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CNRO-2015-00027

December 17, 2015

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)**

Arkansas Nuclear One, Units 1 & 2
Docket No. 72-013

River Bend Station
Docket No. 72-049

Grand Gulf Nuclear Station
Docket No. 72-050

Waterford 3 Steam Electric Station
Docket No. 72-075

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), and to resubmit those plans with adjustments as necessary to account for changes in costs and the extent of contamination. Entergy Operations, Inc. (Entergy) is hereby submitting (Attachments 1 through 4) the required Plans for the subject plants.

The attachment for each plant shows that the surpluses in the 10 CFR 50.75 Decommissioning Trust Funds exceed the estimated costs of ISFSI decommissioning, as summarized in the following table. The Trust Fund balances account for the 10 CFR 50 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 2015 dollars. This letter constitutes a certification that financial assurance is provided to cover the estimated cost of ISFSI decommissioning, as indicated in the following table:

Plant Site	Trust Fund surplus	DCE
Arkansas Nuclear One	Unit 1: \$ 212M Unit 2: \$ 276M	\$ 9.10M
Grand Gulf: SERI* share, 90% SMEPA** share, 10%	\$ 476M \$ 9.37M	\$ 9.93M
River Bend: Regulated share, 70% Non-Regulated share, 30%	\$ 137M \$ 223M	\$ 7.05M
Waterford 3	\$ 104M	\$ 7.05M

* System Energy Resources, Inc.

** South Mississippi Electric Power Association

Please address any comments or questions to Mr. Guy Davant at 601-368-5756.

This submittal contains no new commitments.

Sincerely,



BSF / trj

Attachments:

1. 10 CFR 72.30 ISFSI Decommissioning Funding Plan - Arkansas Nuclear One
2. 10 CFR 72.30 ISFSI Decommissioning Funding Plan - Grand Gulf Nuclear Station
3. 10 CFR 72.30 ISFSI Decommissioning Funding Plan - River Bend Station
4. 10 CFR 72.30 ISFSI Decommissioning Funding Plan - Waterford 3 Steam Electric Station

cc:

Mr. J. F. McCann (WPO)
Ms. D. Jacobs (WF3)
Ms. D. Gibbs (ECH)
Mr. J. A. Aluise (ENT)
Mr. L. Jager Smith (ECH)
Mr. W. A. Cloutier (TLG)

Mr. J. G. Browning (ANO)
Mr. K. J. Mulligan (GGN)
Mr. E. W. Olson (RBS)
Ms. M. R. Chisum (WF3)

USNRC Regional Administrator, Region IV

USNRC Project Manager, ANO
USNRC Project Manager, GGN
USNRC Project Manager, RBS
USNRC Project Manager, WF3

USNRC Resident Inspector, ANO
USNRC Resident Inspector, GGN
USNRC Resident Inspector, RBS
USNRC Resident Inspector, WF3

Arkansas Department of Health
Mississippi Department of Health
Louisiana Department of Environmental Quality

ATTACHMENT 1

CNRO-2015-00027

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN
ARKANSAS NUCLEAR ONE
ISFSI DOCKET 72-013

10 CFR 72.30 ISFSI Decommissioning Funding Plan
Arkansas Nuclear One
Docket No. 72-013

1. Background and Introduction

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

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

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

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

This letter also provides:

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

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

² “ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Arkansas Nuclear One, Units 1 & 2, Grand Gulf Nuclear Station, River Bend Station and Waterford 3 Steam Electric Station,” CNRO-2012-00011, dated December 17, 2012 (NRC Accession No. ML12354A131)

2. Spent Fuel Management Strategy

The operating licenses are currently set to expire on May 20, 2034 and July 17, 2038 for Units 1 and 2, respectively. Approximately 5,669 spent fuel assemblies are currently projected to be generated over the life of the two units. Primarily 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 set of pads to support decommissioning. The ISFSI is operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K^[3]).

Because of the DOE's breach, it is envisioned that the spent fuel pools will contain a significant number of spent fuel assemblies at the time of expiration of the current operating licenses in 2034 for Unit 1 and 2038 for Unit 2, assuming the units operate to those dates, and including assemblies off-loaded from the reactor vessels. To facilitate immediate dismantling operations or safe-storage operations, the fuel that cannot be transferred directly to the DOE from the pools is assumed to be packaged in dry storage casks for interim storage at the ISFSI. Once the spent fuel pools are 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 Arkansas, Inc.'s (Entergy) current spent fuel management plan for the ANO spent fuel is based in general upon: 1) a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the ANO 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 ANO site in 2072.

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

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

Commission and as “a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel...”^[5]

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

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

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

3. ISFSI Decommissioning Strategy

At the conclusion of the spent fuel transfer process the ISFSI pads 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 ISFSI at ANO comprises three independent but adjoining pads. The original pad is used to store 24 Sierra Nuclear VSC-24 Ventilated Storage Casks (VSCs). Entergy transferred 576 assemblies into the VSCs between 1996 and 2003. It is possible that the spent fuel in these casks will have to be repackaged before it can be shipped off-site.

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

Repackaging is currently assumed to occur immediately after the cessation of plant operations, while the spent fuel pools are still available and the associate fuel handling systems are operable. As such, the VSCs are not expected to be on the ISFSI pad when it is decommissioned (and are not considered in this funding plan).

The design and capacity of the dry storage modules on the other (and future) pads is based upon the Holtec HI-STORM 100 dry cask storage system (Version C). The system consists of a multi-purpose canister, with a nominal capacity of 24 or 32 fuel assemblies, and a steel-lined concrete storage overpack.

Entergy's current spent fuel management plan for the ANO spent fuel would result in 130 spent fuel storage casks (which includes the repackaged fuel from the VSCs) being placed on five storage pads at the site (including two future pads). This projected configuration is based upon the 2025 DOE spent fuel program start with a 2028 DOE start date for ANO spent fuel, a 3,000 MTU / year pickup rate, and the current cask capacity (including expansion capability) for the ISFSI pads built to support plant operations. This scenario would allow the spent fuel storage pools to be emptied within approximately five and one-half years following the permanent cessation of operations.

The 130 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 10) 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 licenses (2034 and 2038) and the DOE's spent fuel acceptance assumptions, as previously described.

