



Entergy Nuclear Operations, Inc.  
Pilgrim Nuclear Power Station  
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Stephen J. Bethay  
Director, Nuclear Assessment

June 7, 2007

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555-0001

SUBJECT: Entergy Nuclear Operations, Inc.  
Pilgrim Nuclear Power Station  
Docket No. 50-293  
License No. DPR-35

Spent Fuel Management Plan Submittal in accordance with  
10 CFR 50.54(bb)

LETTER NUMBER: 2.07.055

Dear Sir or Madam:

In accordance with 10 CFR 50.54(bb), attached please find Pilgrim Nuclear Power Station's (Pilgrim's) program to manage and provide funding for the management of all irradiated fuel until title to the irradiated fuel is transferred to the Secretary of Energy. The operating license is scheduled to expire on June 8, 2012.

It should be noted that Entergy has submitted an application for License Renewal pursuant to 10 CFR 54. Based on this, Entergy requests that the NRC schedule the review of this information following a final decision on the License Renewal application.

There are no regulatory commitments made in this submittal.

If you have any questions or require additional information, please contact Mr. Bryan Ford, Licensing Manager, at (508) 830-8403.

Sincerely,

for Stephen J. Bethay

ERS/dl

Attachment 1: 10 CFR 50.54(bb) Program for Maintenance of Irradiated Fuel (7 pages)

cc: Mr. James S. Kim, Project Manager  
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## **10 CFR 50.54(bb) Program for Maintenance of Irradiated Fuel**

### **1. Background and Introduction**

Entergy Nuclear Generation Company and Entergy Nuclear Operations, Inc. (Entergy) is seeking renewal of the operating license for the Pilgrim Nuclear Power Station (Pilgrim), currently set to expire on June 8, 2012. However, pursuant to 10 CFR 50.54(bb), licensees of nuclear power plants that are within five years of the expiration of the reactor operating license shall submit written notification to the Nuclear Regulatory Commission for its review and preliminary approval of the program by which the licensee intends to manage and provide funding for the management of all irradiated fuel at the reactor following permanent cessation of operation of the reactor until title to the irradiated fuel and possession of the fuel is transferred to the U.S. Department of Energy (DOE) for ultimate disposal. Since Entergy has submitted an application for License Renewal pursuant to 10 CFR 54, Entergy requests that the NRC schedule the review of this information following a final decision on the License Renewal application.

### **2. Spent Fuel Management Strategy**

Completion of the decommissioning process is highly dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. 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") it was removed from service. The Entergy's current spent fuel management plan for the Pilgrim spent fuel is based in general upon: 1) a 2017 start date for repository operations and 2) expectations for spent fuel receipt by the DOE. The Company projects that fuel could be removed from the site as early as 2042, if the oldest fuel allocation receives the highest priority and the geologic repository is able to achieve the DOE's stated annual rate of transfer (3,000 metric tons of uranium year).

The NRC requires (in 10 CFR 50.54(bb)) that licensees establish a program to manage and provide funding for the caretaking of all irradiated fuel at the reactor site until title of the fuel is transferred to the DOE. Interim storage of the spent fuel, until the DOE has completed the transfer, will be in the reactor building storage pool and/or at an Independent Spent Fuel Storage Installation (ISFSI) located on the Pilgrim site. For financial planning purposes, the cost to construct this facility is included within the cost reported.

In the assumed scenario, 3,594 assemblies are generated through the end of currently licensed operations in 2012. An ISFSI is constructed within the owner controlled area to permit post-shutdown dry fuel storage. The assemblies stored in the reactor building's spent fuel storage pool at the time of shutdown are loaded into multi-purpose canisters (MPCs) and moved into storage casks on the new pad by late 2017. The MPCs are periodically off-loaded into a DOE transport cask such that all canisters are removed from the site by the year 2042. The Company's analysis assumes, for purposes only of this report, that the Company does not employ DOE spent fuel disposal contract allowances for up to 20% additional fuel designation for shipment to DOE each year.

In the event that Pilgrim does cease operations in 2012, Entergy will continue to comply with existing NRC licensing requirements, including the operation and maintenance of the systems and structures needed to support continued operation of the spent fuel pool and ISFSI, as necessary, under the decommissioning scenario ultimately selected. In addition, Entergy will also comply with applicable license termination requirements in accordance with 10 CFR 50.82 with respect to plant shutdown and post-shutdown activities including seeking such NRC approvals and on such schedules as necessary to satisfy these requirements consistent with the continued storage of irradiated fuel.

### **3. Cost Considerations**

The license termination costs are provided in Entergy letter dated March 29, 2007 (Reference 1). Table 1 provides a schedule for the estimated spent fuel management costs in 2006 nominal dollars.

