,580	1,464	9,283	1,896	388
Total (w/25% contingency)	144	9	45	103	1,674	1,975	-	-	-	-

Table 3
IP-3 Financial Assurance

Plant name: Indian Point, Unit 3

	Month	Day	Year
Year of Biennial:	10	1	2012
Termination of Operation:	12	12	2015

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
PWR	3216	$103,300,800	117.6	2.16	0.65	2.54	1.971	4.022	0.13	2.83	0.22	12.28

NRC Minimum: $487,675,198 **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$487,675,198	$567,343,681

Step 1: Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of	Total Earnings:	
$567,343,681	2%	3.20	1.06535	**$604,420,635**	**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:	
$604,420,635	2%	7	0.14869	$44,934,343	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Total of Steps 1 - 3:	
$649,354,978	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	$161,679,780 to NRC minimum

ATTACHMENT 4 TO ENOC-12-00039

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN

FOR

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

ISFSI DOCKET 72-012

ENTERGY NUCLEAR OPERATIONS, INC

10 CFR 72.30 ISFSI Decommissioning Funding Plan

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).

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 is 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.

2. Spent Fuel Management Strategy

The operating license for FitzPatrick is currently set to expire on October 17, 2034. Approximately 6,228 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, 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, the construction of a second pad after shutdown to support

[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

decommissioning. The ISFSI is assumed to be operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[2]).

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 2034, 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 FitzPatrick's (Entergy) current spent fuel management plan for the FitzPatrick spent fuel is based in general upon: 1) a 2020 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,[3] the spent fuel is projected to be fully removed from the FitzPatrick site in 2059.

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In a report delivered to Congress in 2009,[4] DOE presented a six-year timeline for siting and constructing an interim storage facility (pending legislation eliminating the linkage in the Nuclear Waste Policy Act of 1982, as amended, between interim storage and the opening of the Yucca Mountain repository). The six-year time span would allow fuel receipt by the 2020 date.

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.

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

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

4 "Report to Congress on the Demonstration of the Interim Storage of Spent Nuclear Fuel from Decommissioned Nuclear Power Reactor Sites," DOE/RW-0596, U.S. Department of Energy Office of Civilian Radioactive Waste Management, December 2008

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 50 spent fuel storage casks being placed on the storage pads at the site. This projected configuration is based upon the 2020 DOE spent fuel program start with a 2023 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 50 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 3) 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 (2034) and the DOE's spent fuel acceptance assumptions, as previously described. For purposes of this analysis, the second, larger pad 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, the second ISFSI pad would be similar in size to the one being constructed at Pilgrim. The Pilgrim pad (approximately 52 feet by 239 feet) is used as a proxy for the second pad at FitzPatrick.

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.[5] The decommissioning estimate is based on the premise that some of the inner steel-liners 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, 9 of the 50 overpack liners 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.[6] 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 latest decommissioning cost study for FitzPatrick (prepared in 2007) 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

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

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

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.[7]

Costs are reported in 2012 dollars and based upon an internal decommissioning analysis prepared for Fitzpatrick in 2007. The spent fuel management plan was updated from a 2017 DOE start date to year 2020, consistent with the current assumption used for Entergy's fleet. Activity costs originally reported in 2007 dollars have been escalated to 2012 dollars using the Consumer Price Index, Services.[8]

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 (liner removal) developed. The next phase includes the cost for craft labor to remove the activated liners, 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.

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7 "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.

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

For estimating purposes it is conservatively assumed that all expenditures will be incurred in the year 2066, 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.[9] 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 $607.333 million, based upon the NRC's latest financial assurance funding determination.[10]
- Based upon FitzPatrick's decommissioning trust fund balance as of September 30, 2012 and considering the allowed real rate of return on the fund between October 1, 2012 and the start of FitzPatrick station decommissioning, the trust fund will contain a $421.789 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).