The dry storage vendor, Holtec International, does not expect the overpacks to have any interior or exterior radioactive surface contamination. Any neutron activation of the steel and concrete is expected to be extremely small.⁶ The decommissioning estimate is based on the premise that some of the inner steel liners and concrete overpacks will contain low levels of neutron-induced residual radioactivity that would necessitate remediation at the time of decommissioning. As an allowance, 14 of the 130 overpacks

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

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., 177 offloaded assemblies per reactor, 24 assemblies per cask for Unit 1 and 32 assemblies per cask for Unit 2) which results in 14 overpacks. It is assumed that these are the final casks offloaded; consequently they have the least time for radioactive decay of the neutron activation products.

The dry storage vendor, Holtec International, does not expect any residual contamination to be left on the concrete ISFSI pads.^[7] It would be expected that this assumption would be confirmed as a result of good radiological practice of surveying potentially impacted areas after each spent fuel transfer campaign. It is assumed for this analysis that the ISFSI 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 ANO (prepared in 2014) did not include the remediation of contaminated (radiological) soil as being required to terminate the site operating license. As such, there is no allowance for soil remediation in this estimate. Low-level radioactive waste disposal costs are based on Entergy's negotiated rates with EnergySolutions.

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

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

Costs are reported in 2015 dollars and based upon an internal decommissioning analysis prepared for ANO in 2014. Activity costs with the exception of those associated with low-level radioactive waste disposal, have been escalated to 2015 dollars using the

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

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.

Consumer Price Index, Services.^[9] Low-level radioactive waste disposal costs have been escalated to 2015 dollars using the Consumer Price Index, All Items.^[10]

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 pad(s), and surrounding environs are characterized and the activity specifications and work procedures for the decontamination (overpack disposition) developed.

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

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

The estimate also contains costs for the NRC (and NRC contractor), 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 2073, the year following all spent fuel removal.

7. Financial Assurance

ISFSI operations at ANO are primarily 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 primarily 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

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

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

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 ANO is \$479.918 million and \$499.736 million for Units 1 and 2, respectively, based upon the NRC's latest financial assurance funding determination.^[11]
- Based upon ANO's decommissioning trust fund balances as of September 30, 2015 and considering the allowed real rate of return on the fund between October 1, 2015 and the start of ANO station decommissioning, the trust funds will contain surpluses of \$212.459 million and \$276.401 million for Units 1 and 2, respectively (refer to Tables 3 and 4) 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). For purposes of this submittal, it is assumed that each ANO trust fund will bear half of the ISFSI decommissioning cost.

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

**Table 1
 Significant Quantities and Physical Dimensions**

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
ISFSI Pads (existing)	421 (3 pads)	41 to 55	No

ISFSI Storage Overpack (Holtec HI-STORM 100-229)

Item	Value	Notes
Overall Height (inches)	229	Dimensions are nominal
Outside Diameter (inches)	132.5	Dimensions are nominal
Inside Diameter (inches)	73.5	Dimensions are nominal
Quantity (total)	140	130 spent fuel + 10 GTCC
Quantity (with residual radioactivity)	14	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste from Overpack (pounds)	1,669,921	Concrete and steel
Low-Level Radioactive Waste from Transfer Cask (pounds)	202,400	
Other Low-Level Radioactive Waste (pounds)	1,770	DAW, filters and other secondary waste
Low-Level Radioactive Waste (total packaged volume)	21,177	Cubic feet
Low-Level Radioactive Waste (packaged density)	88	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Transfer Cask	1	Potentially contaminated
Number of Overpacks used for GTCC storage	10	No residual radioactivity

Table 2
ISFSI Decommissioning Costs and Waste Volumes

	Costs (thousands, 2015 dollars)						Waste Volume	Person-Hours	
	Removal	Packaging	Transport	Disposal	Other	Total	Class A (cubic feet)	Craft	Oversight and Contractor
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	403	403	-	-	1,240
Decontamination/Demolition (activated cask disposition)	809	409	450	2,246	-	3,915	21,177	2,039	-
License Termination (radiological surveys)	-	-	-	-	1,815	1,815	-	-	-
Subtotal	809	409	450	2,246	2,218	6,133	21,177	2,039	1,240
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	429	429	-	-	776
Insurance	-	-	-	-	126	126	-	-	-
Property Taxes	-	-	-	-	0	0	-	-	-
Plant Energy Budget	-	-	-	-	49	49	-	-	-
Non-Labor Overhead	-	-	-	-	10	10	-	-	-
Corporate A&G	-	-	-	-	102	102	-	-	-
Security (industrial)	-	-	-	-	142	142	-	-	5,103
Entergy Oversight Staff	-	-	-	-	288	288	-	-	3,866
Subtotal	-	-	-	-	1,148	1,148	-	-	9,744
Total (w/o contingency)	809	409	450	2,246	3,366	7,281	21,177	2,039	10,984
Total (w/25% contingency)	1,012	512	563	2,807	4,208	9,102			

Plant name:

Arkansas Nuclear One, Unit 1

Table 3
 Assurance

Financial

Month

Day

Year

Year of Biennial:

9

30

2015

Termination of Operation:

5

20

2034

	MWth	1986\$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
PWR	2568	\$97,598,400	124.3	1.98	0.65	2.46	2.052	1.980	0.13	2.02	0.22	13.885

NRC Minimum:

\$479,917,790

Site Specific:

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	\$479,917,790	\$417,993,406

Step 1:

Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of Return:	Total Earnings:	Total Earnings = Trust Fund balance x (1+RRR)^Years left in license
\$417,993,406	2.35%	18.64	1.54181	\$644,465,286	

Step 2:

Accumulation:

Value of Annuity per year	Real Rate of Return per	Years of Annuity:	Total Annuity:
\$0	2.35%	0	\$0

Total Step 2

\$0

Total Step 1 + Step 2

\$644,465,286

Step 3:

Decom Period:

Total Earnings:	Real Rate of Return per	Decom Period:	Total Real Rate of Return:	Total Earnings for Decom:	Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]
\$644,465,286	2%	7	0.14869	\$47,911,376	

Accumulation during Decom

Total of Steps 1 - 3:

\$692,376,662

Total = Total Earnings + Total Earnings for Decom

Excess (Shortfall)	\$	212,458,872	to NRC minimum
	\$	(4,550,869)	Less ISFSI
	\$	-	Parent Co Guaranty
	\$	207,908,002	Total Excess Financial Assurance

