



Crystal River Nuclear Plant
15760 W. Power Line Street
Crystal River, FL 34428

Docket 50-302
Operating License No. DPR-72

10 CFR 50.82

June 17, 2014
3F0614-02

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

Subject: Crystal River Unit 3 – Post-Shutdown Decommissioning Activities Report –
Response to Request for Additional Information

- References:
1. CR-3 to NRC letter dated December 2, 2013, "Crystal River Unit 3 – Post-Shutdown Decommissioning Activities Report," (ADAMS Accession No. ML13340A009)
 2. NRC to CR-3 Electronic Mail dated April 28, 2014, "Crystal River Unit 3 – Request for Additional Information on the Post Shutdown Decommissioning Activities Report (Tac No. MF3210)," (ADAMS Accession No. ML14104A039)
 3. NRC to CR-3 letter dated May 14, 2014, "Crystal River Unit 3 – Request for Additional Information on the Post-Shutdown Decommissioning Activities Report," (ADAMS Accession No. ML14133A503)

Dear Sir:

In accordance with 10 CFR 50.82, Duke Energy Florida, Inc. (DEF) submitted the Post-Shutdown Decommissioning Activities Report (PSDAR) to document the plans and schedule for the decommissioning of the Crystal River Unit 3 (CR-3) Nuclear Plant (Reference 1). On April 28, 2014, DEF received a request for additional information (RAI) associated with the PSDAR submittal (Reference 2). Reference 3 provided a correction to the RAI questions, whereby the NRC withdrew RAI Question No. 5.

The RAIs and the associated DEF responses can be found in the attached enclosure.

There are no new regulatory commitments associated with this RAI response.

If you have any questions regarding this submittal, please contact Mr. Dan Westcott, Manager, Nuclear Regulatory Affairs, at (352) 563-4796.

Sincerely,



John Einitsky, Vice President
Project Management and Construction
JE/par

Enclosure: Post-Shutdown Decommissioning Activities Report – Response to Request for
Additional Information

xc: NRR Project Manager
Regional Administrator, Region I

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DUKE ENERGY FLORIDA, INC.

DOCKET NUMBER 50 - 302 / LICENSE NUMBER DPR - 72

ENCLOSURE

**POST-SHUTDOWN DECOMMISSIONING ACTIVITIES REPORT
– RESPONSE TO REQUEST FOR ADDITIONAL
INFORMATION**

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

By letter dated December 2, 2013 and in accordance with 10 CFR 50.82, Duke Energy Florida, Inc. (DEF) submitted the Post-Shutdown Decommissioning Activities Report (PSDAR) to document the plans and schedule for the decommissioning of the Crystal River (CR-3) Unit 3 Nuclear Plant (ADAMS Accession No. ML13340A009). On April 28, 2014, DEF received a request for additional information (RAI) associated with the PSDAR submittal (ADAMS Accession No. ML14104A039). On May 14, 2014, the NRC provided a correction to the RAI questions, whereby the NRC withdrew RAI Question No. 5 (ADAMS Accession No. ML14133A503). The RAIs and the DEF responses are provided below.

RAI #1:

Per 10 CFR 50.82(a)(4)(i), licensees must submit a PSDAR that has a Site-Specific DCE. Regulatory Guide 1.185 Revision 1, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report," indicates that the amount in the cost estimate cannot be less than the minimum amount calculated from 10 CFR 50.75(c). DEF did not provide the minimum amount from 10 CFR 50.75(c). Provide the minimum formula amount per 10 CFR 50.75(c)(1) for CR-3 in 2013 dollars. The staff requires assurance that the Site-Specific DCE for radiological decommissioning is not less than the minimum formula amount.

Response to RAI #1

Although it was presented as apportioned for each co-owner, DEF provided the minimum formula amount by letter dated March 31, 2014, "Crystal River Unit 3 – Annual Decommissioning and Irradiated Fuel Management Financial Status Report for 2013," (ADAMS Accession No. ML14098A039). DEF calculated the Decommissioning Cost Estimate (DCE) minimum formula amount to complete CR-3 decommissioning, per 10 CFR 50.75(c)(1), as \$483,349,110 in 2013 dollars.

RAI #2

Per 10 CFR 50.82(a)(4)(i), licensees must include in their Site-Specific DCEs costs for managing spent fuel. Section 50.54(bb) of 10 CFR requires licensees to provide a plan for management of spent fuel within 2 years of permanent cessation of operations. Provide additional information on "internal probability assessment" related to the dates when the Department of Energy (DOE) will assume control of spent nuclear fuel. Why did DEF assume 2032 as the first year that DOE will assume control of spent nuclear fuel in the country as discussed in Section 1 of the Site-Specific DCE?

