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10 CFR 72.30

CNRO2021-00026

December 15, 2021

ATTN: Document Control Desk
Director, Division of Fuel Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555-0001

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 Steam Electric Station, Unit 3 Docket No. 72-075

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 (Enclosures 1 through 4) the required Plans for the subject plants.

The enclosure 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 Part 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 2021 dollars unless noted otherwise. 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: $ 553M Unit 2: $ 413M	$10.95M
Grand Gulf: SERI* share, 90% CE** share, 10%	 $1,608M $ 177M	$11.86M
River Bend Regulated share, 70% Non-Regulated share, 30%	 $ 798M $ 829M	$10.50M
Waterford 3	$ 873M	$ 8.01M

* System Energy Resources, Inc.
** Cooperative Energy

This letter contains no new regulatory commitments.

Should you have any questions or require additional information, please contact me at (601) 368-5102.

Respectfully,

Philip L. Couture

PLC/chm

Enclosures:

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 Steam Electric Station, Unit 3

cc: NRC Region IV Regional Administrator
NRC Senior Resident Inspector – ANO
NRC Senior Resident Inspector – GGN
NRC Senior Resident Inspector – RBS
NRC Senior Resident Inspector – WF3
NRC Project Manager – ANO
NRC Project Manager – GGN
NRC Project Manager – RBS
NRC Project Manager – WF3

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

ENCLOSURE 1

CNRO2021-00026

10 CFR 72.30 ISFSI Decommissioning Funding Plan
Arkansas Nuclear One

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN
ARKANSAS NUCLEAR ONE

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, Inc. in December 2018.[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.

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

2 "ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Arkansas Nuclear One, Units 1 & 2, Grand Gulf Nuclear Station, River Bend Station and Waterford 3 Steam Electric Station," CNRO2018-00049, (NRC Accession No. ML18351A491), dated December 17, 2018.

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 5,610 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 2030 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE 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 2078.

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 Obama administration's Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[5]

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

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

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

The report stated that "[W]ith the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that: Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites." [6] Therefore, in 2013, DOE assumed it could begin fuel acceptance within 8 years of its report at in interim facility. While as in 2013 no further progress has currently been made on a disposal facility, its estimate of an 8-year development time for an interim facility would still allow fuel to be removed beginning in 2030.

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 several separate 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. 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).

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6 *Ibid*. at page 2.

The design and capacity of the dry storage modules on the additional pads are 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 intends to use Holtec's HI-STORM FW System (with a 37 spent fuel assembly capacity) for storing all future spent fuel on-site, starting in 2023 for ANO-1 and 2025 for ANO-2 respectively. The Holtec dry storage system consists of an inner multi-purpose canister (containing the spent fuel) and an outer concrete and steel overpack.

Entergy's current spent fuel management plan for the ANO spent fuel would result in 131 (74 100S and 57 FW) spent fuel storage casks (which includes the repackaged fuel from the VSCs) being placed on seven storage pads at the site. This projected configuration is based upon the 2030 DOE spent fuel program start with a 2033 DOE start date for ANO spent fuel, a 3,000 MTU (metric ton of uranium) / 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 131 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.[7] 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 131 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., 177 offloaded assemblies per reactor, 37 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.

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7 HI-STORM FW FSAR, Holtec International, Report HI-2114830, Rev.0 , at page 2-83 (Accession Number ML15075A203).

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

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

The latest decommissioning cost study for ANO (prepared in 2019) 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 Energy*Solutions*.

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

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

Costs are reported in 2021 dollars and based upon an internal decommissioning analysis prepared for ANO in 2019. Activity costs have been escalated to 2021 dollars using the Consumer Price Index, Services.[10]

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

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

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8 HI-STORM FW FSAR, Holtec International, Report HI-2114830, Rev. 0, at page 2-84 (Accession Number ML15075A203).

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

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

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

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

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

6. Cost Considerations

The estimated cost to decommission the ISFSI 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 2079, 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 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 $493.297 million and $513.669 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, 2021 and considering the allowed real rate of return on the fund between October 1, 2021 and the assumed end of ANO station decommissioning, the trust funds will contain surpluses of $552.574 million and $412.836 million for Units 1 and 2, respectively (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 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.

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

11 "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 18, January 2021.

