



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

September 28, 2018

Mr. Bryan C. Hanson  
Senior Vice President  
Exelon Generation Company, LLC  
President and Chief Nuclear Officer  
Exelon Nuclear  
Oyster Creek Nuclear Generating Station  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: OYSTER CREEK NUCLEAR GENERATING STATION – SAFETY  
EVALUATION RE: UPDATE TO SPENT FUEL MANAGEMENT PLAN  
(EPID L-2018-LRO-0023)

Dear Mr. Hanson:

The U.S. Nuclear Regulatory Commission (NRC) staff has completed reviewing the submittal dated May 21, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18141A486), by Exelon Generation Company, LLC (Exelon or the licensee). In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(bb), the licensee provided an update to the spent fuel management plan (SFMP) for Oyster Creek Nuclear Generating Station (Oyster Creek).

By letter dated January 7, 2011 (ADAMS Accession No. ML110070507), Exelon notified the NRC of its "Certification of Permanent Cessation of Power Operations for Oyster Creek Nuclear Generating Station," to prematurely and permanently cease power operations at Oyster Creek no later than December 31, 2019, pursuant to 10 CFR 50.82(a)(1)(i).

Pursuant to 10 CFR 50.54(bb), Exelon submitted the SFMP and Preliminary Decommissioning Cost Estimate to the NRC on December 30, 2014 (ADAMS Accession No. ML14365A067), and the NRC completed its review by letter dated July 6, 2016 (ADAMS Accession No. ML16131A750).

By letter dated February 14, 2018 (ADAMS Accession No. ML18045A084), Exelon revised its certification to permanently cease power operations at Oyster Creek no later than October 31, 2018, pursuant to 10 CFR 50.82(a)(1)(i). As a result of its decision to retire Oyster Creek 1 year earlier, and related changes to the anticipated schedule of decommissioning activities and spent fuel management activities, Exelon updated the Oyster Creek SFMP to reflect these changes.

Exelon permanently ceased power operations at Oyster Creek on September 17, 2018 (ADAMS Accession No. ML18263A163).

As discussed in 10 CFR 50.54, "Conditions of licenses," paragraph (bb), a "licensee shall notify the NRC of any significant changes in the proposed waste management program as described

in the initial notification." Accordingly, the letter dated May 21, 2018, included the significant changes to the SFMP for NRC review and preliminary approval.

The enclosed safety evaluation documents the NRC staff's review of the updated SFMP for Oyster Creek.

If you have any questions, please contact me at 301-415-3100 or via e-mail at [John.Lamb@nrc.gov](mailto:John.Lamb@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "John G. Lamb". The signature is fluid and cursive, with the first name "John" being the most prominent.

John G. Lamb, Senior Project Manager  
Special Projects and Process Branch  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-219

Enclosure:  
Safety Evaluation

cc: Listserv



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

UPDATE TO SPENT FUEL MANAGEMENT PLAN

EXELON GENERATION COMPANY, LLC

OYSTER CREEK NUCLEAR GENERATING STATION

DOCKET NO. 50-219

1.0 INTRODUCTION

The U.S. Nuclear Regulatory Commission (NRC) staff has completed reviewing the submittal dated May 21, 2018 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML18141A486), by Exelon Generation Company, LLC (Exelon or the licensee). In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(bb), the licensee provided an update to the spent fuel management plan (SFMP) for Oyster Creek Nuclear Generating Station (Oyster Creek).

By letter dated January 7, 2011 (ADAMS Accession No. ML110070507), Exelon notified the NRC of its "Certification of Permanent Cessation of Power Operations for Oyster Creek Nuclear Generating Station," to prematurely and permanently cease power operations at Oyster Creek no later than December 31, 2019, pursuant to 10 CFR 50.82(a)(1)(i).

Pursuant to 10 CFR 50.54(bb), Exelon submitted the SFMP and Preliminary Decommissioning Cost Estimate to the NRC on December 30, 2014 (ADAMS Accession No. ML14365A067), and the NRC completed its review by letter dated July 6, 2016 (ADAMS Accession No. ML16131A750).

By letter dated February 14, 2018 (ADAMS Accession No. ML18045A084), Exelon revised its certification to permanently cease power operations at Oyster Creek no later than October 31, 2018, pursuant to 10 CFR 50.82(a)(1)(i). As a result of its decision to retire Oyster Creek 1 year earlier, and related changes to the anticipated schedule of decommissioning activities and spent fuel management (SFM) activities, Exelon updated the Oyster Creek SFMP to reflect these changes.

