



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

September 28, 2012

Mr. Jon A. Franke, Vice President
Crystal River Nuclear Plant (NA2C)
ATTN: Supervisor, Licensing & Regulatory Programs
15760 W. Power Line Street
Crystal River, Florida 34428-6708

SUBJECT: CRYSTAL RIVER UNIT 3 NUCLEAR GENERATING PLANT – REVIEW OF
SPENT FUEL MANAGEMENT PROGRAM AND THE PRELIMINARY
DECOMMISSIONING COST ESTIMATE (TAC NO. ME7831)

Dear Mr. Franke:

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(bb), nuclear power plants that are within 5 years of expiration of their operating license must submit a spent fuel management and funding program to the U.S. Nuclear Regulatory Commission (NRC) for review and preliminary approval. The program should discuss the means by which the licensee intends to manage and provide funding for the management of spent fuel until the fuel is transferred to the Department of Energy for permanent disposal. The licensee is also required by 10 CFR 50.75(f)(3) to submit a preliminary cost estimate, which includes an up-to-date assessment of the major factors that could affect the cost to decommission the reactor.

By letter dated November 29, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML113390139), Florida Power Corporation (the licensee) submitted "Crystal River, Unit 3 – Submittal of Program for Maintenance of Irradiated Fuel and Preliminary Decommissioning Cost Analysis in accordance with 10 CFR 50.54(bb) and 10 CFR 50.75(f)(3)". The NRC staff's review of this submittal is enclosed.

The NRC staff finds that the licensee's program for the long-term storage of spent fuel and the preliminary cost estimate for radiological decommissioning of Crystal River Unit 3 Nuclear Generating Plant (Crystal River 3) are adequate and provide sufficient details associated with the funding mechanisms. The NRC staff, therefore, concludes that the licensee's spent fuel management program for Crystal River 3 complies with 10 CFR 50.54(bb) and approves the program on a preliminary basis. In addition, the NRC staff finds that the preliminary cost estimate for Crystal River 3 is not unreasonable and complies with the requirements of 10 CFR 50.75(f)(3).

However, if there are changes in the decommissioning trust funds balance that materially impact the licensee's cost analysis, or if new disposal rates are significantly higher, the licensee is obligated under 10 CFR 50.9 to update any significant changes in projected costs or available funds.

J. Franke

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If you have any questions, please contact me at 301-415-1447 or via e-mail at farideh.saba@nrc.gov.

Sincerely,

Handwritten signature of Farideh E. Saba in black ink.

Farideh E. Saba, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-302

Enclosure:
Staff Evaluation

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
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OFFICE OF NUCLEAR REGULATORY COMMISSION

STAFF EVALUATION

SPENT FUEL MANAGEMENT PROGRAM AND

THE PRELIMINARY DECOMMISSIONING COST ESTIMATE

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3 NUCLEAR GENERATING PLANT

DOCKET NO. 50-302

1.0 INTRODUCTION

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(bb), nuclear power plants that are within 5 years of expiration of their operating license must submit a spent fuel management and funding program to the U.S. Nuclear Regulatory Commission (NRC) for review and preliminary approval. The program should discuss the means by which the licensee intends to manage and provide funding for the management of spent fuel until the fuel is transferred to the Department of Energy (DOE) for permanent disposal. In the same time period, the licensee is also required by 10 CFR 50.75(f)(3) to submit a preliminary cost estimate, which includes an up-to-date assessment of the major factors that could affect the cost to decommission the reactor.

By letter dated November 29, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML113390139), Florida Power Corporation (the licensee, FPC) submitted "Crystal River, Unit 3 – Submittal of Program for Maintenance of Irradiated Fuel and Preliminary Decommissioning Cost Analysis in accordance with 10 CFR 50.54(bb) and 10 CFR 50.75(f)(3)". The following sections document the NRC staff's review of this submittal.