Response to RAI #2

In order to estimate the costs associated with maintenance of the CR-3 site, in SAFSTOR and the eventual decommissioning of the site, DEF assumed 2032 as the first year that the DOE will begin removing spent nuclear fuel from nuclear power reactor sites. Pursuant to the Nuclear Waste Policy Act (Reference 1), the federal government has the responsibility to remove all spent fuel from CR-3 and other commercial nuclear power reactor sites. However, the DOE spent fuel and high-level waste management program is currently stalled. Given the status of the DOE program, DEF conducted an assessment of the probable scenarios under which the government would fulfill its

contractual obligation to remove spent fuel from CR-3. The two scenarios are described in more detail below. In conducting this assessment, DEF considered information made publicly available by DOE, the Government Accountability Office (GAO), and the Blue Ribbon Commission on America's Nuclear Future, as well as the current political environment surrounding this issue. Based on the information available at the time of its assessment, Duke Energy concluded that 2032 was the most likely timeframe for DOE to initiate removal of commercial nuclear fuel from reactor sites. However, it should be noted that factors such as local, state and federal political considerations will impact the timing of spent fuel removal.

Scenario 1: Yucca Mountain

In this scenario, pursuant to the Nuclear Waste Policy Act, the government would develop a geologic repository at Yucca Mountain, Nevada. In 2010, DOE stopped work on Yucca Mountain and attempted to withdraw its application for a construction authorization. However, in 2013 the United States Court of Appeals for the District of Columbia Circuit ordered the NRC to resume work on the license application review to the extent allowed by available funding (Reference 2). NRC staff review work is underway, but funding is insufficient to complete the licensing process and additional appropriations for licensing work are currently unavailable. In 2012, the GAO performed a study of various options for getting to a point of being able to move spent nuclear fuel from reactor sites. The GAO estimated 15 years would be required from the point of restarting Yucca Mountain licensing efforts before the repository site would be open and able to accept spent nuclear fuel (Reference 3). Using the nominal 15 year estimate and assuming that work begins in earnest in 2017, following the next presidential election, the earliest date for operation of the Yucca Mountain repository would be 2032.

Scenario 2: Centralized interim storage

This scenario is based on plans outlined in the DOE document, "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," January 2013 (Reference 4). Under this scenario, the DOE would develop a pilot interim storage facility with limited capacity capable of accepting used nuclear fuel and high-level radioactive waste and initially focused on serving shutdown reactor sites such as CR-3. This scenario is also based on recommendations from the Blue Ribbon Commission on America's Nuclear Future (Reference 5).

For centralized interim storage, the DOE established a target start date of 2021 for beginning fuel pickup from shutdown plants. DEF considers that date to be technically feasible but very optimistic given political and institutional considerations. The DOE maintains it needs legislative authorization to proceed with an interim storage project, and the project will require annual appropriations in order to carry it out. Additionally, the DOE must find a site and an interim storage facility must be licensed by the NRC, a process that includes an opportunity for opponents to challenge the application in a hearing process. DEF believes that if the DOE moves forward with centralized interim storage, it is unlikely the facility would be open and able to accept spent nuclear fuel by the DOE target date of 2021. Given the current lack of necessary legislation, funding and an appropriately characterized site, DEF

assumed 2032 to be a reasonable date by which initiation of spent nuclear fuel removal under a DOE interim storage program would begin.

This assessment considers two possible scenarios for spent nuclear fuel removal from commercial nuclear power plants: developing a geologic repository at Yucca Mountain and opening a pilot centralized interim storage facility. Considering both scenarios, 2032 is viewed as a reasonable median date by which the federal government will begin spent fuel removal from nuclear power reactor sites. As described in this response, there is uncertainty associated with any prediction of a schedule for future spent nuclear fuel management activities. The date used by DEF is later than the interim storage dates the DOE provided in Reference 3. Therefore, the DEF date is conservative relative to the DOE dates from the standpoint of overall spent fuel management costs.

RAI #3

Per 10 CFR 50.82(a)(8)(iii), licensees must submit a Site-Specific DCE. Guidance for providing DCEs is provided in Regulatory Guide 1.202, "Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors" (ADAMS Accession No. ML050230008).