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9 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)

10 "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 14, November 2010

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)	132.50	Dimensions are nominal
Inside Diameter (inches)	73.50	Dimensions are nominal
Inner Liner Thickness (inches)	1.25	Dimensions are nominal
Quantity (total)	53	50 spent fuel + 3 GTCC
Quantity (with residual radioactivity)	9	Equivalent to the number of overpacks used to store last complete core offload
Total Surface Area of Overpack Liner with Residual Radioactivity (square feet)	3,067	
Low-Level Radioactive Waste (cubic feet)	1,880	
Low-Level Radioactive Waste (packaged density)	84	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Number of Overpacks used for GTCC storage	3	No residual radioactivity

Table 2
ISFSI Decommissioning Costs and Waste Volumes

	Costs (thousands, 2012 dollars)						Waste Volume	Person-Hours		
	Removal	Packaging	Transport	Disposal	Other	Total	(ft3)	Contractor	Licensee	NRC / NRC Contractor
Decommissioning Contractor										
Planning (characterization, specs and procedures)	-	-	-	-	240	240	-	1,048	-	-
Decontamination/Demolition (activated liner removal)	108	8	48	106	53	324	1,880	536	-	-
License Termination (radiological surveys)	-	-	-	-	948	948	-	7,394	-	-
Subtotal	108	8	48	106	1,242	1,513	1,880	8,978	-	-
Supporting Costs										
NRC and NRC Contractor Fees and Costs	-	-	-	-	258	258		-	-	776
Insurance	-	-	-	-	62	62		-	-	-
Security (industrial)	-	-	-	-	190	190		4,999	-	-
Entergy Oversight Staff	-	-	-	-	284	284		-	3,792	-
Subtotal	-	-	-	-	792	792	-	4,999	3,792	776
Total (w/o contingency)	108	8	48	106	2,034	2,305	1,880	13,977	3,792	776
Total (w/25% contingency)	136	10	60	133	2,543	2,881				

Table 3
Financial Assurance

Plant name: James A. Fitzpatrick

	Month	Day	Year
Year of Biennial:	10	1	2012
Termination of Operation:	10	17	2034

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
BWR	2536	$126,824,000	117.6	2.16	0.65	2.54	1.971	4.022	0.13	2.91	0.22	12.54

NRC Minimum: $607,333,267

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$607,333,267	$619,075,175

Step 1:
Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of	Total Earnings:	
$619,075,175	2%	22.04	1.54732	**$957,908,797**	**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:	
$957,908,797	2%	7	0.14869	$71,213,655	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Total of Steps 1 - 3:	
$1,029,122,452	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$421,789,185**	**to NRC minimum**

ATTACHMENT 5 TO ENOC-12-00039

ILLUSTRATIVE 10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN

FOR

PILGRIM NUCLEAR POWER STATION

DOCKET 50-293*

ENTERGY NUCLEAR OPERATIONS, INC

*currently no ISFSI Docket

Illustrative 10 CFR 72.30 ISFSI Decommissioning Funding Plan

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).

Although no ISFSI has been licensed at Pilgrim, for information purposes only, this letter provides a detailed cost estimate for decommissioning the ISFSI to be constructed at Pilgrim Nuclear Power Station (Pilgrim), in an amount reflecting:

1. The work is 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.

2. Spent Fuel Management Strategy

The operating license for Pilgrim is currently set to expire on June 8, 2032. Approximately 5,146 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, 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

[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

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[2]).

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 2032, 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 Generation Company's (Entergy) current spent fuel management plan for the Pilgrim spent fuel is based in general upon: 1) a 2020 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,[3] the spent fuel is projected to be fully removed the Pilgrim site in 2059.

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In a report delivered to Congress in 2009,[4] DOE presented a six-year timeline for siting and constructing an interim storage facility (pending legislation eliminating the linkage in the Nuclear Waste Policy Act of 1982, as amended, between interim storage and the opening of the Yucca Mountain repository). The six-year time span would allow fuel receipt by the 2020 date.

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.

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

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

4 "Report to Congress on the Demonstration of the Interim Storage of Spent Nuclear Fuel from Decommissioned Nuclear Power Reactor Sites," DOE/RW-0596, U.S. Department of Energy Office of Civilian Radioactive Waste Management, December 2008

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 43 spent fuel storage casks being placed on two separate storage pads at the site. This projected configuration is based upon the 2020 DOE spent fuel program start with a 2022 DOE start date for Pilgrim spent fuel, a 3,000 MTU / year pickup rate, and a 40 cask capacity for the ISFSI pad expected to be 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 43 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 the end of its current license (2032) and the DOE's spent fuel acceptance assumptions, as previously described. A single (yet-to-be-constructed) Pilgrim ISFSI pad is expected to be approximately 52 feet by 239 feet, and have 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.[5] The decommissioning estimate is based on the premise that some of the inner steel-liners 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, nine of the 43 overpack liners 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.[6] 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.

During the construction of the ISFSI, the top six inches of soil at the excavation was sampled and analyzed. [7] 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*.

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

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

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

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 2012 dollars and based upon an internal decommissioning analysis prepared for Pilgrim in 2012.