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
ISFSI Pads (existing)	421 (3 pads)	41 to 56	No
ISFSI Pads (expansion)	660 (4 pads)	50	No

ISFSI Storage Overpack (Holtec HI-STORM FW PWR**)**

Item	Value	Notes
Overall Height (inches)	217.3	Dimensions are nominal
Outside Diameter (inches)	139.0	Dimensions are nominal
Inside Diameter (inches)	81.0	Dimensions are nominal
Quantity (total)	141	131 spent fuel (74 100S + 57 Holtec FW) + 10 GTCC (Holtec FW)
Quantity (with residual radioactivity)	10	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste (total packaged volume)	25,058	Cubic feet
Low-Level Radioactive Waste (packaged density)	124	Average weight density

Other Potentially Impacted Items

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

Table 2
ISFSI Decommissioning Costs and Waste Volumes

	Costs (thousands, 2021 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)	-	-	-	-	445	445	-	-	1,240
Decontamination/Demolition (activated cask disposition)	221	181	1,390	2,649	47	4,488	25,058	2,644	-
License Termination (radiological surveys)	-	-	-	-	2,286	2,286	-	17,228	-
Subtotal	**221**	**181**	**1,390**	**2,649**	**2,778**	**7,220**	**25,058**	**19,872**	**1,240**
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	548	548	-	-	1,153
Insurance	-	-	-	-	178	178	-	-	-
Property Taxes	-	-	-	-	1	1	-	-	-
Plant Energy Budget	-	-	-	-	87	87	-	-	-
Non-Labor Overhead	-	-	-	-	21	21	-	-	-
Corporate A&G	-	-	-	-	136	136	-	-	-
Security	-	-	-	-	235	235	-	-	5,082
Entergy Oversight Staff	-	-	-	-	334	334	-	-	3,855
Subtotal	**-**	**-**	**-**	**-**	**1,540**	**1,540**	**-**	**-**	**10,090**
Total (w/o contingency)	**221**	**181**	**1,390**	**2,649**	**4,319**	**8,760**	**25,058**	**19,872**	**11,330**
Total (w/25% contingency)	**277**	**226**	**1,738**	**3,312**	**5,398**	**10,950**			

Note: Columns/Rows may not add due to rounding

Table 3
Financial Assurance

Plant name: **Arkansas Nuclear One, Unit 1**

	Month	Day	Year
Year of Biennial:	9	30	2021
Termination of Operation:	5	20	2034

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
PWR	2568	$97,598,400	144.6	1.98	0.65	2.86	2.300	3.810	0.13	2.93	0.22	12.793

NRC Minimum: **$493,297,449** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$493,297,449	$757,926,848

Step 1:

Earnings Credit: Trust Fund Balance:	Real Rate of Return per year	Years Left in License	Total Real Rate of Return:	Total Earnings:	
$757,926,848	2%	12.64	1.28442	**$973,496,402**	**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 year	Years of Annuity:	Total Annuity:
$0	2%	0	$0

Total Step 2
$0

Total Step 1 + Step 2
$973,496,402

Step 3:

Decom Period: Total Earnings:	Real Rate of Return per year	Decom Period:	Total Real Rate of Return:	Total Earnings for Decom:	
$973,496,402	2%	7	0.14869	$72,374,590	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Accumulation during Decom	Total of Steps 1 - 3:	
	$1,045,870,992	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$**	**552,573,543**	**to NRC minimum**
	$	**(5,475,000)**	**Less ISFSI**
	$	**547,098,543**	**Total Excess Financial Assurance**

Table 4
Financial Assurance

Plant name: Arkansas Nuclear One, Unit 2

	Month	Day	Year
Year of Biennial:	9	30	2021
Termination of Operation:	7	17	2038

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
PWR	3026	$101,628,800	144.6	1.98	0.65	2.86	2.300	3.810	0.13	2.93	0.22	12.793

NRC Minimum: **$513,668,542** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$513,668,542	$618,329,032

Step 1:

Earnings Credit:

Trust Fund Balance:	Real Rate of Return per year	Years Left in License	Total Real Rate of Return:	Total Earnings:	
$618,329,032	2%	16.80	1.39471	**$862,389,684**	**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 year	Years of Annuity:	Total Annuity:
$0	2%	0	$0

Total Step 2
$0

Total Step 1 + Step 2
$862,389,684

Step 3:

Decom Period:

Total Earnings:	Real Rate of Return per year	Decom Period:	Total Real Rate of Return:	Total Earnings for Decom:	
$862,389,684	2%	7	0.14869	$64,114,361	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Accumulation during Decom	Total of Steps 1 - 3:	
	$926,504,045	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$**	**412,835,504**	**to NRC minimum**
	$	**(5,475,000)**	**Less ISFSI**
	$	**407,360,504**	**Total Excess Financial Assurance**

ENCLOSURE 2

CNRO2021-00026

10 CFR 72.30 ISFSI Decommissioning Funding Plan
Grand Gulf Nuclear Station

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN
GRAND GULF NUCLEAR STATION

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, Inc. in December 2018.[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.

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

2 "ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Arkansas Nuclear One, Units 1 & 2, Grand Gulf Nuclear Station, River Bend Station and Waterford 3 Steam Electric Station," CNRO2018-00049, (NRC Accession No. ML18351A491), dated December 17, 2018.

2. Spent Fuel Management Strategy

The operating license for Grand Gulf is currently set to expire on November 1, 2044. Approximately 10,488 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 2044, 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 2030 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE 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 2079.