Exelon permanently ceased power operations at Oyster Creek on September 17, 2018 (ADAMS Accession No. ML18263A163).

As discussed in 10 CFR 50.54, "Conditions of licenses," paragraph (bb), a "licensee shall notify the NRC of any significant changes in the proposed waste management program as described in the initial notification." Accordingly, the letter dated May 21, 2018, included the significant changes to the SFMP for NRC review and preliminary approval.

Enclosure

## 2.0 BACKGROUND

Oyster Creek is located in approximately 2 miles south of Forked River, New Jersey. The reactor site is comprised of a single reactor and was authorized to operate at a maximum thermal power level of about 1930 megawatts thermal. Oyster Creek received its operating license on April 9, 1969. The reactor is a boiling-water reactor with a Mark I type containment. The principal structures at Oyster Creek include a reactor building that houses primary containment and the reactor, turbine building, office buildings, old and new radwaste buildings, offgas building, emergency diesel generators, intake and discharge structures, ventilation stack, storage tanks, warehouse, and security structures. The Oyster Creek reactor site also houses an independent spent fuel storage installation (ISFSI).

The decommissioning approach that has been selected by Exelon for Oyster Creek is the SAFSTOR method. Under SAFSTOR, often considered "deferred dismantling," a nuclear facility is maintained and monitored in a condition that allows the radioactivity to decay; afterwards, the plant is dismantled and the property decontaminated. In accordance with 10 CFR 50.82(a)(3), decommissioning will be completed within 60 years of permanent cessation of operations.

On July 29, 2018, Holtec International (Holtec) announced that it intends to purchase Oyster Creek from Exelon. Holtec plans to assume ownership of the site, real property, and used nuclear fuel. Holtec plans to manage all site decommissioning and restoration activities. Holtec plans to decommission Oyster Creek within 8 years. This is a significant schedule change from the current plan to decommission Oyster Creek within 60 years of permanent cessation of operations.

By letter dated August 31, 2018 (ADAMS Accession No. ML18243A489), Exelon submitted an application for an order approving the direct transfer of the Oyster Creek Renewed Facility Operating License (RFOL) and General License and proposed conforming amendment for Oyster Creek. This would transfer the Oyster Creek RFOL and General License from Exelon to Oyster Creek Environmental Protection, LLC as the licensed owner, and to Holtec Decommissioning International, LLC as the licensed operator.

## 3.0 REGULATORY EVALUATION

### 3.1 Regulatory Requirement (10 CFR 50.54(bb))

The regulation under 10 CFR 50.54(bb) states, in relevant part:

For nuclear power reactors licensed by the NRC, the licensee shall, within 2 years following permanent cessation of operation of the reactor or 5 years before expiration of the reactor operating license, whichever occurs first, submit written notification to the 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 Secretary of Energy for its ultimate disposal in a repository.

### 3.1.1 Criteria and Information Evaluated to Support the 10 CFR 50.54(bb) Review

Similar to reviews of other SFMPs,<sup>1</sup> the NRC staff reviewed the following information submitted in support of the Oyster Creek SFMP to evaluate and provide preliminary approval of the SFM and funding program:

- Estimated cost to isolate the spent fuel pool (SFP) and fuel handling systems. For the decontamination (DECON) option, the cost to isolate the SFP and fuel handling systems may be considered part of the preparation for DECON;
- Estimated cost to construct an ISFSI or a combination of wet/dry storage;
- Estimated annual cost for the operation of the selected option (wet or dry storage or a combination of the two) until the U.S. Department of Energy (DOE) takes possession of the fuel;
- Estimated cost for the preparation, packaging, and shipping of the fuel to the DOE;
- Estimated cost to decommission the spent fuel storage facility; and
- Brief discussion of the selected storage method or methods and the estimated time for these activities.
- Information identifying the source of funds for managing spent fuel.