2.0 BACKGROUND

Crystal River Unit 3 Nuclear Generating Plant, (Crystal River 3) is an 838 megawatt electrical pressurized-water reactor licensed to Florida Power Corporation (the licensee, FPC), which is owned by Progress Energy Florida, Inc., a subsidiary of Progress Energy, Inc. (Progress Energy). On July 2, 2012, following a January 8, 2011, Merger Agreement between Progress Energy and Duke Energy Corporation (Duke), Progress Energy merged with Duke. Pursuant to the Merger Agreement, Progress Energy was acquired by Duke in a stock-for-stock transaction and continues as a wholly owned subsidiary of Duke. Crystal River 3 is located in Crystal River, Florida, approximately 80 miles north of Tampa, Florida. The Crystal River 3 operating license was issued on December 3, 1976 and is set to expire on December 3, 2016. On December 16, 2008 the licensee submitted to the NRC an application for the renewal of Facility Operating License No. DPR-72 for an additional 20-year period. That application is currently under review.

Enclosure

The licensee submitted the subject document, in accordance with 10 CFR 50.75(f)(3), until such time that a finding is made on the renewal of the operating license. The licensee states that it has not determined or committed to a specific decommissioning approach for Crystal River 3. However, the licensee is providing the submitted plan for the purposes of demonstrating the adequacy of funding to meet regulatory requirements to use the mothballing (SAFSTOR) decommissioning option based on the current license expiration date. Progress Energy recognizes that license renewal is likely to require a need for revision to this plan.

3.0 REGULATORY REQUIREMENTS AND CRITERIA

3.1 Regulatory Requirement (10 CFR 50.54(bb))

Section 50.54(bb) of 10 CFR states in 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 the 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 to Support the 10 CFR 50.54(bb) Review

For the NRC staff to evaluate and provide preliminary approval of the spent fuel management and funding program, the submittal should include:

- Estimated cost to isolate the spent fuel pool and fuel handling systems. For the decontamination (DECON) option, the cost to isolate the spent fuel pool and fuel handling systems may be considered part of the preparation for DECON;
- Estimated cost to construct an independent spent fuel storage installation (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 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.

3.2 Regulatory Requirement (10 CFR 50.75(f)(3) and (f)(5))

Section 10 CFR 50.75(f)(3) states: "Each power reactor licensee shall at or about 5 years prior to the projected end of operations submit a preliminary decommissioning cost estimate [herein referred to as the preliminary cost estimate] which includes an up-to-date assessment of the major factors that could affect the cost to decommission."

Section 50.75(f)(5) requires a licensee to include plans with the preliminary cost estimate, to adjust decommissioning funding levels to demonstrate a reasonable level of assurance that funds will be available when needed to cover the cost of decommissioning. The preliminary cost estimate should include a comparison to the minimum decommissioning funding amount based on the formulas in 10 CFR 50.75(c), and an assessment of the major factors that could affect the preliminary cost estimate.

3.2.1 Criteria to Support the 10 CFR 50.75(f)(3) Review

NUREG-1713, entitled "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors," Section C1 provides additional guidance on the information that is to be addressed in the preliminary cost estimate. The principal factors to be addressed are:

- Decommissioning option/method anticipated;
- Potential for known or suspected contamination of the facility or site;
- Low-level radioactive waste (LLW) disposition plan;
- Preliminary schedule of decommissioning activities; and
- Any other factors that could significantly affect the cost to decommission.

The cost estimate should provide costs for each of the following:

- Pre-decommissioning engineering and planning - decommissioning engineering and planning prior to completion of reactor defueling;
- Reactor deactivation - deactivation and radiological decontamination of plant systems to place the reactor into a safe, permanent shutdown condition;
- Safe storage - safe storage monitoring of the facility until dismantlement begins (if storage or monitoring of spent fuel is included in the cost estimate, it should be shown separately);
- Dismantlement - radiological decontamination and dismantlement of systems and structures required for license termination (if demolition of uncontaminated structures and site restoration activities are included in the cost estimate, they should be shown separately); and
- LLW disposition - LLW packaging, transportation, vendor processing, and disposal.