Since information provided in the Site-Specific DCE is needed for reasonable assurance of availability of funds for decommissioning, the staff requests that DEF address the difference in Class B and C waste volume compared to the reference Pressurized-Water Reactor (PWR) in NUREG-1713, "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors" (ADAMS Accession No. ML043510113). The staff noted an 83-percent difference between combined Class B and C waste volume from Table 5.1 in the CR-3 Site-Specific DCE (1338 cubic feet) compared to those for the reference PWR in NUREG-1713, Table 20 (9900 cubic feet).

Response to RAI #3

The majority of the radioactive waste classified as Class B, C and greater than class C (GTCC) (10 CFR §61.55), particularly in the SAFSTOR alternative, is generated in the segmentation of the reactor vessel's internal components. For purposes of this response, the volume of GTCC has been included in the comparison of the total waste volumes since there is some uncertainty inherent in the classification of the activated materials/components without a detailed activation analysis (providing the spatial distribution of the radioactivity), and a disposition/segmentation plan.

The curie content of the reactor vessel's internal components in the Site-Specific DCE was derived from the curie/gram values listed in NUREG/CR-3474, "Long-Lived Activation Products in Reactor Materials," adjusted for the mass of the CR-3 reactor components, operating life, and period of decay. CR-3 operated for approximately 22.5 effective full power years (at 2609 Megawatt Thermal (MWt) maximum power level) before being permanently shut down. Additional short-lived isotopes were derived from NUREG/CR-0130, "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," and NUREG/CR-0672, "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station, Main Report," and benchmarked to the long-lived values from NUREG/CR-3474. A total waste volume of 3,123 cubic feet for Class B, C and GTCC waste (Table 5.1 in the Site-

Specific DCE) was estimated for the SAFSTOR alternative, assuming that the segmentation of the internal components occurred approximately 60 years after the plant last operated in 2009.

For comparison, the reactor vessel's internal components at Rancho Seco were segmented approximately 20 years after the cessation of operations in 1989. Rancho Seco is similar in design to CR-3, with the same Nuclear Steam Supply System supplier (Babcock & Wilcox) and a slightly higher thermal power level (NUREG-1350, Appendix C). The EPRI report, "Rancho Seco Nuclear Generating Station Decommissioning Experience Report, Detailed Experiences 1989-2007," Report No. 1015121, dated December 2007, reported a total volume of Class B, C and GTCC waste of 3,648 cubic feet from the decommissioning, or 17% higher than the current Crystal River waste projection. This variance is not unreasonable given the differences in operating history, segmentation timing and the inherent uncertainties in waste packaging efficiencies.

NUREG-1713

Table 20 in NUREG-1713 provides waste volumes by waste class. The total reported for Class B, C and GTCC is 10,300 cubic feet for the Reference PWR. NUREG-1713 refers to NUREG/CR-5884, Vol. 1, "Revised Analyses of Decommissioning for the Reference Pressurized Water Reactor Power Station," as the source for the Reference PWR. NUREG/CR-5884 provides waste volume estimates for several decommissioning alternatives (DECON, SAFSTOR and ENTOMB) in Table ES.1 (Page xvi). Waste volumes are provided for two SAFSTOR scenarios and vary by about a factor of 10 depending upon the assumptions on the decay of radioactive materials over the storage period (from the DECON volume with no volume reduction due to radioactive decay to approximately 1/10 of the DECON volume with significant volume reduction due to decay).

The waste volume of 10,300 feet for Class B, C and GTCC in NUREG/CR-5884 is based upon the DECON alternative according to the discussion on Page xxi. The 3,123 cubic feet calculated for the Class B, C and GTCC waste in the Crystal River Site-Specific DCE for the SAFSTOR alternative represents a reduction of about a factor of 3 in the 10,300 cubic feet reported for the Reference PWR (DECON alternative).

Some variance in the decommissioning waste volume (from the NUREG/CR-5884 reference values) is to be expected with the different reactor designs (Westinghouse for the Reference PWR vs. Babcock & Wilcox for Crystal River), different operating histories, activation assumptions, segmentation and packaging assumptions (i.e., used to estimate disposal volumes) and radioactive decay assumptions. A reduction of a factor of 3 is within the range of the decrease presented in NUREG/CR-5884 (a factor of 0 to 10) for the SAFSTOR estimates.

RAI #4

Per 10 CFR 50.82(a)(8)(iii), licensees must submit a Site-Specific DCE. Guidance for providing DCEs is provided in Regulatory Guide 1.202, "Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors," (ADAMS Accession No. ML050230008).