### 3.1.2 Spent Fuel Management Strategy

The NRC requires (as discussed in 10 CFR 50.54(bb)) that licensees establish a program “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 Secretary of Energy for its ultimate disposal in a repository.” Pending transfer of the fuel to the DOE [Secretary of Energy], Exelon will store fuel on an interim basis in the SFP and/or the ISFSI located at the Oyster Creek site. A licensed ISFSI is currently operating under a NRC general license at Oyster Creek. Exelon stated that the ISFSI facility will be expanded to accommodate the inventory of spent fuel remaining in the SFP at the time of permanent shutdown. After the required cooling time, the spent fuel will be loaded in fuel storage canisters and moved to the ISFSI. Once the SFP is emptied of fuel, Exelon currently plans to place the facility in a SAFSTOR condition. The existing ISFSI will continue to operate until the transfer of spent fuel to the DOE is complete.

Assuming the DOE’s generator allocation/receipt schedules are based upon the oldest fuel receiving the highest priority and that the DOE begins removing spent fuel from commercial facilities in 2025 with an annual capacity of 3,000 metric tons of uranium, spent fuel is projected by Exelon to remain at the Oyster Creek site for approximately 16 years after the termination of operation (spent fuel is projected by Exelon to be removed from the Oyster Creek site by the

---

<sup>1</sup> Recent reviews include the safety evaluations by the Office of Nuclear Reactor Regulation related to the SFMP of Southern California Edison Company, San Onofre Nuclear Generating Station, Units 2 and 3, Docket Nos. 50-361 and 50-362 (ADAMS Accession No. ML15182A256), and the updated SFMP of Duke Energy Florida, Inc., Crystal River Unit 3 Nuclear Generating Plant, Docket No. 50-302 (ADAMS Accession No. ML14344A408).

end of 2034). Any delay in transfer of fuel to DOE or decrease in the rate of acceptance will correspondingly prolong the transfer process and result in spent fuel remaining at the site longer than anticipated.

Operation and maintenance costs for the storage facilities (ISFSI and SPF) are reflected in the Oyster Creek Decommissioning Cost Estimate dated December 30, 2014, and include the costs for staffing the facilities, maintenance of necessary operational requirements as well as security, insurance, and licensing fees. The estimate includes the costs to purchase, load, and transfer the fuel storage canisters to the ISFSI and to decommission the ISFSI.

#### 4.0 TECHNICAL EVALUATION

##### 4.1 Evaluation of the SFMP Estimated Costs

As previously stated, by letter dated May 21, 2018, Exelon provided an update to its SFMP as preliminarily approved in 2016. This update adjusted the schedule for SFM activities based on an earlier projected permanent cessation of operations date (1 year earlier) and also updated SFM costs (2017 dollars).

The NRC staff's review of the licensee's submittal included the SFM activities and associated cost elements found in the Oyster Creek updated SFMP and site-specific DCE, and those costs previously provided in Exelon's 2016 submittal. The SFMP and associated costs estimated by the licensee total \$290.1 million (2017 dollars), as compared to \$275 million (2016 dollars) in its prior submittals. The NRC staff reviewed estimates for major SFM activities and funding requirements including capital for SFM infrastructure; SFP operation, maintenance, and isolation costs; ISFSI expansion and operating costs; emergency planning costs; security and utility staffing costs; and spent fuel transfer costs. All of the fuel on the ISFSI is stored in Transnuclear NUHOMS Dry Shielded Canisters as provided in the 2016 site-specific DCE submittal.

With regard to spent fuel removal from the reactor site, the licensee indicated that its plan for spent fuel removal remains dependent upon the DOE's ability to remove spent fuel from the site in a timely manner. Accordingly, this plan is based upon a 2025 start date for the DOE's acceptance of spent fuel from the industry, and considers the order by which DOE plans to retrieve spent fuel from individual nuclear power facilities including that from Oyster Creek. The licensee is therefore assuming that DOE will begin accepting spent fuel from Oyster Creek in 2033, with all spent fuel removed from the site by the end of 2034, compared to 2036 as provided in the 2014 SFMP. The licensee maintains its position that DOE has a contractual obligation to accept fuel from Oyster Creek in a timely manner. The NRC staff accepts these assumptions with regard to the final disposition of Oyster Creek spent fuel as the DOE, per the Nuclear Waste Policy Act of 1982, authorizes the DOE to ultimately enter into contracts with owners and generators of commercial spent nuclear fuel to begin taking title to (legal ownership of) spent nuclear fuel. Consistent with the SFMP, the Oyster Creek ISFSI serves to address interim storage requirements of spent fuel at the site.