Plant name: Arkansas Nuclear One, Unit 2
Financial
Year of Biennial: Month 9 Day 30 Year 2015
Termination of Operation: 7 17 2038

**Table 4
 Assurance**

	MWth	1986\$	ECI	Base Lx	Lx	Px	Fx	Ex	Bx			
PWR	3026	\$101,628,800	124.3	1.98	0.65	2.46	2.052	1.980	0.13	2.02	0.22	13.885

NRC Minimum: \$499,736,359 Site Specific:

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	\$499,736,359	\$328,532,386

Step 1:

Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of Return:	Total Earnings:	Total Earnings = Trust Fund balance x (1+RRR)^Years left in license
\$328,532,386	2.70%	22.80	1.83561	\$603,056,336	

Step 2:

Accumulation:

Value of Annuity per year	Real Rate of Return per	Years of Annuity:	Total Annuity:
See Annuity Sheet	2.70%	23	\$119,373,325

Total Step 2
 \$119,373,325

Total Step 1 + Step 2
 \$722,429,661

Step 3:

Decom Period:

Total Earnings:	Real Rate of Return per	Decom Period:	Total Real Rate of Return:	Total Earnings for Decom:	Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]
\$722,429,661	2%	7	0.14869	\$53,707,468	

Accumulation during Decom	Total of Steps 1 - 3:	Total = Total Earnings + Total Earnings for Decom
	\$776,137,129	

Excess (Shortfall)	\$ 276,400,770	to NRC minimum
	\$ (4,550,869)	Less ISFSI
	\$ -	Parent Co Guaranty
	\$ 271,849,901	Total Excess Financial Assurance

Table 4 (continued)
Financial Assurance – Annuity

Arkansas Nuclear One, Unit 2	Real	Total	
Year	Rate of	Accumulation	
Year	Rate of	Accumulation	Real Annuity
2015	2.70%	\$0	\$0
2016	2.70%	\$5,157,467	\$2,870,032
2017	2.70%	\$5,147,423	\$2,941,782
2018	2.70%	\$5,139,233	\$3,016,403
2019	2.70%	\$5,132,676	\$3,093,894
2020	2.70%	\$5,132,185	\$3,177,125
2021	2.70%	\$5,132,686	\$3,263,226
2022	2.70%	\$5,138,405	\$3,355,067
2023	2.70%	\$5,144,555	\$3,449,778
2024	2.70%	\$5,155,165	\$3,550,229
2025	2.70%	\$5,169,778	\$3,656,420
2026	2.70%	\$5,187,961	\$3,768,352
2027	2.70%	\$5,209,310	\$3,886,023
2028	2.70%	\$5,233,443	\$4,009,434
2029	2.70%	\$5,263,650	\$4,141,456
2030	2.70%	\$5,295,755	\$4,279,217
2031	2.70%	\$5,332,909	\$4,425,589
2032	2.70%	\$5,374,552	\$4,580,570
2033	2.70%	\$5,420,156	\$4,744,162
2034	2.70%	\$5,472,418	\$4,919,234
2035	2.70%	\$5,530,622	\$5,105,786
2036	2.70%	\$5,594,091	\$5,303,818
2037	2.70%	\$5,662,191	\$5,513,331
2038	2.70%	\$3,346,696	\$3,346,696
	Total:	\$119,373,325	

Total Accumulation = Annuity x (1+RRR)^Years left from Accum

ATTACHMENT 2

CNRO-2015-00027

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN
GRAND GULF NUCLEAR STATION
ISFSI DOCKET 72-050

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN
GRAND GULF NUCLEAR STATION
ISFSI DOCKET 72-050

1. Background and Introduction

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

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

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

This letter also provides:

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

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

² “ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Arkansas Nuclear One, Units 1 & 2, Grand Gulf Nuclear Station, River Bend Station and Waterford 3 Steam Electric Station,” CNRO-2012-00011, dated December 17, 2012 (NRC Accession No. ML12354A131)

2. Spent Fuel Management Strategy

The operating license for Grand Gulf is currently set to expire on November 1, 2024. Approximately 7,380 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 assumes that the current ISFSI will be expanded or a second pad constructed after shutdown to support decommissioning. The ISFSI is assumed to be operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K^[3]).

Because of the DOE's breach, it is envisioned that the spent fuel pool will contain a significant number of spent fuel assemblies at the time of expiration of the current operating license in 2024, 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 Operations, Inc.'s (Entergy) current spent fuel management plan for the Grand Gulf spent fuel is based in general upon: 1) a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the Grand Gulf 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 Grand Gulf site in 2063.

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

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

Commission and as “a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel...”^[5]

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

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

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

3. ISFSI Decommissioning Strategy

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

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 Grand Gulf 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. Some of the overpacks are assumed to have residual radioactivity due to some minor

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

level of neutron-induced activation as a result of the long-term storage of the fuel. The cost to dispose of residual radioactivity, and verify that the remaining facility and surrounding environs meet the NRC's radiological limits established for unrestricted use, forms the basis of the ISFSI decommissioning estimate.

Entergy's current spent fuel management plan for the Grand Gulf spent fuel would result in 109 spent fuel storage casks being placed on the storage pads at the site. This projected configuration is based upon the 2025 DOE spent fuel program start with a 2028 DOE start date for Grand Gulf spent fuel, a 3,000 MTU / year pickup rate, and a 48 cask capacity for the ISFSI pad built to support plant operations (a second pad of comparable size would be needed to support decommissioning). 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 109 casks projected to be on the ISFSI pads after shutdown excludes any additional casks that may be used for Greater-than-Class-C (GTCC) storage. The storage overpacks used for the GTCC canisters (estimated quantity of 5) are not expected to have any interior contamination of residual activation and can be reused or disposed of by conventional means after a final status survey.

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

5. Key Assumptions / Estimating Approach

The decommissioning estimate is based on the configuration of the ISFSI expected after all spent fuel and GTCC material has been removed from the site. The configuration of the ISFSI is based on the station operating until the end of its current license (2024) and the DOE's spent fuel acceptance assumptions, as previously described. For purposes of this analysis, two pads, each approximately 61 feet by 196 feet (size of the current pad), will be required to accommodate the number of casks anticipated.