4.0 EVALUATION

4.1 Evaluation of the Program to Manage and Provide Funding of all Irradiated Fuel

As required by 10 CFR 50.54(bb), the licensee estimated the cost associated with the long-term management of spent fuel at 271.9 million dollars (note: all dollar values identified in this evaluation are indicated in 2011 dollars). The long-term management of the spent fuel for Crystal River 3 is divided between an initial wet storage of the fresh core, as well as the most recent fuel cycles following shutdown, to provide the cooling for the final core and transfer to an ISFSI. Interim storage of the Crystal River 3 spent fuel, until the DOE takes receipt, will be in the Crystal River 3 fuel storage pool and the ISFSI. Crystal River 3 is projected to generate 1,508 spent fuel assemblies through the end of its currently licensed operations in 2016. According to the licensee, an ISFSI is currently being constructed to support plant operations within the owner controlled area. This facility will also be used for post-shutdown dry fuel storage. All

assemblies stored in the Crystal River 3 fuel storage building's spent fuel storage pool at the time of shutdown will be loaded into multi-purpose canisters and moved into storage casks on the ISFSI pad by the end of year 2023. The licensee estimates that all Crystal River 3 canisters will be removed from the site by the year 2057. The 2057 date is based on a 2020 start date for repository operations and receipt of fuel by DOE.

Direct costs include the procurement of multi-purpose storage canisters as well as the loading and transfer costs associated with transferring the spent fuel from the pool to the ISFSI pad or into a DOE transport cask and the eventual transfer of the fuel to the DOE. A direct cost of 107.56 million dollars is estimated to be required for the Crystal River 3 spent fuel management program. Progress Energy states that, for the purpose of the submitted analysis, the design and capacity of the ISFSI is based upon the NUHOMS system, with a 32 fuel assembly capacity. A cost of approximately 1.46 million dollars is used for pricing each internal multi-purpose canister and the horizontal concrete storage module. Additionally, an average cost of 700,000 dollars is used for the labor and equipment to seal each spent fuel canister once loaded and to transport the spent fuel from the pool to the ISFSI pad. An additional 100,000 dollars is used to estimate the unit cost to transfer the fuel from the ISFSI into a DOE transport cask. For operation and maintenance (O&M) cost estimating, annual costs (excluding labor) of approximately 764,000 dollars and 89,000 dollars are used for spent fuel pool and ISFSI O&M, respectively. Pool operations are expected to continue for six and one-half years following cessation of operations to allow for final core cooling. ISFSI operating costs are based upon a 41 year period of operations following plant shutdown. Progress Energy estimated the annual O&M cost associated with wet and dry storage for the period from 2016 to 2057 at 8.6 million dollars. The cost estimated to decontaminate any activated horizontal storage modules (HSMs), conventional demolition of the HSMs and pad, and restoration of the affected area of the site is estimated at 2.7 million dollars. All costs listed are subsets of the 271.9 million dollars decommissioning cost estimate for Crystal River 3.

The licensee has submitted a license renewal application for Crystal River 3. If Crystal River 3 ceases operation in 2016, the licensee will be required to comply with existing licensing requirements, including operation and maintenance of the systems and structures needed to support continued operation of the spent fuel pool. The licensee states that it intends to fund expenditures for license termination from the decommissioning trust fund (DTF) currently held by FPC as well as the nine minority owners. The licensee further states that the management of the spent fuel, until it can be transferred to the DOE, may be funded from excess trust fund earnings and from proceeds gained from spent fuel litigation against the DOE. The licensee maintains that expenditures from the trust fund for the management of the spent fuel will not reduce the value of the DTF below the amount necessary to place and maintain the reactor in safe storage. For assurance, the licensee applied a real rate of return of 2.0 percent to its analysis and deducted the annual expenses associated with SAFSTOR, which resulted in a surplus of approximately 865.21 million dollars over the 753.72 million dollars estimated cost license termination. The licensee acknowledged the need for an exemption pursuant to 10 CFR 50.12(a) to use radiological DTF for anything beyond decommissioning activities as defined in 10 CFR 50.2. In addition, the licensee stated that it 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.

The NRC staff finds the spent fuel management program estimates to be reasonable, based on a cost comparison with similar decommissioning reactors, while acknowledging that there are large uncertainties and potential site-specific variances.