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 Obama administration's Blue Ribbon Commission and as "a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[5]

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

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

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

The report stated that "[W]ith the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that: Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites." [6] Therefore, in 2013, DOE assumed it could begin fuel acceptance within 8 years of its report at in interim facility. While as in 2013 no further progress has currently been made on a disposal facility, its estimate of an 8-year development time for an interim facility would still allow fuel to be removed beginning in 2030.

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 current 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 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.

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6 *Ibid*. at page 2.

Entergy intends to use Holtec's HI-STORM FW System (with an 89 spent fuel assembly capacity) for storing future spent fuel on-site starting in 2023. The Holtec dry storage system consists of an inner multi-purpose canister (containing the spent fuel) and an outer concrete and steel overpack.

Entergy's current spent fuel management plan for the Grand Gulf spent fuel would result in 89 (46 100S and 43 FW) spent fuel storage casks being placed on the storage pads at the site. This projected configuration is based upon the 2030 DOE spent fuel program start with a 2037 DOE start date for Grand Gulf spent fuel, a 3,000 MTU (metric ton of uranium) / 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 89 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 (2044) and the DOE's spent fuel acceptance assumptions, as previously described. For purposes of this analysis, two pads, 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.[7] The decommissioning estimate is based on the premise that some of the inner steel liners and the concrete overpacks will contain low levels of neutron-induced residual radioactivity that would necessitate remediation at the time of decommissioning. As an allowance, 9 of the 89 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, 89 assemblies per cask) which results in 9 overpacks. It is assumed that these are the final casks offloaded; consequently, they have the least time for radioactive decay of the neutron activation products.

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7 HI-STORM FW FSAR, Holtec International, Report HI-2114830, Rev.0 , at page 2-83 (Accession Number ML15075A203).

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

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

The latest decommissioning cost study for Grand Gulf (prepared in 2017) 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 Energy*Solutions*.

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

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

Costs are reported in 2021 dollars and based upon an internal decommissioning analysis prepared for Grand Gulf in 2017. Activity costs have been escalated to 2021 dollars using the Consumer Price Index, Services.[10]

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

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

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8 HI-STORM FW FSAR, Holtec International, Report HI-2114830, Rev. 0, at page 2-84 (Accession Number ML15075A203).

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

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

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

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

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

6. Cost Considerations

The estimated cost to decommission the ISFSI and release the facility for unrestricted use is provided in Table 2. The cost includes an initial planning phase. During this phase the empty overpacks, ISFSI 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 2080, 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 $684.698 million, based upon the NRC's latest financial assurance funding determination.[11]
- Based upon Grand Gulf's decommissioning trust fund balances as of September 30, 2021 (and considering the allowed real rate of return on the fund between October 1, 2021 and the assumed end of Grand Gulf station decommissioning),[12] the trust funds will contain a $1,607.827 million surplus for System Energy Resources, Inc. and a $176.934 million surplus for Cooperative Energy (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).

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

11 "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 18, January 2021.

12 No further annuity collections are assumed for Grand Gulf for this filing.

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
ISFSI Pad (existing)	196	61	No
New ISFSI Pad (conceptual design)	196	61	No

ISFSI Storage Overpack (HI-STORM FW BWR)

Item	Value	Notes
Overall Height (inches)	199.3	Dimensions are nominal
Outside Diameter (inches)	139.0	Dimensions are nominal
Inside Diameter (inches)	81.0	Dimensions are nominal
Quantity (total)	94	89 spent fuel (46 100S + 43 Holtec FW) + 5 GTCC (Holtec FW)
Quantity (with residual radioactivity)	9	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste (total packaged volume)	24,836	Cubic feet
Low-Level Radioactive Waste (packaged density)	112	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Transfer Cask	1	
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, 2021 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)	-	-	-	-	342	342	-	-	1,120
Decontamination/Demolition (activated cask disposition)	218	213	1,438	4,290	37	6,196	24,836	2,375	-
License Termination (radiological surveys)	-	-	-	-	1,458	1,458	-	9,568	-
Subtotal	**218**	**213**	**1,438**	**4,290**	**1,836**	**7,996**	**24,836**	**11,943**	**1,120**
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	538	538	-	-	1,153
Insurance	-	-	-	-	88	88	-	-	-
Property Taxes	-	-	-	-	-	-	-	-	-
Plant Energy Budget	-	-	-	-	77	77	-	-	-
Non-Labor Overhead	-	-	-	-	8	8	-	-	-
Corporate A&G	-	-	-	-	202	202	-	-	-
Security	-	-	-	-	234	234	-	-	4,999
Entergy Oversight Staff	-	-	-	-	343	343	-	-	3,792
Subtotal	-	-	-	-	1,491	1,491	-	-	9,945
Total (w/o contingency)	**218**	**213**	**1,438**	**4,290**	**3,327**	**9,487**	**24,836**	**11,943**	**11,065**
Total (w/25% contingency)	**273**	**267**	**1,797**	**5,363**	**4,159**	**11,859**			

Note: Columns/Rows may not add due to rounding

Table 3
Financial Assurance
System Energy Resources, Inc.