The dry storage vendor, Holtec International, does not expect the overpacks to have any interior or exterior radioactive surface contamination. Any neutron activation of the steel and concrete is expected to be extremely small.⁶ The decommissioning estimate is based on the premise that some of the inner steel liners and the concrete overpacks will contain low levels of neutron-induced residual radioactivity that would necessitate remediation at the time of decommissioning. As an allowance, 12 of the 109 overpacks are assumed to be affected, i.e., contain residual radioactivity. The allowance quantity is based upon the number of casks required for the final core off-load (i.e., 800 offloaded assemblies, 68 assemblies per cask) which results in 12 overpacks. It is assumed that

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

these are the final casks offloaded; consequently they have the least time for radioactive decay of the neutron activation products.

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

A survey conducted by the licensee in July 2012 found no detectible contamination on the ISFSI pad or cask surfaces.^[8] Therefore, contamination is not expected within the current ISFSI footprint and there is no allowance for soil remediation included within the current ISFSI decommissioning estimate.

The latest decommissioning cost study for Grand Gulf (prepared in 2015) did not include the remediation of contaminated (radiological) soil as being required to terminate the site operating license.

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

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]

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

⁸ Enclosure to the NRC Inspection Report 05000416/2012009 and 072000050/2012001, dated October 26, 2012, p. 7 (Accession Number ML12303A002)

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.

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

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 pads, and surrounding environs are characterized and the activity specifications and work procedures for the decontamination (overpack disposition) developed.

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

The final phase includes the cost for the license termination 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 2064, the year following all spent fuel removal.

7. Financial Assurance

ISFSI operations at Grand Gulf 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.

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 Grand Gulf is \$671.949 million, based upon the NRC's latest financial assurance funding determination.^[10]
- Based upon Grand Gulf's decommissioning trust fund balances as of September 30, 2015 (and considering the schedule of remaining principal payments into the decommissioning fund,^[11] and the allowed real rate of return on the fund between October 1, 2015 and the start of Grand Gulf station decommissioning), the trust funds will contain a \$485.215 million surplus (refer to Tables 3 and 4) beyond the NRC minimum funding formula provided in 10CFR50.75(e). This surplus is more than sufficient to fund the cost to complete the decommissioning of the ISFSI (estimated cost provided in Table 2).

¹⁰ "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 15, January 2013

¹¹ Collection details provided in Entergy letter CNRO-2015-00011, "Decommissioning Funding Status Report – Entergy Operations, Inc," dated March 27, 2015 (ML15092A183)

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
Current ISFSI Pad	392	61	No

ISFSI Storage Overpack

Item	Value	Notes
Overall Height (inches)	218	Dimensions are nominal
Outside Diameter (inches)	132.5	Dimensions are nominal
Inside Diameter (inches)	73.5	Dimensions are nominal
Quantity (total)	114	109 spent fuel + 5 GTCC
Quantity (with residual radioactivity)	12	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste from Overpack (pounds)	1,984,830	Concrete and steel
Other Low-Level Radioactive Waste (pounds)	2,488	DAW, filters and other secondary waste
Low-Level Radioactive Waste (total packaged volume)	27,033	Cubic feet
Low-Level Radioactive Waste (packaged density)	74	Average weight density

Other Potentially Impacted Items

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

Table 2
ISFSI Decommissioning Costs and Waste Volumes
 (100%, not adjusted for ownership share)

	Costs (thousands, 2015 dollars)						Waste Volume	Person-Hours	
	Removal	Packaging	Transport	Disposal	Other	Total	Class A (cubic feet)	Craft	Oversight and Contractor
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	361	361	-	-	1,192
Decontamination/Demolition (activated cask disposition)	279	110	598	4,164	-	5,151	27,033	4,606	-
License Termination (radiological surveys)	-	-	-	-	1,367	1,367	-	11,293	-
Subtotal	279	110	598	4,164	1,729	6,880	27,033	15,899	1,192
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	420	420	-	-	776
Insurance	-	-	-	-	67	67	-	-	
Property Taxes	-	-	-	-	-	-	-	-	
Plant Energy Budget	-	-	-	-	73	73	-	-	
Non-Labor Overhead	-	-	-	-	10	10	-	-	
Corporate A&G	-	-	-	-	84	84	-	-	
Security (industrial)	-	-	-	-	111	111	-	-	3,457
Entergy Oversight Staff	-	-	-	-	298	298	-	-	3,803
Subtotal	-	-	-	-	1,062	1,062	-	-	8,036
Total (w/o contingency)	279	110	598	4,164	2,791	7,942	27,033	15,899	9,228
Total (w/25% contingency)	349	137	748	5,205	3,489	9,927			

Table 3

Plant name: Grand Gulf Nuclear Station (SERI 90%) **Financial Assurance**
System **Month** **Day** **Year** **Energy Resources, Inc.**
Year of Biennial: 9 30 2015
Termination of Operation: 11 1 2024

	MWth	1986\$	ECI	Base Lx	Lx	Px	Fx	Ex	Bx			
BWR	4408	\$135,000,000	124.3	1.98	0.65	2.46	2.052	1.980	0.13	2.02	0.22	14.16

NRC Minimum:

\$671,949,130

Site Specific:

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	90.00%	\$604,754,217	\$674,211,036

Step 1:

Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of Return:	Total Earnings:	Total Earnings = Trust Fund balance x (1+RRR)^Years left in license
\$674,211,036	2.0%	9.09	1.19716	\$807,137,385	

Step 2:

Accumulation:

Value of Annuity per year	Real Rate of Return per	Years of Annuity:	Total Annuity:
See Annuity Sheet	2.0%	8	\$198,684,490

Total Step 2
\$198,684,490

Total Step 1 + Step 2
\$1,005,821,874

Step 3:

Decom Period:

Total Earnings:	Real Rate of Return per	Decom Period:	Total Real Rate of Return:	Total Earnings for Decom:	Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]
\$1,005,821,874	2%	7	0.14869	\$74,775,648	

Accumulation during Decom Total of Steps 1 - 3:
 \$1,080,597,523 Total = Total Earnings + Total Earnings for Decom

Excess (Shortfall)	\$	475,843,306	to NRC minimum
	\$	(8,934,648)	Less ISFSI
	\$	-	Parent Co Guaranty
	\$	466,908,658	Total Excess Financial Assurance