With regard to the cost estimate for the SFMP and related activities at Oyster Creek, the NRC staff evaluated the \$290.1 million (2017 dollars) estimated cost for reasonableness. In doing so, the NRC staff considered cost information from independent sources and compared that data against information provided by other licensees. One such study, "Blue Ribbon Commission on America's Nuclear Future" (Blue Ribbon Commission Report), published in January 2012 for the DOE, provides cost and cost considerations for the operation and maintenance of spent fuel

storage at shutdown sites. Costs cited in that report<sup>2</sup> range from \$4.5 million to \$8 million per year (2012 dollars) for SFM at shutdown sites. These costs adjusted for inflation (2017 dollars) are \$4.9 million and \$9 million, respectively. Accounting for inflation, and considering the SFMP operational period, the NRC staff determined that the cost estimate provided by Exelon, on the average (approximately \$17 million) exceeds the higher range of costs cited in the study. In addition, the NRC staff determined that the Exelon cost estimate was comparable with a range of other licensees' SFMP cost estimates previously reviewed by NRC staff. The NRC staff acknowledges that potential site-specific variances may exist among individual SFMPs. Based on the foregoing, the NRC staff finds that the \$290.1 million cost estimate for SFM to be reasonable.

#### 4.2 Evaluation of the Program to Manage and Provide Funding of all Spent Fuel

According to Exelon, to the extent that the trust fund balance exceeds costs required for radiological decommissioning, trust fund monies, in conjunction with Exelon operating revenues, will be used to pay for SFM costs. The NRC staff review of an exemption request that would allow Exelon to use excess funds from the Oyster Creek decommissioning trust is currently under review.

As an additional potential source of funding for Oyster Creek SFM costs, Exelon also will rely on reimbursements from the DOE to fund SFMP activities, pursuant to the terms of the settlement agreement between Exelon and the United States Government, concerning DOE's breach of its contract to accept and dispose of spent fuel and high-level waste at Oyster Creek.<sup>3</sup> The DOE has agreed to reimburse Exelon for costs incurred attributable to DOE's failure to meet its contractual obligations for the transfer of spent fuel from Oyster Creek and other Exelon nuclear plants.

Based on Exelon's plan to fund SFM costs with excess funds from the Oyster Creek decommissioning trust (pending exemption request approval) and Exelon operating revenues, as well as anticipated payments from DOE reimbursements as earlier cited, the NRC staff concludes that Exelon's SFMP complies with 10 CFR 50.54(bb).

#### 5.0 CONCLUSION

The NRC staff reviewed estimates for major SFM activities and funding requirements and found the activities and associated costs of the Oyster Creek SFMP appear reasonable. The NRC staff also concludes that the activities and associated costs of the Oyster Creek SFMP appear reasonable, and the NRC staff does not have information that challenges the preliminary approval of the SFMP previously granted by NRC.

Principal Contributor: S. Harwell

Date: September 28, 2018

---

<sup>2</sup> See page 35 of the Blue Ribbon Commission Report.

<sup>3</sup> Settlement Agreement between the U.S. Department of Energy and Exelon Generation Company, LLC (including Commonwealth Edison Company and AmerGen Energy Company), signed and executed August 5, 2004, as amended by the Addendum to the Settlement Agreement signed May 4, 2009.

SUBJECT: OYSTER CREEK NUCLEAR GENERATING STATION – SAFETY  
EVALUATION RE: UPDATE TO SPENT FUEL MANAGEMENT PLAN  
(EPID L-2018-LRO-0023) DATED SEPTEMBER 28, 2018

**DISTRIBUTION:**

PUBLIC

PM File Copy

RidsACRS\_MailCTR Resource

RidsNrrDlpPfpb Resource

RidsNrrDorlLspb Resource

RidsNrrPMOysterCreek Resource

RidsNrrLAJBurkhardt Resource

RidsRgn1MailCenter Resource

SHarwell, NRR

**ADAMS Accession No. ML18226A330**

**\*via memo**

OFFICE	NRR/DORL/LSPB/PM	NRR/DORL/LSPB/LA	NRR/DLP/PFPB/BC*
NAME	JLamb	JBurkhardt	ABowers*
DATE	8/17/18	8/16/18	9/20/18
OFFICE	NRR/DORL/LSPB/BC	NRR/DORL/LSPB/PM	
NAME	GEMiller for DBroaddus	JLamb	
DATE	9/14/18	9/28/18	

**OFFICIAL RECORD COPY**