4.2 Evaluation of the Preliminary Decommissioning Cost Estimate

The licensee estimated the total decommissioning cost of Crystal River 3 to be approximately 1,077.60 million dollars in 2011 dollars. This cost includes 753.72 million dollars for license termination expenditures, 271.91 million dollars for spent fuel management expenditures, and 51.97 million dollars for site restoration expenditures. The licensee has elected to use the SAFSTOR option with decommissioning completed in 2078.

Prior to starting the detailed review of the cost estimate, the NRC staff reviewed the estimate to confirm the supporting systems/structures necessary to support the safe operation had been identified in the estimate. The validity of the cost estimate is based on a reasonable estimate of the cost to decommission the supporting systems and structures, as well as confirming that all of the major equipment necessary to support operation was included.

The licensee has divided the estimated total cost of 685.1 million dollars into the following principal categories/activities: decontamination costs; support systems/component removal; packaging; transportation; waste disposal; off-site waste processing; program management; site security; spent fuel pool isolation; spent fuel management; insurance and regulatory fees; energy; characterization and licensing surveys; property taxes; utility site indirect; corporate allocations; and miscellaneous equipment costs. The licensee included a time line and an annual cost projection that identifies when these activities will take place, and the costs associated with each of these items. In addition, the licensee identified the contingency factors for the major activities with an overall average contingency of 16.1 percent. The NRC staff reviewed the contingency factors and the work difficulty factors used in the TLG Services Inc. cost estimate and found them to be reasonable.

The NRC staff recognized that a significant uncertainty exists regarding the low-level waste disposal cost since Barnwell no longer accepts waste from Non-Atlantic Compact members. The NRC staff concluded that the waste volume estimates were in a reasonable range. For disposal cost estimating purposes, the disposal rate is reasonable based on the mix of waste and the available disposal options. However, when new disposal facilities become available, or if the Barnwell disposal site reopens to members outside its compact, disposal rates will likely be significantly higher.

The DTF balance could be subject to decline, depending on the performance of DTF investments. The licensee's decommissioning cost analysis was based on a DTF balance for radiological decommissioning of 578.0 million dollars as of September 30, 2011. The licensee applied a real rate of return of 2.0 percent to its analysis and deducted the annual expenses associated with SAFSTOR, which resulted in a surplus of approximately 865.21 million dollars over the 753.72 million dollars estimated cost license termination. The NRC staff noted that this surplus of funds is sufficient to cover the remaining costs for spent fuel management and site restoration. NRC staff confirmed that the DTF has sufficient funds to pay for radiological decommissioning and spent fuel management. If there are changes in the DTF balance that materially impact the

licensee's cost analysis, or if new disposal rates are significantly higher, given these considerations, the licensee would be under an obligation under 10 CFR 50.9 to update any significant changes in the projected cost or available funds.

The NRC staff finds the preliminary cost estimate for radiological decommissioning of Crystal River 3 is not unreasonable, and that the DTF balance, as of September 30, 2011, will be sufficient to fund the radiological decommissioning.

5.0 CONCLUSION

The NRC staff finds that the licensee's program for the long-term storage of spent fuel and the preliminary cost estimate for radiological decommissioning of Crystal River 3 are adequate and provide sufficient details associated with the funding mechanisms. The NRC staff, therefore, concludes that the licensee's spent fuel management program for Crystal River 3 complies with 10 CFR 50.54(bb) and approves the program on a preliminary basis. In addition, the NRC staff finds that the preliminary cost estimate for Crystal River 3 complies with the requirements of 10 CFR 50.75(f)(3) and the NRC staff finds that the preliminary cost estimate is not unreasonable.

However, if there are changes in the DTF balance that materially impact the licensee's cost analysis, or if new disposal rates are significantly higher, the licensee would be obligated under 10 CFR 50.9 to update any significant changes in projected costs or available funds.

Principal Contributor: Shawn W. Harwell

Date: September 28, 2012

J. Franke

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If you have any questions, please contact me at 301-415-1447 or via e-mail at farideh.saba@nrc.gov.

Sincerely,

/RA/

Farideh E. Saba, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-302

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Staff Evaluation

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