Table 3 (continued)
Financial Assurance – Annuity
System Energy Resources, Inc.
Grand Gulf Nuclear Station (SERI 90%)

Year	Annuity:	Real Rate of	Total Accumulation		
2015	\$5,571,250	2.00%	\$6,791,323	Total Accumulation = Annuity x (1+RRR)^Years left from Accum	
2016	\$24,550,000	2.00%	\$29,339,523		
2017	\$24,550,000	2.00%	\$28,764,238		
2018	\$24,550,000	2.00%	\$28,200,233		
2019	\$24,550,000	2.00%	\$27,647,287		
2020	\$24,550,000	2.00%	\$27,105,184		
2021	\$29,878,000	2.00%	\$32,340,908		
2022	\$17,429,000	2.00%	\$18,495,794		
2023	\$0	2.00%	\$0		
2024	\$0	2.00%	\$0		
2025	\$0	2.00%	\$0		
		Total:	\$198,684,490		

Table 4

Plant name:

Grand Gulf Nuclear Station (SMEPA 10%)

Financial Assurance

South

Month

Day

Year

Mississippi Electric Power Association

Year of Biennial:

9

30

2015

Termination of Operation:

11

1

2024

	<u>MWth</u>	<u>1986\$</u>	ECI	Base Lx		<u>Lx</u>	Px	Fx		<u>Ex</u>		<u>Bx</u>
BWR	4408	\$135,000,000	124.3	1.98	0.65	2.46	2.052	1.980	0.13	2.02	0.22	14.16

NRC Minimum:

\$671,949,130

Site Specific:

<u>Licensee:</u>	<u>% Owned:</u>	<u>Amount of NRC Minimum/Site Specific:</u>	<u>Amount in Trust Fund:</u>
Entergy	10.00%	\$67,194,913	\$54,915,123

Step 1:

Earnings Credit:

<u>Trust Fund Balance:</u>	<u>Real Rate of Return per</u>	<u>Years Left in License</u>	<u>Total Real Rate of Return:</u>	<u>Total Earnings:</u>	
\$54,915,123	2.91%	9.09	1.29779	\$71,268,340	Total Earnings = Trust Fund balance x (1+RRR)^Years left in license

Step 2:

Accumulation:

<u>Value of Annuity per year</u>	<u>Real Rate of Return per</u>	<u>Years of Annuity:</u>	<u>Total Annuity:</u>
See Annuity Sheet	2.91%	8	\$0

Total Step 2	\$0
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Total Step 1 + Step 2	\$71,268,340
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Step 3:

Decom Period:

<u>Total Earnings:</u>	<u>Real Rate of Return per</u>	<u>Decom Period:</u>	<u>Total Real Rate of Return:</u>	<u>Total Earnings for Decom:</u>	
\$71,268,340	2%	7	0.14869	\$5,298,290	Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]
Accumulation during Decom		Total of Steps 1 - 3:		\$76,566,631	Total = Total Earnings + Total Earnings for Decom

Excess (Shortfall)	\$	9,371,718	to NRC minimum
	\$	(992,739)	Less ISFSI
	\$	-	Parent Co Guaranty
	\$	8,378,979	Total Excess Financial Assurance

ATTACHMENT 3

CNRO-2015-00027

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN
RIVER BEND STATION
ISFSI DOCKET 72-049

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN
RIVER BEND STATION
ISFSI DOCKET 72-049

1. Background and Introduction

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

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

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

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

This letter also provides:

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

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

² “ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Arkansas Nuclear One, Units 1 & 2, Grand Gulf Nuclear Station, River Bend Station and Waterford 3 Steam Electric Station,” CNRO-2012-00011, dated December 17, 2012 (NRC Accession No. ML12354A131)

2. Spent Fuel Management Strategy

The operating license for River Bend is currently set to expire on August 29, 2025. Approximately 5,738 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 assumes that the current ISFSI will be expanded after shutdown to support decommissioning. The ISFSI is assumed to be operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K^[3]).

Because of the DOE's breach, it is envisioned that the spent fuel pool will contain a significant number of spent fuel assemblies at the time of expiration of the current operating license in 2025, 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 Operations, Inc.'s (Entergy) current spent fuel management plan for the River Bend spent fuel is based in general upon: 1) a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the River Bend 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 River Bend site in 2062.

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

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

Commission and as “a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel...”^[5]

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

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

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

3. ISFSI Decommissioning Strategy

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

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 River Bend 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.

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

Entergy's current spent fuel management plan for the River Bend spent fuel would result in 85 spent fuel storage casks being placed on the storage pad at the site. This projected configuration is based upon the 2025 DOE spent fuel program start with a 2032 DOE start date for River Bend spent fuel, a 3,000 MTU / year pickup rate, and a 44 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 85 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 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 (2025) and the DOE's spent fuel acceptance assumptions, as previously described. For purposes of this analysis the expanded ISFSI pad is expected to be approximately 122 feet by 210 feet (double the size of the current pad), and have a maximum capacity of 88 casks.

The dry storage vendor, Holtec International, does not expect the overpacks to have any interior or exterior radioactive surface contamination. Any neutron activation of the steel and concrete is expected to be extremely small.⁶ The decommissioning estimate is based on the premise that some of the inner steel liners and concrete overpacks will contain low levels of neutron-induced residual radioactivity that would necessitate remediation at the time of decommissioning. As an allowance, 10 of the 85 overpacks are assumed to be affected, i.e., contain residual radioactivity. The allowance quantity is based upon the number of casks required for the final core off-load (i.e., 624 offloaded assemblies, 68 assemblies per cask) which results in 10 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.

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

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

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

The current ISFSI area was not part of the original plant Protected Area (the Protected Area was expanded to include the ISFSI area). The ISFSI was built by bringing in clean fill to raise the area to the same grade elevation as the original plant Protected Area. The fill would not have been subject to radioactive contamination; therefore, there is no allowance for soil remediation included within the current ISFSI decommissioning estimate.

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

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

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

Costs are reported in 2015 dollars and based upon an internal decommissioning analysis prepared for River Bend in 2014. Activity costs with the exception of those associated with low-level radioactive waste disposal, have been escalated to 2015 dollars using the

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

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.