Plant name: **Grand Gulf Nuclear Station (SERI 90%)**

	Month	Day	Year
Year of Biennial:	9	30	2021
Termination of Operation:	11	1	2044

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
BWR	4408	$135,000,000	144.6	1.98	0.65	2.86	2.300	3.810	0.13	2.99	0.22	12.837

NRC Minimum: **$684,698,400** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	90.00%	$616,228,560	$1,310,462,369

Step 1: Earnings Credit:

Trust Fund Balance:	Real Rate of Return per year	Years Left in License	Total Real Rate of Return:	Total Earnings:	
$1,310,462,369	2.0%	23.09	1.57971	**$2,070,150,509**	**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 year	Years of Annuity:	Total Annuity:
$0	2.0%	0	$0

Total Step 2
$0

Total Step 1 + Step 2
$2,070,150,509

Step 3: Decom Period:

Total Earnings:	Real Rate of Return per year	Decom Period:	Total Real Rate of Return:	Total Earnings for Decom:	
$2,070,150,509	2%	7	0.14869	$153,905,340	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Accumulation during Decom	Total of Steps 1 - 3:	
	$2,224,055,849	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$**	**1,607,827,289**	**to NRC minimum**
	$	**(10,672,920)**	**Less ISFSI**
	$	**1,597,154,369**	**Total Excess Financial Assurance**

Table 4
Financial Assurance
South Mississippi Electric Power Association

Plant name: Grand Gulf Nuclear Station (Cooperative Energy 10%)

	Month	Day	Year
Year of Biennial:	9	30	2021
Termination of Operation:	11	1	2044

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
BWR	4408	$135,000,000	144.6	1.98	0.65	2.86	2.300	3.810	0.13	2.99	0.22	12.837

NRC Minimum: **$684,698,400** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	10.00%	$68,469,840	$113,880,710

Step 1:

Earnings Credit:

Trust Fund Balance:	Real Rate of Return per year	Years Left in License	Total Real Rate of Return:	Total Earnings:	
$113,880,710	2.91%	23.09	1.93930	**$220,848,861**	**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 year	Years of Annuity:	Total Annuity:
$0	2.91%	0	$0

Total Step 2
$0

Total Step 1 + Step 2
$220,848,861

Step 3:

Decom Period:

Total Earnings:	Real Rate of Return per year	Decom Period:	Total Real Rate of Return:	Total Earnings for Decom:	
$220,848,861	2.91%	7	0.22237	$24,555,081	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Accumulation during Decom	Total of Steps 1 - 3:	
	$245,403,942	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$**	**176,934,102**	**to NRC minimum**
	$	**(1,185,880)**	**Less ISFSI**
	$	**175,748,222**	**Total Excess Financial Assurance**

ENCLOSURE 3

CNRO2021-00026

10 CFR 72.30 ISFSI Decommissioning Funding Plan
River Bend Station

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN
RIVER BEND STATION

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, Inc. in December 2018.[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.

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

2 "ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Arkansas Nuclear One, Units 1 & 2, Grand Gulf Nuclear Station, River Bend Station and Waterford 3 Steam Electric Station," CNRO2018-00049, (NRC Accession No. ML18351A491), dated December 17, 2018.

2. Spent Fuel Management Strategy

The operating license for River Bend is currently set to expire on August 29, 2045.[3] Approximately 7,852 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 to support decommissioning. The ISFSI is assumed to be operated under a Part 50 General License (in accordance with 10 CFR 72, Subpart K[4]).

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 2045, 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 2030 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE 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,[5] the spent fuel is projected to be fully removed from the River Bend site in 2077.

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 Obama administration's Blue Ribbon Commission and as "a framework for moving toward a sustainable program to

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3 A 20-year license renewal was issued by the NRC in late December 2018.

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

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

deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[6]

The report stated that "[W]ith the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that: Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites." [7] Therefore, in 2013, DOE assumed it could begin fuel acceptance within 8 years of its report at in interim facility. While as in 2013 no further progress has currently been made on a disposal facility, its estimate of an 8-year development time for an interim facility would still allow fuel to be removed beginning in 2030.

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 current 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

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

7 *Ibid*. at page 2.

storage overpack. Entergy intends to use Holtec's HI-STORM FW System (with an 89 spent fuel assembly capacity) for storing all future spent fuel on-site starting in 2024. The Holtec dry storage system consists of an inner multi-purpose canister (containing the spent fuel) and an outer concrete and steel overpack.