The staff requests that DEF address the difference in cost between Period 1, Planning and Preparation from NUREG-1713, Table 6, and the Site-Specific DCE Planning and Preparation amount from Table 2. In Table 2 of the Site-Specific DCE, DEF assumed approximately \$145 million in 2013 dollars. Table 6 of NUREG-1713 assumes \$14.5 million, in 2000 dollars. Assuming an adjustment per the Consumer Price Index, from 2000 dollars to 2013 dollars, NUREG-1713 Planning and Preparation costs would be approximately \$20 million.

Response to RAI #4

DEF made the decision to prematurely decommission CR-3 in February 2013. Prior to this date, it was assumed that the containment structure would be repaired and the plant would return to an operating status. Consequently, DEF had not conducted extensive decommissioning planning or preparations prior to this decision. Substantial staff must be maintained from February 2013 through the middle of 2015 for planning and preparation prior to entering SAFSTOR. The total operations and maintenance funding allocated for Period 1 is approximately \$118 million. Period 1 is defined as Planning and Preparations and runs from June 3, 2013 through July 1, 2015. Additionally, approximately \$5 million is allotted for design and construction of the spent fuel island systems, \$20 million for disposal of legacy radioactive waste (including the old steam generators and the old reactor vessel closure head) and \$2 million for taxes. This information is identified in Table C of the Decommissioning Cost Estimate under "Period 1 Additional Costs."

RAI #5

This RAI question has been withdrawn as documented in the NRC to CR-3 letter dated May 14, 2014 (ADAMS Accession No. ML14133A503).

RAI #6

Section 50.82(a)(8)(vi) of 10 CFR states: "If the sum of the balance of any remaining decommissioning funds, plus earnings on such funds calculated at not greater than a 2-percent real rate of return, together with the amount provided by other financial assurance methods being relied upon, does not cover the estimated cost to complete the decommissioning, the financial assurance status report must include additional financial assurance to cover the estimated cost of completion."

In the 2011 Preliminary DCE for CR-3 (ADAMS Accession No. ML113390139), a 2-percent real rate of return was assumed in Table 3. In the PSDAR Table 4, the real rate of return was lowered to 1.65 percent. The staff requests that DEF provide the FPSC Order authorizing DEF to use a real rate of return of 1.65 percent.

Response to RAI #6

DEF does not have an Order from the Florida Public Service Commission (FPSC) authorizing the use of a real rate of return of 1.65 percent. In the most recent Order issued (by the FPSC) on April 30, 2012, the FPSC approved an assumed fund earning rate of 5.47 percent and an escalation rate of 2.8 percent (resulting in a real rate of return of 2.67 percent).

The real rate of return of 1.65 percent in the PSDAR was used because during the preparation of the PSDAR, DEF performed an internal financial analysis that resulted in a conservative, assumed real rate of return of 1.65 percent. Subsequently, on March 21, 2014, DEF submitted a petition to the FPSC which, among other things, requested that the FPSC approve an assumed average annual fund earning rate of 4.47 percent which is made up of 5.1 percent for the normal growth portion of the fund and 2.80 percent for the low risk portion of the fund and which represents a spread of 1.67 percent over the forecasted inflation rate of 2.80 percent. The FPSC has not yet acted on this petition.

The above referenced earnings rates only account for DEF's planning assumptions and do not account for the assumptions of the other owners. For this reason, the "Crystal River Unit 3 – Annual Decommissioning and Irradiated Fuel Management Financial Status Report for 2013," submitted by letter dated March 31, 2014 (ADAMS Accession No. ML14098A039), returned to the use of a 2 percent real rate of return, as allowed by 10 CFR 50.82(a)(8)(vi). Specifically, Attachments 11 and 12 of that submittal provide the information to meet the requirements of 10 CFR 50.82(a)(8)(vi) and (vii). For the purpose of demonstrating compliance with 10 CFR 50.82(a)(8)(vi), DEF requests that the NRC rely on the analysis provided in the "Crystal River Unit 3 Annual Decommissioning and Irradiated Fuel Management Financial Status Report for 2013."

References

1. United States of America Public Law 97-425, "Nuclear Waste Policy Act of 1982," dated January 7, 1983.
2. United States Court of Appeals for the District of Columbia Circuit, No. 11-1271, "On Petition for Writ of Mandamus", dated August 13, 2013.
3. GAO-12-797, "Spent Nuclear Fuel – Accumulating Quantities at Commercial Reactors Present Storage and Other Challenges," dated August 2012.
4. "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," Department of Energy, dated January 2013.
5. "Report to the Secretary of Energy by the Blue Ribbon Commission on America's Nuclear Future," dated January 26, 2012.