Consumer Price Index, Services.^[9] Low-level radioactive waste disposal costs have been escalated to 2015 dollars using the Consumer Price Index, All Items.^[10]

6. Cost Considerations

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

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

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

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

7. Financial Assurance

ISFSI operations at River Bend 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.

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

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

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

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 River Bend is \$656.116 million, based upon the NRC's latest financial assurance funding determination.^[11]
- Based upon Entergy's decommissioning trust fund balances for River Bend as of September 30, 2015 (and considering the schedule of remaining principal payments into the decommissioning fund,^[12] and the allowed real rate of return on the fund between October 1, 2015 and the start of River Bend station decommissioning), the trust funds will contain a \$359.910 million surplus (refer to Tables 3 and 4) beyond the NRC minimum funding formula provided in 10 CFR 50.75(e). This surplus is more than sufficient to fund the cost to complete the decommissioning of the ISFSI (estimated cost provided in Table 2).

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

¹² Collection details provided in Entergy letter CNRO-2015-00011, "Decommissioning Funding Status Report – Entergy Operations, Inc," dated March 27, 2015 (ML15092A183)

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
Current ISFSI Pad	210	61	No

ISFSI Storage Overpack

Item	Value	Notes
Overall Height (inches)	218	Dimensions are nominal
Outside Diameter (inches)	132.5	Dimensions are nominal
Inside Diameter (inches)	73.5	Dimensions are nominal
Quantity (total)	89	85 spent fuel + 4 GTCC
Quantity (with residual radioactivity)	10	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste from Overpack (pounds)	1,461,035	Concrete and steel
Low-Level Radioactive Waste from Transfer Cask (pounds)	202,400	
Other Low-Level Radioactive Waste (pounds)	1,452	DAW, filters and other secondary waste
Low-Level Radioactive Waste (total packaged volume)	20,058	Cubic feet
Low-Level Radioactive Waste (packaged density)	83	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Transfer Cask	1	Potentially contaminated
Number of Overpacks used for GTCC storage	4	No residual radioactivity

Table 2
ISFSI Decommissioning Costs and Waste Volumes

	Costs (thousands, 2015 dollars)						Waste Volume	Person-Hours	
	Removal	Packaging	Transport	Disposal	Other	Total	Class A (cubic feet)	Craft	Oversight and Contractor
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	309	309	-	-	1,120
Decontamination/Demolition (activated cask disposition)	228	257	485	1,955	-	2,925	20,058	2,565	-
License Termination (radiological surveys)	-	-	-	-	1,312	1,312	-	10,767	-
Subtotal	228	257	485	1,955	1,621	4,546	20,058	13,332	1,120
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	400	400	-	-	776
Insurance	-	-	-	-	69	69	-	-	-
Property Taxes	-	-	-	-	16	16	-	-	-
Plant Energy Budget	-	-	-	-	48	48	-	-	-
Non-Labor Overhead	-	-	-	-	15	15	-	-	-
Corporate A&G	-	-	-	-	140	140	-	-	-
Security (industrial)	-	-	-	-	126	126	-	-	3,457
Entergy Oversight Staff	-	-	-	-	277	277	-	-	3,803
Subtotal	-	-	-	-	1,090	1,090	-	-	8,036
Total (w/o contingency)	228	257	485	1,955	2,711	5,636	20,058	13,332	9,156
Total (w/25% contingency)	285	321	607	2,444	3,388	7,045			

**Table 3
 Financial Assurance**

Plant name: River Bend (Regulated 70%)
Year of Biennial: Month 9 Day 30 Year 2015
Termination of Operation: Month 8 Day 29 Year 2025

	MWth	1986\$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
BWR	3091	\$131,819,000	124.3	1.98	0.65	2.46	2.052	1.980	0.13	2.02	0.22	14.16

NRC Minimum: \$656,116,018 **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	70.00%	\$459,281,213	\$303,152,320

**Step 1:
 Earnings Credit:**

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of Return:	Total Earnings:	
\$303,152,320	2.00%	9.91	1.21692	\$368,911,651	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:
See Annuity Sheet	2.00%	11	\$124,341,390

Total Step 2	\$124,341,390
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Total Step 1 + Step 2	\$493,253,041
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Step 3:

Decom Period:

Total Earnings:	Real Rate of Return per	Decom Period:	Total Real Rate of Return:	Total Earnings for Decom:	
\$493,253,041	2%	7	0.14869	\$36,669,829	Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]

Accumulation during Decom	Total of Steps 1 - 3:	Total = Total Earnings + Total Earnings for Decom
\$66,479,570	\$596,402,440	

Excess (Shortfall)	\$ 137,121,227	to NRC minimum
	\$ (4,931,531)	Less ISFSI
	\$ -	Parent Co Guaranty
	\$ 132,189,696	Total Excess Financial Assurance

Table 3 (continued)
Financial Assurance – Annuity

River Bend (Regulated 70%)							
Year	LPSC	PUCT	FERC	Annuity:	Real Rate of	Total Accumulation	
2015	\$2,324,000	\$281,500	\$28,229	\$2,633,728	2.0%	\$3,210,500	Total Accumulation = Annuity x (1+RRR)^Years left from Accum
2016	\$8,996,000	\$1,126,000	\$112,914	\$10,234,914	2.0%	\$12,231,670	
2017	\$8,996,000	\$1,126,000	\$112,914	\$10,234,914	2.0%	\$11,991,833	
2018	\$8,996,000	\$1,126,000	\$112,914	\$10,234,914	2.0%	\$11,756,699	
2019	\$8,996,000	\$1,126,000	\$112,914	\$10,234,914	2.0%	\$11,526,176	
2020	\$10,195,000	\$1,126,000	\$112,914	\$11,433,914	2.0%	\$12,623,965	
2021	\$10,195,000	\$1,126,000	\$112,914	\$11,433,914	2.0%	\$12,376,436	
2022	\$10,195,000	\$1,126,000	\$112,914	\$11,433,914	2.0%	\$12,133,761	
2023	\$10,195,000	\$1,126,000	\$112,914	\$11,433,914	2.0%	\$11,895,844	
2024	\$10,195,000	\$1,126,000	\$112,914	\$11,433,914	2.0%	\$11,662,592	
2025	\$11,693,000	\$1,126,000	\$112,914	\$12,931,914	2.0%	\$12,931,914	
					Total:	\$124,341,390	
Accumulation During Decomm Period							
2026	\$12,931,914	\$0	\$0	\$12,931,914		\$12,931,914	
2027	\$12,931,914	\$0	\$0	\$12,931,914		\$12,931,914	
2028	\$12,931,914	\$0	\$0	\$12,931,914		\$12,931,914	
2029	\$12,931,914	\$0	\$0	\$12,931,914		\$12,931,914	
2030	\$14,751,914	\$0	\$0	\$14,751,914		\$14,751,914	
2031	\$0	\$0	\$0	\$0		\$0	
2032	\$0	\$0	\$0	\$0		\$0	
2033	\$0	\$0	\$0	\$0		\$0	
2034	\$0	\$0	\$0	\$0		\$0	
					Total:	\$66,479,570	