Entergy's current spent fuel management plan for the River Bend spent fuel would result in 67 (37 100S and 30 FW) spent fuel storage casks being placed on the storage pad at the site. This projected configuration is based upon the 2030 DOE spent fuel program start with a 2037 DOE start date for River Bend spent fuel, a 3,000 MTU (metric ton of uranium) / year pickup rate, and a 44 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 67 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 (2045) and the DOE's spent fuel acceptance assumptions, as previously described. For purposes of this analysis, two pads, 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.[8] 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, 8 of the 67 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, 89 assemblies per cask) which results in 8 overpacks. It is assumed that these are the final casks offloaded; consequently, they have the least time for radioactive decay of the neutron activation products.

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8 HI-STORM FW FSAR, Holtec International, Report HI-2114830, Rev.0, at page 2-83 (Accession Number ML15075A203).

The dry storage vendor, Holtec International, does not expect any residual contamination to be left on the concrete ISFSI pad.[9] 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 Energy*Solutions*.

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

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

Costs are reported in 2021 dollars and based upon an internal decommissioning analysis prepared for River Bend in 2018. Activity costs have been escalated to 2021 dollars using the Consumer Price Index, Services.[11]

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9 HI-STORM FW FSAR, Holtec International, Report HI-2114830, Rev. 0, at page 2-84 (Accession Number ML15075A203).

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

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

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

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

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

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

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

6. Cost Considerations

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

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

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

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 2078, 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 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 $668.565 million, based upon the NRC's latest financial assurance funding determination.[12]
- Based upon Entergy's decommissioning trust fund balances for River Bend as of September 30, 2021 (and considering the schedule of remaining principal payments into the decommissioning fund, and the allowed real rate of return on the fund between October 1, 2021 and the assumed end of River Bend Station decommissioning), the River Bend regulated trust funds will contain a $798.025 million surplus and the River Bend "non-regulated"[13] trust funds will contain a $828.931 million surplus (refer to Tables 3 and 4) beyond the NRC minimum funding formula provided in 10 CFR 50.75(e). These surplus values are more than sufficient to fund the cost to complete the decommissioning of the ISFSI (estimated cost provided in Table 2).

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

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12 "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 18, January 2021.

13 The licensee refers to the 30% share of River Bend formerly owned by Cajun Electric Cooperative as "non-regulated," because at the time the licensee acquired the 30% share it was not governed by rate regulation. The 30% share is now governed by Federal Energy Regulatory Commission tariffs, and as such, is not non-regulated, but the naming convention has continued to distinguish the two shares.

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
ISFSI Pad (existing)	210	61	No
New ISFSI Pad (conceptual design)	210	61	No

ISFSI Storage Overpack (HI-STORM FW BWR)

Item	Value	Notes
Overall Height (inches)	199.3	Dimensions are nominal
Outside Diameter (inches)	139.0	Dimensions are nominal
Inside Diameter (inches)	81.0	Dimensions are nominal
Quantity (total)	71	67 spent fuel (37 100S + 30 Holtec FW) + 4 GTCC (Holtec FW)
Quantity (with residual radioactivity)	8	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste (total packaged volume)	48,199	Cubic feet
Low-Level Radioactive Waste (packaged density)	51	Average weight density

Other Potentially Impacted Items

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

Table 2
ISFSI Decommissioning Costs and Waste Volumes

	Costs (thousands, 2021 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)	-	-	-	-	299	299	-	-	1,072
Decontamination/Demolition (activated cask disposition)	195	192	1,319	3,618	37	5,361	48,199	2,115	-
License Termination (radiological surveys)	-	-	-	-	1,378	1,378	-	9,165	-
Subtotal	**195**	**192**	**1,319**	**3,618**	**1,714**	**7,038**	**48,199**	**11,280**	**1,072**
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	536	536	-	-	1,153
Insurance	-	-	-	-	87	87	-	-	-
Property Taxes	-	-	-	-	17	17	-	-	-
Plant Energy Budget	-	-	-	-	51	51	-	-	-
Non-Labor Overhead	-	-	-	-	1	1	-	-	-
Corporate A&G	-	-	-	-	107	107	-	-	-
Security	-	-	-	-	232	232	-	-	4,999
Entergy Oversight Staff	-	-	-	-	335	335	-	-	3,792
Subtotal	-	-	-	-	1,364	1,364	-	-	9,945
Total (w/o contingency)	**195**	**192**	**1,319**	**3,618**	**3,078**	**8,403**	**48,199**	**11,280**	**11,017**
Total (w/25% contingency)	**244**	**240**	**1,649**	**4,523**	**3,848**	**10,504**			

Note: Columns/Rows may not add due to rounding

Table 3
Financial Assurance

Plant name: River Bend (Regulated 70%)

	Month	Day	Year
Year of Biennial:	9	30	2021
Termination of Operation:	8	29	2045

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
BWR	3091	$131,819,000	144.6	1.98	0.65	2.86	2.300	3.810	0.13	2.99	0.22	12.837

NRC Minimum: **$668,564,877** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	70.00%	$467,995,414	$637,553,155