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 (liner removal) developed.

The next phase includes the cost for craft labor to remove the activated liners, 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 2060, the year following all spent fuel removal.

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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.

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.[9] 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 $585.439 million, based upon the NRC's latest financial assurance funding determination.[10]
- Based upon Pilgrim's decommissioning trust fund balance as of September 30, 2012 and considering the allowed real rate of return on the fund between October 1, 2012 and the start of Pilgrim station decommissioning, the trust fund will contain a $562.885 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).

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

10 "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 14, November 2010

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
Primary ISFSI Pad	239	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
Inner Liner Thickness (inches)	1.25	Dimensions are nominal
Quantity (total)	47	43 spent fuel + 4 GTCC
Quantity (with residual radioactivity)	9	Equivalent to the number of overpacks used to store last complete core offload
Total Surface Area of Overpack Liner with Residual Radioactivity (square feet)	3,067	
Low-Level Radioactive Waste (cubic feet)	1,878	
Low-Level Radioactive Waste (packaged density)	84	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, 2012 dollars)						Waste Volume	Person-Hours		
	Removal	Packaging	Transport	Disposal	Other	Total	(ft3)	Contractor	Licensee	NRC / NRC Contractor
Decommissioning Contractor										
Planning (characterization, specs and procedures)	-	-	-	-	221	221	-	1,024	-	-
Decontamination/Demolition (activated liner removal)	99	8	55	106	53	321	1,878	536	-	-
License Termination (radiological surveys)	-	-	-	-	925	925	-	7,614	-	-
Subtotal	99	8	55	106	1,199	1,467	1,878	9,174	-	-
Supporting Costs										
NRC and NRC Contractor Fees and Costs	-	-	-	-	291	291		-	-	776
Insurance	-	-	-	-	62	62		-	-	-
Security (industrial)	-	-	-	-	75	75		4,999	-	-
Entergy Oversight Staff	-	-	-	-	303	303		-	3,792	-
Subtotal	-	-	-	-	730	730	-	4,999	3,792	776
Total (w/o contingency)	99	8	55	106	1,929	2,197	1,878	14,173	3,792	776
Total (w/25% contingency)	124	10	69	133	2,411	2,746				

Table 3
Financial Assurance

Plant name: Pilgrim

	Month	Day	Year
Year of Biennial:	10	1	2012
Termination of Operation:	6	8	2032

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
BWR	2028	$122,252,000	117.6	2.16	0.65	2.54	1.971	4.022	0.13	2.91	0.22	12.54

NRC Minimum: **$585,438,927** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$585,438,927	$723,802,070

Step 1:
Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of	Total Earnings:	
$723,802,070	2%	19.69	1.47673	**$1,068,861,580**	**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:	
$1,068,861,580	2%	7	0.14869	$79,462,199	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Total of Steps 1 - 3:	
$1,148,323,779	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**562,884,852**	**to NRC minimum**

ATTACHMENT 6 TO ENOC-12-00039

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN

FOR

VERMONT YANKEE NUCLEAR POWER STATION

ISFSI DOCKET 72-059

ENTERGY NUCLEAR OPERATIONS, INC

10 CFR 72.30 ISFSI Decommissioning Funding Plan

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).

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 is 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.

2. Spent Fuel Management Strategy

The operating license for Vermont Yankee is currently set to expire on March 21, 2032. Approximately 5,319 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, 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, a second, larger pad after shutdown to support

[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

decommissioning and also accommodate the casks from operations. The ISFSI is assumed to be operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[2]).

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 2032, 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 Vermont Yankee's (Entergy) current spent fuel management plan for the Vermont spent fuel is based in general upon: 1) a 2020 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,[3] the spent fuel is projected to be fully removed from the Vermont Yankee site in 2060.

Entergy believes that one or more monitored retrievable storage facilities could be put into place within a reasonable time. In a report delivered to Congress in 2009,[4] DOE presented a six-year timeline for siting and constructing an interim storage facility (pending legislation eliminating the linkage in the Nuclear Waste Policy Act of 1982, as amended, between interim storage and the opening of the Yucca Mountain repository). The six-year time span would allow fuel receipt by the 2020 date.

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.

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

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

4 "Report to Congress on the Demonstration of the Interim Storage of Spent Nuclear Fuel from Decommissioned Nuclear Power Reactor Sites," DOE/RW-0596, U.S. Department of Energy Office of Civilian Radioactive Waste Management, December 2008

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.