Plant name:

River Bend (Non-Regulated 30%)

Table 4
 Financial Assurance

Year of Biennial:

Month 9 Day 30 Year 2015

Termination of Operation:

8 29 2025

	MWth	1986\$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
BWR	3091	\$131,819,000	124.3	1.98	0.65	2.46	2.052	1.980	0.13	2.02	0.22	14.16

NRC Minimum:

\$656,116,018

Site Specific:

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	30.00%	\$196,834,805	\$320,963,181

Step 1:

Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of	Total Earnings:	
\$320,963,181	2%	9.91	1.21692	\$390,586,015	Total Earnings = Trust Fund balance x (1+RRR)^Years left in license

Step 2:

Accumulation:

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

Total Step 1 + Step 2	\$390,586,015
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Step 3:

Decom Period:

Total Earnings:	Real Rate of Return per	Decom Period:	Total Real Rate of	Total Earnings for Decom:	
\$390,586,015	2%	7	0.14869	\$29,037,271	Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]

Total of Steps 1 - 3:	\$419,623,287	Total = Total Earnings + Total Earnings for Decom
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Excess (Shortfall)	\$ 222,788,481	to NRC minimum
	\$ (2,113,513)	Less ISFSI
	\$ -	Parent Co Guaranty
	\$ 220,674,968	Total Excess Financial Assurance

ATTACHMENT 4

CNRO-2015-00027

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN
WATERFORD 3 STEAM ELECTRIC STATION
ISFSI DOCKET 72-075

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN
WATERFORD 3 STEAM ELECTRIC STATION
ISFSI DOCKET 72-075

1. Background and Introduction

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

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

In accordance with the rule, this letter provides a detailed cost estimate for decommissioning the ISFSI at the Waterford Steam Electric Station, Unit 3 (Waterford), in an amount reflecting:

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

This letter also provides:

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

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

² “ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Arkansas Nuclear One, Units 1 & 2, Grand Gulf Nuclear Station, River Bend Station and Waterford 3 Steam Electric Station,” CNRO-2012-00011, dated December 17, 2012 (NRC Accession No. ML12354A131)

2. Spent Fuel Management Strategy

The operating license for Waterford is currently set to expire on December 18, 2024. Approximately 2,555 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 assumes that the current ISFSI will have sufficient capacity to support decommissioning. The ISFSI is assumed to be operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K^[3]).

Because of the DOE's breach, it is envisioned that the spent fuel pool will contain a significant number of spent fuel assemblies at the time of expiration of the current operating license in 2024, 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 Operations, Inc.'s (Entergy) current spent fuel management plan for the Waterford spent fuel is based in general upon: 1) a 2025 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the Waterford 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 Waterford site in 2061.

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

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

Commission and as “a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel...”^[5]

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

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

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

3. ISFSI Decommissioning Strategy

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

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 Waterford 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.

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

Entergy's current spent fuel management plan for the Waterford spent fuel would result in 80 spent fuel storage casks being placed on the storage pad at the site. This projected configuration is based upon the 2025 DOE spent fuel program start with a 2032 DOE start date for Waterford spent fuel, a 3,000 MTU / year pickup rate, and a 72 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 80 casks projected to be on the ISFSI pad after shutdown excludes any additional casks that may be used for Greater-than-Class-C (GTCC) storage. The storage overpacks used for the GTCC canisters (estimated quantity of 6) are not expected to have any interior contamination of residual activation and can be reused or disposed of by conventional means after a final status survey.

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

5. Key Assumptions / Estimating Approach

The decommissioning estimate is based on the configuration of the ISFSI expected after all spent fuel and GTCC material has been removed from the site. The configuration of the ISFSI is based on the station operating until the end of its current license (2024) and the DOE's spent fuel acceptance assumptions, as previously described. For purposes of this analysis the ISFSI pad is approximately 154 feet by 120 feet and has a maximum capacity of 72 casks.

The dry storage vendor, Holtec International, does not expect the overpacks to have any interior or exterior radioactive surface contamination. Any neutron activation of the steel and concrete is expected to be extremely small.⁶ The decommissioning estimate is based on the premise that some of the inner steel liners and the concrete overpacks will contain low levels of neutron-induced residual radioactivity that would necessitate remediation at the time of decommissioning. As an allowance, 7 of the 80 overpacks are assumed to be affected, i.e., contain residual radioactivity. The allowance quantity is based upon the number of casks required for the final core off-load (i.e., 217 offloaded assemblies, 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.

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

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

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

The current ISFSI area was not part of the original plant Protected Area (the Protected Area was expanded to include the ISFSI area). The latest decommissioning cost study for Waterford (prepared in 2015) did not include the remediation of contaminated (radiological) soil as being required to terminate the site operating license. Therefore, there is no allowance for the remediation of any contaminated soil in the estimate to decommissioning the ISFSI.

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

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

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

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

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

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

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.

empty overpacks, ISFSI pad, and surrounding environs are characterized and the activity specifications and work procedures for the decontamination (overpack disposition) developed. The next phase includes the cost for craft labor to demolish the activated overpacks, package in certified waste containers, transportation to the Clive, Utah site, disposal, as well as the costs for the supporting equipment, materials and supplies. The final phase includes the cost for the license termination survey, verification survey, and the associated equipment and laboratory support.

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

For estimating purposes it is conservatively assumed that all expenditures will be incurred in the year 2062, the year following all spent fuel removal.

7. Financial Assurance

ISFSI operations at Waterford 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.