Step 1:
Earnings Credit:

Trust Fund Balance:	Real Rate of Return per year	Years Left in License	Total Real Rate of Return:	Total Earnings:	
$637,553,155	2.00%	23.91	1.60557	**$1,023,636,220**	**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 year	Years of Annuity:	Total Annuity:
See Annuity Sheet	2.00%	10	$154,775,358

Total Step 2
$154,775,358

Total Step 1 + Step 2
$1,178,411,578

Step 3:
Decom Period:

Total Earnings:	Real Rate of Return per year	Decom Period:	Total Real Rate of Return:	Total Earnings for Decom:	
$1,178,411,578	2.00%	7	0.14869	$87,609,009	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Accumulation during Decom	Total of Steps 1 - 3:	
	$1,266,020,587	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$**	**798,025,173**	**to NRC minimum**
	$	**(7,352,450)**	**Less ISFSI**
	$	**790,672,723**	**Total Excess Financial Assurance**

Table 3 (continued)
Financial Assurance – Annuity

Plant name: **River Bend Station (Regulated 70%)**

Assumed Termination of Operations: 2045

Year	LPSC	PUCT	FERC	Annuity:	Real Rate of	Total Accumulation
2021	$ 2,548,750	$ -	$ 112,914	$ 2,661,664	2.0%	$ 4,281,120
2022	$ 10,195,000	$ -	$ 112,914	$ 10,307,914	2.0%	$ 16,254,542
2023	$ 10,195,000	$ -	$ 112,914	$ 10,307,914	2.0%	$ 15,935,825
2024	$ 10,195,000	$ -	$ 112,914	$ 10,307,914	2.0%	$ 15,623,358
2025	$ 11,693,000	$ -	$ 112,914	$ 11,805,914	2.0%	$ 17,542,967
2026	$ 11,693,000	$ -	$ 112,914	$ 11,805,914	2.0%	$ 17,198,987
2027	$ 11,693,000	$ -	$ 112,914	$ 11,805,914	2.0%	$ 16,861,752
2028	$ 11,693,000	$ -	$ 112,914	$ 11,805,914	2.0%	$ 16,531,130
2029	$ 11,693,000	$ -	$ 112,914	$ 11,805,914	2.0%	$ 16,206,990
2030	$ 13,513,000	$ -	$ 112,914	$ 13,625,914	2.0%	$ 18,338,686
					Total:	**$ 154,775,358**

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

Table 4
Financial Assurance

Plant name: River Bend (Non-Regulated 30%)

	Month	Day	Year
Year of Biennial:	9	30	2021
Termination of Operation:	8	29	2045

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
BWR	3091	$131,819,000	144.6	1.98	0.65	2.86	2.300	3.810	0.13	2.99	0.22	12.837

NRC Minimum: **$668,564,877** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	30.00%	$200,569,463	$596,834,093

Step 1:

Earnings Credit:

Trust Fund Balance:	Real Rate of Return per year	Years Left in License	Total Real Rate of Return:	Total Earnings:	
$596,834,093	2%	23.91	1.60557	**$958,258,915**	**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 year	Years of Annuity:	Total Annuity:
$0	2%	0	$0

Total Step 2
$0

Total Step 1 + Step 2
$958,258,915

Step 3:

Decom Period:

Total Earnings:	Real Rate of Return per year	Decom Period:	Total Real Rate of Return:	Total Earnings for Decom:	
$958,258,915	2%	7	0.14869	$71,241,759	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Total of Steps 1 - 3:	
$1,029,500,674	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$**	**828,931,211**	**to NRC minimum**
	$	**(3,151,050)**	**Less ISFSI**
	$	**825,780,161**	**Total Excess Financial Assurance**

ENCLOSURE 4

CNRO2021-00026

10 CFR 72.30 ISFSI Decommissioning Funding Plan
Waterford Steam Electric Station, Unit 3

10 CFR 72.30 ISFSI DECOMMISSIONING FUNDING PLAN
WATERFORD STEAM ELECTRIC STATION, UNIT 3

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, Inc. in December 2018.[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.

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

2 "ISFSI Decommissioning Funding Plans (10 CFR 72.30) for Arkansas Nuclear One, Units 1 & 2, Grand Gulf Nuclear Station, River Bend Station and Waterford 3 Steam Electric Station," CNRO2018-00049, (NRC Accession No. ML18351A491), dated December 17, 2018.

2. Spent Fuel Management Strategy

The operating license for Waterford 3 is currently set to expire on December 18, 2044.[3] Approximately 3,834 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[4]).

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 2044, 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 3 spent fuel is based in general upon: 1) a 2030 start date for DOE initiating transfer of commercial spent fuel to a federal facility (not necessarily a final repository), and 2) expectations for spent fuel receipt by the DOE for the Waterford 3 fuel. The DOE's generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority. Assuming a maximum rate of transfer of 3,000 metric tons of uranium/year,[5] the spent fuel is projected to be fully removed from the Waterford 3 site in 2066.