The significant contributors to the cost of spent fuel management are identified in Table 2. As shown, costs are included for the design and construction of the ISFSI, the relocation of the spent fuel from the pool to the ISFSI pad, and eventual transfer of the fuel to the DOE. Table 3 provides an annual schedule for the Table 2 expenditures. Note that the \$93.7 million, shown in Tables 2 and 3, reflects the direct costs associated with constructing an ISFSI, procuring and loading dry storage canisters, and transferring fuel to the DOE. This cost is a subset of the \$318.7 million (spent fuel costs) estimate identified in Table 1. The differential comprises the management, security and other administrative and site support costs assigned to the spent fuel management effort over the 30-year post-operations storage period (from 2012 to 2042). It must also be noted that these figures will vary based on actual DOE performance, including the actual cask provisions and requirements that DOE settles upon. At this time, DOE has not identified any transport casks or requirements. Therefore, there is considerable uncertainty as to the actual costs that may have to be incurred; and uncertainty as to whether the DOE will bear certain of those costs. Major scheduling milestones are identified in Table 4.

At shutdown, the spent fuel pool is expected to contain freshly discharged assemblies from the most recent refueling cycles. Over the next five and one-half years the assemblies are packaged into MPCs for transfer to dry storage. It is assumed that the five and one-half years provides the necessary cooling period for the final core to meet the decay heat requirements for the dry cask storage system.

The evaluated scenario includes the construction of an ISFSI at an estimated cost of \$18 million. The estimate is based on the cost to build the ISFSI pad, transporter path, and security systems and support facilities. Once completed, Entergy anticipates loading 53 MPCs with the assemblies stored in the reactor building's spent fuel pool. The MPCs will then be placed in storage casks on the ISFSI.

In the absence of identifiable DOE cask requirements, the design and capacity of the new ISFSI is based upon a commercial dry cask storage system. The MPC has a capacity of 68 fuel assemblies at a unit cost of approximately \$705,000. An additional cost of \$295,000 is allocated for the concrete storage overpack. It should be noted that

Entergy's contract with the DOE requires DOE to provide transport casks to Entergy, but for present purposes, this estimate includes those costs.

An average cost of \$274,500 was estimated for the labor and equipment to load, seal and transfer each MPC from the storage pool to the ISFSI. A cost of \$76,800 was estimated for the final transfer of the MPC at the ISFSI into a DOE transport cask (50% of the cost incurred for transferring the spent fuel into a dry storage canister).

Operation of the spent fuel pool is discontinued in late 2017 after the fuel has been transferred to dry storage. ISFSI operations continue until such time that the DOE is able to complete the transfer of the Pilgrim fuel to a federal repository (currently anticipated to be in 2042).

#### **4. ISFSI Decommissioning**

Once the spent fuel is removed from the site, ISFSI decommissioning operations would commence. It is assumed that once the MPCs containing the spent fuel assemblies have been removed, any required decontamination performed on the storage modules (some minor activation is assumed) and the license for the facility terminated, the modules can be dismantled using conventional techniques for the demolition of reinforced concrete. The concrete storage pad can then be removed and the area regraded. The cost estimated to decontaminate the ISFSIs to the extent necessary to release the facilities for conventional demolition is estimated at \$4.7 million. Conventional demolition of the remaining overpacks and pads and restoration of the affected area of the site is estimated at \$1.2 million.

#### **5. Financial Assurance**

As of the year ending December 31, 2006, the Pilgrim decommissioning trust fund balance was \$582.63 million and the projected amount necessary for decommissioning is \$482.28 million (Reference 1). Although the decommissioning trust fund is for radiological decommissioning cost only, to the extent that the trust fund balance exceeds costs required for radiological decommissioning, these funds would be available to address costs incurred by the Entergy Corporation including spent fuel management costs.

#### **6. References**

1. Entergy Letter dated March 29, 2007, "Status of Decommissioning Funding for Plants Operated by Entergy Nuclear Operations, Inc. for Year Ending December 31, 2006 – 10 CFR 50.75(f)(1)"