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 radiological decommissioning, these funds would be available to address costs incurred by Entergy, including ISFSI decommissioning costs.
- The projected amount necessary for decommissioning Waterford is \$516.313 million, based upon the NRC's latest financial assurance funding determination.^[9]
- Based upon Entergy's decommissioning trust fund balance for Waterford as of September 30, 2015 (and considering the schedule of remaining principal payments into the decommissioning fund,^[10] and the allowed real rate of return on the fund

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

¹⁰ Collection details provided in Entergy letter CNRO-2015-00011, "Decommissioning Funding Status Report – Entergy Operations, Inc," dated March 27, 2015 (ML15092A183)

between October 1, 2015 and the start of Waterford station decommissioning), the trust fund will contain a \$104.009 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).

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
ISFSI Pad	187	120	No

ISFSI Storage Overpack

Item	Value	Notes
Overall Height (inches)	218	Dimensions are nominal
Outside Diameter (inches)	132.50	Dimensions are nominal
Inside Diameter (inches)	73.50	Dimensions are nominal
Quantity (total)	86	80 spent fuel + 6 GTCC
Quantity (with residual radioactivity)	7	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste from Overpack (pounds)	1,157,818	Concrete and steel
Other Low-Level Radioactive Waste (pounds)	1,951	DAW, filters and other secondary waste
Low-Level Radioactive Waste (total packaged volume)	15,794	Cubic feet
Low-Level Radioactive Waste (packaged density)	73	Average weight density

Other Potentially Impacted Items

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

Table 2
ISFSI Decommissioning Costs and Waste Volumes

	Costs (thousands, 2015 dollars)						Waste Volume	Person-Hours	
	Removal	Packaging	Transport	Disposal	Other	Total	Class A (cubic feet)	Craft	Oversight and Contractor
Decommissioning Contractor									
Planning (characterization, specs and procedures)	-	-	-	-	306	306	-	-	1,120
Decontamination/Demolition (activated cask disposition)	167	67	341	2,430	-	3,005	15,794	2,689	-
License Termination (radiological surveys)	-	-	-	-	1,273	1,273	-	9,862	-
Subtotal	167	67	341	2,430	1,579	4,583	15,794	12,551	1,120
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	416	416	-	-	776
Insurance	-	-	-	-	67	67	-	-	-
Property Taxes	-	-	-	-	-	-	-	-	-
Plant Energy Budget	-	-	-	-	63	63	-	-	-
Non-Labor Overhead	-	-	-	-	10	10	-	-	-
Corporate A&G	-	-	-	-	72	72	-	-	-
Security (industrial)	-	-	-	-	111	111	-	-	3,457
Entergy Oversight Staff	-	-	-	-	321	321	-	-	3,803
Subtotal	-	-	-	-	1,059	1,059	-	-	8,036
Total (w/o contingency)	167	67	341	2,430	2,638	5,642	15,794	12,551	9,156
Total (w/25% contingency)	209	83	426	3,038	3,297	7,053			

Table 3
Waterford 3

Financial Assurance

Plant name:
Year of Biennial: **Month** **Day** **Year**
 9 **30** **2015**
Termination of Operation: **12** **18** **2024**

	MWth	1986\$	ECl	Base Lx		Lx	Px	Fx		Ex		Bx
PWR	3716	\$105,000,000	124.3	1.98	0.65	2.46	2.052	1.980	0.13	2.02	0.22	13.885

NRC Minimum: \$516,313,463 Site Specific:

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	\$516,313,463	\$376,447,673

Step 1:
Earnings Credit:

Trust Fund Balance:	Real Rate of Return per	Years Left in License	Total Real Rate of Return:	Total Earnings:	Total Earnings = Trust Fund balance x (1+RRR)^Years left in license
\$376,447,673	2%	9.22	1.20024	\$451,828,332	

Step 2:

Accumulation:

Value of Annuity per year	Real Rate of Return per	Years of Annuity:	Total Annuity:
See Annuity Sheet	2%	10	\$74,765,059

Total Step 2
 \$74,765,059

Total Step 1 + Step 2
 \$526,593,391

Step 3:
Decom Period:

Total Earnings:	Real Rate of Return per	Decom Period:	Total Real Rate of Return:	Total Earnings for Decom:	Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]
\$526,593,391	2%	7	0.14869	\$39,148,445	

Accumulation during Decom	Total of Steps 1 - 3:	Total = Total Earnings + Total Earnings for Decom
\$54,581,000	\$620,322,836	

Excess (Shortfall)	\$	104,009,372	to NRC minimum
	\$	(7,052,911)	Less ISFSI
	\$	-	Parent Co Guaranty
	\$	96,956,461	Total Excess Financial Assurance

Table 3 (continued)
Financial Assurance – Annuity
Waterford 3

Year	LPSC	CNO	Annuity:	Real Rate of	Total Accumulatio	
2015	\$1,672,000	\$24,170	\$1,696,170	2.00%	\$2,067,622	Total Accumulation = Annuity x (1+RRR)^Years left from Accum
2016	\$6,688,000	\$133,000	\$6,821,000	2.00%	\$8,151,726	
2017	\$6,688,000	\$133,000	\$6,821,000	2.00%	\$7,991,889	
2018	\$6,688,000	\$133,000	\$6,821,000	2.00%	\$7,835,185	
2019	\$6,688,000	\$133,000	\$6,821,000	2.00%	\$7,681,554	
2020	\$7,580,000	\$151,000	\$7,731,000	2.00%	\$8,535,649	
2021	\$7,580,000	\$151,000	\$7,731,000	2.00%	\$8,368,283	
2022	\$7,580,000	\$151,000	\$7,731,000	2.00%	\$8,204,199	
2023	\$7,580,000	\$151,000	\$7,731,000	2.00%	\$8,043,332	
2024	\$7,580,000	\$151,000	\$7,731,000	2.00%	\$7,885,620	
Total:					\$74,765,059	

Accumulation During Decomm Period

2025	\$8,867,000	\$0	\$8,867,000
2026	\$8,867,000	\$0	\$8,867,000
2027	\$8,867,000	\$0	\$8,867,000
2028	\$8,867,000	\$0	\$8,867,000
2029	\$8,867,000	\$0	\$8,867,000
2030	\$10,246,000	\$0	\$10,246,000
2031	0	\$0	\$0
Total:		\$54,581,000	