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 Obama administration's Blue Ribbon Commission and as "a framework for moving toward a sustainable program to

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3 A 20-year license renewal was issued by the NRC in December 2018.

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

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

deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel..."[6]

The report stated that "[W]ith the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that: Sites, designs and licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites." [7] Therefore, in 2013, DOE assumed it could begin fuel acceptance within 8 years of its report at in interim facility. While as in 2013 no further progress has currently been made on a disposal facility, its estimate of an 8-year development time for an interim facility would still allow fuel to be removed beginning in 2030.

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.

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

7 *Ibid*. at page 2.

4. ISFSI Description

The design and capacity of the current Waterford 3 ISFSI is based upon the Holtec HI-STORM 100S dry cask storage system. The system consists of a multi-purpose canister, with a nominal capacity of 32 fuel assemblies, and a steel-lined concrete storage overpack. Entergy intends to use Holtec's HI-STORM FW System (with a 37 spent fuel assembly capacity) for storing all future spent fuel on-site starting in 2022. The Holtec dry storage system consists of an inner multi-purpose canister (containing the spent fuel) and an outer concrete and steel overpack.

Entergy's current spent fuel management plan for the Waterford 3 spent fuel would result in 80 (31 100S and 49 FW) spent fuel storage casks being placed on the storage pad at the site. This projected configuration is based upon the 2030 DOE spent fuel program start with a 2037 DOE start date for Waterford 3 spent fuel, a 3,000 MTU (metric ton of uranium) / year pickup rate, and a 72 cask capacity for the ISFSI pad built to support plant operations (a second smaller pad 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 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 (2044) and the DOE's spent fuel acceptance assumptions, as previously described. For purposes of this analysis, two pads, 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.[8] 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, 6 of the 80 overpacks are assumed to be affected, i.e., contain residual radioactivity. The allowance quantity is

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8 HI-STORM FW FSAR, Holtec International, Report HI-2114830, Rev.0 , at page 2-83 (Accession Number ML15075A203).

based upon the number of casks required for the final core off-load (i.e., 217 offloaded assemblies, 37 assemblies per cask) which results in 6 overpacks. It is assumed that these are the final casks offloaded; consequently, they have the least time for radioactive decay of the neutron activation products.

The dry storage vendor, Holtec International, does not expect any residual contamination to be left on the concrete ISFSI pad.[9] 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 3 (prepared in 2019) 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 Energy*Solutions*.

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

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

Costs are reported in 2021 dollars and based upon an internal decommissioning analysis prepared for Waterford 3 in 2019. Activity costs have been escalated to 2021 dollars using the Consumer Price Index, Services.[11]

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9 HI-STORM FW FSAR, Holtec International, Report HI-2114830, Rev. 0, at page 2-84 (Accession Number ML15075A203).

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

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

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

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

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

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

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

6. Cost Considerations

The estimated cost to decommission the ISFSI and release the facility for unrestricted use is provided in Table 2. The cost includes an initial planning phase. During this phase the empty overpacks, ISFSI pad, and surrounding environs are characterized and the activity specifications and work procedures for the decontamination (overpack disposition) developed. The next phase includes the cost for craft labor to demolish the activated overpacks, package in certified waste containers, transportation to the Clive, Utah site, disposal, as well as the costs for the supporting equipment, materials and supplies.

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

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 2080, the year following all spent fuel removal.

7. Financial Assurance

ISFSI operations at Waterford 3 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 3 is $530.708 million, based upon the NRC's latest financial assurance funding determination.[12]
- Based upon Entergy's decommissioning trust fund balance for Waterford 3 as of September 30, 2021 (and considering the schedule of remaining principal payments into the decommissioning fund, and the allowed real rate of return on the fund between October 1, 2021 and the assumed end of Waterford 3 station decommissioning), the trust fund will contain an $872.745 million surplus (refer to Table 3) beyond the NRC minimum funding formula provided in 10 CFR 50.75(e). This surplus is more than sufficient to complete the decommissioning of the ISFSI (estimated cost provided in Table 2).

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

12 "Report on Waste Burial Charges," U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, NUREG-1307, Rev. 18, January 2021.