**Table 1**  
**Estimated Spent Fuel Management Costs**  
(thousands of 2006 dollars)

<b>Year</b>	<b>Labor</b>	<b>Equip &amp; Matls</b>	<b>Energy</b>	<b>Burial</b>	<b>Other</b>	<b>Total</b>
2012	0	0	0	0	6,970	6,970
2013	659	159	24	0	11,474	12,318
2014	10,942	2,644	406	0	20,635	34,627
2015	10,942	2,644	406	0	20,635	34,627
2016	10,972	2,652	407	0	20,692	34,722
2017	10,539	2,479	383	0	19,361	32,762
2018	4,815	129	61	0	1,253	6,259
2019	4,815	129	61	0	1,253	6,259
2020	4,829	130	61	0	1,257	6,276
2021	4,815	129	61	0	1,253	6,259
2022	4,815	129	61	0	1,253	6,259
2023	4,815	129	61	0	1,253	6,259
2024	4,829	130	61	0	1,257	6,276
2025	4,815	129	61	0	1,253	6,259
2026	4,815	129	61	0	1,253	6,259
2027	4,815	129	61	0	1,253	6,259
2028	4,829	130	61	0	1,257	6,276
2029	4,815	129	61	0	1,253	6,259
2030	4,815	129	61	0	1,253	6,259
2031	4,815	129	61	0	1,253	6,259
2032	4,829	130	61	0	1,257	6,276
2033	4,815	129	61	0	1,253	6,259
2034	4,815	129	61	0	1,253	6,259
2035	4,815	129	61	0	1,253	6,259
2036	4,829	130	61	0	1,257	6,276
2037	4,815	129	61	0	1,253	6,259
2038	4,815	129	61	0	1,253	6,259
2039	4,815	129	61	0	1,253	6,259
2040	4,829	130	61	0	1,257	6,276
2041	4,815	129	61	0	1,253	6,259
2042	4,802	129	61	0	1,250	6,242
2043	0	0	0	0	0	0
2044	0	0	0	0	0	0
2045	599	200	0	331	81	1,211
2046	810	270	0	447	110	1,638
2047	810	270	0	447	110	1,638
2048	198	85	0	107	26	415
2049	177	824	0	0	0	1,001
2050	40	187	0	0	0	228
	167,137	15,651	3,152	1,333	131,449	318,721

**Table 2**  
**Significant Cost Contributors**

Spent Fuel Management - Direct Expenditures	(2006 dollars)*
ISFSI Construction Cost	18,038,225
Spent Fuel Transfer Facility	3,688,888
Capital Costs of ISFSI MPCs and Overpack	53,258,602
MPC Loading Costs	6,517,036
MPC Transfer Costs from Pool to ISFSI	8,146,295
MPC Transfer Costs from ISFSI to DOE	4,073,148
Total	93,722,194

\* Contingency has been added to all costs (15%)

**Table 3**  
**Estimated Expenditures for ISFSI Construction, Spent Fuel Packaging and Canister Transfer \***

Year	ISFSI Construction	Fuel Transfer Facility	ISFSI Cask Costs	Pool to ISFSI Loading	Pool to ISFSI Transfer	ISFSI to DOE Transfer	Total (\$2006)
2012	6,012,742	0	0	0	0	0	6,012,742
2013	6,012,742	0	0	0	0	0	6,012,742
2014	6,012,742	0	0	0	0	0	6,012,742
2015	0	0	35,170,775	0	0	0	35,170,775
2016	0	0	18,087,827	4,303,703	5,379,629	0	27,771,159
2017	0	3,688,888	0	2,213,333	2,766,666	0	8,668,888
2018	0	0	0	0	0	0	0
2019	0	0	0	0	0	153,704	153,704
2020	0	0	0	0	0	461,111	461,111
2021	0	0	0	0	0	76,852	76,852
2022	0	0	0	0	0	537,963	537,963
2023	0	0	0	0	0	0	0
2024	0	0	0	0	0	230,556	230,556
2025	0	0	0	0	0	0	0
2026	0	0	0	0	0	0	0
2027	0	0	0	0	0	153,704	153,704
2028	0	0	0	0	0	153,704	153,704
2029	0	0	0	0	0	153,704	153,704
2030	0	0	0	0	0	0	0
2031	0	0	0	0	0	230,556	230,556
2032	0	0	0	0	0	230,556	230,556
2033	0	0	0	0	0	0	0
2034	0	0	0	0	0	153,704	153,704
2035	0	0	0	0	0	153,704	153,704
2036	0	0	0	0	0	0	0
2037	0	0	0	0	0	230,556	230,556
2038	0	0	0	0	0	153,704	153,704
2039	0	0	0	0	0	0	0
2040	0	0	0	0	0	230,556	230,556
2041	0	0	0	0	0	76,852	76,852
2042	0	0	0	0	0	691,667	691,667
	18,038,225	3,688,888	53,258,602	6,517,036	8,146,295	4,073,148	93,722,194

\* A 15% contingency factor has been applied to all spent fuel related costs

**Table 4**  
**Projected Schedule and Milestones**

Major Milestones and Fuel-Related Events	
Currently scheduled cessation of plant operations	June 2012
ISFSI available	2015
First MPC transferred from pool to ISFSI	2016
Last MPC transferred from pool to ISFSI	2017
End of wet storage pool operations	2017
DOE begins to receive commercial spent fuel	2017
1st fuel assembly removed from site	2019
Last fuel assembly leaves site	2042
ISFSI decommissioned	2048
ISFSI demolition	2050