Entergy's current spent fuel management plan for the Vermont Yankee spent fuel would result in 42 spent fuel storage casks being placed on the future storage pad at the site (including the casks generated during plant operations). This projected configuration is based upon the 2020 DOE spent fuel program start with a 2021 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 42 casks projected to be on the 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 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 (2032) and the DOE's spent fuel acceptance assumptions, as previously described. For purposes of this analysis, the second, larger pad would be able 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, larger ISFSI pad is expected to be approximately 70 feet by 342 feet, and have a maximum capacity of 84 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.[5] The decommissioning estimate is based on the premise that some of the inner steel-liners 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 42 overpack liners 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.

The dry storage vendor, Holtec International, does not expect any residual contamination to be left on the concrete ISFSI pad.[6] 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 decommissioning cost study[7] developed for Vermont Yankee and filed with the NRC, included the cost for the remediation of contaminated (radiological) soil, based

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

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

7 Decommissioning Cost Analysis for the Vermont Yankee Nuclear Power Station, dated January 2007 (Accession Number ML080430658)

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. There has been no decision on the location of the future pad, but it is reasonable to assume that the site selected would be free of plant-related radionuclide or remediated prior to construction. 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.[8]

Costs are reported in 2012 dollars and based upon an updated, internal decommissioning analysis prepared for Vermont Yankee in 2011. Activity costs originally reported in 2011 dollars have been escalated to 2012 dollars using the Consumer Price Index, Services.[9]

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 (liner removal) developed. The next phase includes the cost for craft labor to remove the activated liners, 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), Entergy's oversight staff, site security (industrial), and other site operating costs.

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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

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 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.[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 Vermont Yankee is $580.439 million, based upon the NRC's latest financial assurance funding determination.[11]
- Based upon Vermont Yankee's decommissioning trust fund balance as of September 30, 2012 and considering the allowed real rate of return on the fund between October 1, 2012 and the start of Vermont Yankee station decommissioning, the trust fund will contain a $275.775 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).

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10 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)

11 "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 14, November 2010

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
Current ISFSI Pad	132	76	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
Inner Liner Thickness (inches)	1.25	Dimensions are nominal
Quantity (total)	47	42 spent fuel + 5 GTCC
Quantity (with residual radioactivity)	6	Equivalent to the number of overpacks used to store last complete core offload
Total Surface Area of Overpack Liner with Residual Radioactivity (square feet)	2,044	
Low-Level Radioactive Waste (cubic feet)	1,262	
Low-Level Radioactive Waste (packaged density)	83	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, 2012 dollars)						Waste Volume	Person-Hours		
	Removal	Packaging	Transport	Disposal	Other	Total	(ft3)	Contractor	Licensee	NRC / NRC Contractor
Decommissioning Contractor										
Planning (characterization, specs and procedures)	-	-	-	-	221	221	-	1,024	-	-
Decontamination/Demolition (activated liner removal)	80	5	33	71	53	242	1,262	358	-	-
License Termination (radiological surveys)	-	-	-	-	940	940	-	8,354	-	-
Subtotal	80	5	33	71	1,213	1,402	1,262	9,736	-	-
Supporting Costs					-	-	-			-
NRC and NRC Contractor Fees and Costs	-	-	-	-	303	303	-	-	-	1,014
Insurance	-	-	-	-	62	62	-	-	-	-
Security (industrial)	-	-	-	-	180	180	-	4,999	-	-
Entergy Oversight Staff	-	-	-	-	252	252	-	-	3,792	-
Subtotal	-	-	-	-	797	797	-	4,999	3,792	1,014
Total (w/o contingency)	80	5	33	71	2,010	2,199	1,262	14,736	3,792	1,014
Total (w/25% contingency)	100	6	42	89	2,513	2,749	-	-	-	-

Table 3
Financial Assurance

Plant name: Vermont Yankee Power Station

	Month	Day	Year
Year of Biennial:	10	1	2012
Termination of Operation:	3	21	2032

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
BWR	1912	$121,208,000	117.6	2.16	0.65	2.54	1.971	4.022	0.13	2.91	0.22	12.54

NRC Minimum: **$580,439,432** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$580,439,432	$541,978,251

Step 1:
Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of	Total Earnings:	
$541,978,251	2%	19.47	1.47048	**$796,965,956**	**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:	
$796,965,956	2%	7	0.14869	$59,248,708	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Total of Steps 1 - 3:	
$856,214,663	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**275,775,231**	**to NRC minimum**