Table 1
Significant Quantities and Physical Dimensions

ISFSI Pad

Item	Length (ft)	Width (ft)	Residual Radioactivity
ISFSI Pad (existing)	197	120	No

ISFSI Storage Overpack (HI-STORM FW PWR)

Item	Value	Notes
Overall Height (inches)	217.3	Dimensions are nominal
Outside Diameter (inches)	139.0	Dimensions are nominal
Inside Diameter (inches)	81.0	Dimensions are nominal
Quantity (total)	86	80 spent fuel (31 100S + 49 Holtec FW) + 6 GTCC (Holtec FW)
Quantity (with residual radioactivity)	6	Equivalent to the number of overpacks used to store last complete core offload
Low-Level Radioactive Waste (total packaged volume)	15,059	Cubic feet
Low-Level Radioactive Waste (packaged density)	123	Average weight density

Other Potentially Impacted Items

Item	Value	Notes
Transfer Cask	1	
Number of Overpacks used for GTCC storage	6	No residual radioactivity

Table 2
ISFSI Decommissioning Costs and Waste Volumes

	Costs (thousands, 2021 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)	-	-	-	-	321	321	-	-	1,096
Decontamination/Demolition (activated cask disposition)	154	146	1,019	1,931	47	3,296	15,059	1,600	-
License Termination (radiological surveys)	-	-	-	-	1,517	1,517	-	9,642	-
Subtotal	**154**	**146**	**1,019**	**1,931**	**1,885**	**5,134**	**15,059**	**11,242**	**1,096**
Supporting Costs									
NRC and NRC Contractor Fees and Costs	-	-	-	-	538	538	-	-	1,153
Insurance	-	-	-	-	90	90	-	-	-
Property Taxes	-	-	-	-	84	84	-	-	-
Plant Energy Budget	-	-	-	-	37	37	-	-	-
Non-Labor Overhead	-	-	-	-	52	52	-	-	-
Corporate A&G	-	-	-	-	43	43	-	-	-
Security	-	-	-	-	72	72	-	-	3,448
Entergy Oversight Staff	-	-	-	-	358	358	-	-	3,792
Subtotal	-	-	-	-	1,275	1,275	-	-	8,393
Total (w/o contingency)	**154**	**146**	**1,109**	**1,931**	**3,160**	**6,409**	**15,059**	**11,242**	**9,489**
Total (w/25% contingency)	**192**	**182**	**1,274**	**2,414**	**3,950**	**8,011**			

Note: Columns/Rows may not add due to rounding

Table 3
Financial Assurance

Plant name: Waterford Steam Electric Station, Unit 3

	Month	Day	Year
Year of Biennial:	9	30	2021
Termination of Operation:	12	18	2044

	MWth	1986$	ECI	Base Lx		Lx	Px	Fx		Ex		Bx
PWR	3716	$105,000,000	144.6	1.98	0.65	2.86	2.300	3.810	0.13	2.93	0.22	12.793

NRC Minimum: **$530,707,800** **Site Specific:**

Licensee:	% Owned:	Amount of NRC Minimum/Site Specific:	Amount in Trust Fund:
Entergy	100.00%	$530,707,800	$752,948,371

Step 1: Earnings Credit:

Trust Fund Balance:	Real Rate of Return per year	Years Left in License	Total Real Rate of Return:	Total Earnings:	
$752,948,371	2%	23.22	1.58378	**$1,192,504,572**	**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 year	Years of Annuity:	Total Annuity:
See Annuity Sheet	2%	10	$113,828,626

Total Step 2
$113,828,626

Total Step 1 + Step 2
$1,306,333,198

Step 3: Decom Period:

Total Earnings:	Real Rate of Return per year	Decom Period:	Total Real Rate of Return:	Total Earnings for Decom:	
$1,306,333,198	2%	7	0.14869	$97,119,342	**Total Earnings for Decom = (1/2) x Total Earnings x [(1+RRR)^Decom period - 1]**

Accumulation during Decom	Total of Steps 1 - 3:	
	$1,403,452,540	**Total = Total Earnings + Total Earnings for Decom**

Excess (Shortfall)	**$**	**872,744,740**	**to NRC minimum**
	$	**(8,011,400)**	**Less ISFSI**
	$	**864,733,340**	**Total Excess Financial Assurance**

Table 3 (continued)
Financial Assurance – Annuity

Plant name: **Waterford Steam Electric Station, Unit 3**

Assumed Termination of Operations: 2044

Year	LPSC	CNO	Annuity:	Real Rate of Return:	Total Accumulation
2021	$ 1,895,000	$ 37,750	$ 1,932,750	2.00%	$3,047,752
2022	$ 7,580,000	$ 151,000	$ 7,731,000	2.00%	$11,951,969
2023	$ 7,580,000	$ 151,000	$ 7,731,000	2.00%	$11,717,617
2024	$ 7,580,000	$ 151,000	$ 7,731,000	2.00%	$11,487,859
2025	$ 8,867,000	$ -	$ 8,867,000	2.00%	$12,917,545
2026	$ 8,867,000	$ -	$ 8,867,000	2.00%	$12,664,259
2027	$ 8,867,000	$ -	$ 8,867,000	2.00%	$12,415,941
2028	$ 8,867,000	$ -	$ 8,867,000	2.00%	$12,172,491
2029	$ 8,867,000	$ -	$ 8,867,000	2.00%	$11,933,815
2030	$10,246,000	$ -	$ 10,246,000	2.00%	$13,519,379
				Total:	**$113,828,626**

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