DUKE ENERGY®

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

Docket 50-302
Operating License No. DPR-72

10 CFR 50.54

December 3, 2013
3F1213-01

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

Subject: Crystal River Unit 3 – Update to Irradiated Fuel Management Program Pursuant to 10 CFR 50.54(bb)

References:

1. CR-3 to NRC letter dated November 29, 2011, "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)" (ADAMS Accession No. ML11339A040)

2. NRC to CR-3 letter dated September 28, 2012, "Crystal River Unit 3 Nuclear Generating Plant – Review of Spent Fuel Management Program and the Preliminary Decommissioning Cost Estimate (TAC NO. ME7831)" (ADAMS Accession No. ML12262A245)

3. NRC to CR-3 letter dated March 13, 2013, "Crystal River Unit 3 Nuclear Generating Plant Certification of Permanent Cessation of Operation and Permanent Removal of Fuel From the Reactor" (ADAMS Accession No. ML13058A380)

4. CR-3 to NRC letter dated December 2, 2013, "Crystal River Unit 3 – Post-Shutdown Decommissioning Activities Report"

5. Issued October 9, 2013, in Docket No. 130207-EI / Order No. PSC-13-0452-FOF-EI, *In re: Petition for declaratory statement with respect to use of decommissioning trust fund dollars for spent fuel and other non-radiological decommissioning costs for Crystal River 3 Nuclear Plant*

Dear Sir:

Pursuant to 10 CFR 50.54(bb), Duke Energy Florida, Inc. (DEF) submitted the Irradiated Fuel Management Program for Crystal River Unit 3 (CR-3) by letter dated November 29, 2011 (Reference 1). 10 CFR 50.54(bb) requires that a licensee submit this report within five years of the expiration of the reactor operating license. This report was submitted in 2011 because, at that time, CR-3 was approaching five years from operating license expiration. By letter dated September 28, 2012 (Reference 2), the NRC Staff notified CR-3 that the Irradiated Fuel Management Program submitted by CR-3 in Reference 1 complied with 10 CFR 50.54(bb) and approved the program on a preliminary basis.

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In Reference 3, the NRC acknowledged CR-3's certification of permanent cessation of power operation and permanent removal of fuel from the reactor vessel. Pursuant to 10 CFR 50.54(bb), licensees are required to notify the NRC of any significant changes in the proposed Irradiated Fuel Management Program as described in the initial notification.

DEF's determination to permanently cease operation of CR-3 has resulted in a change to the timing of the decommissioning approach that was assumed in Reference 1. This change in timing has been analyzed in the CR-3 Post-Shutdown Decommissioning Activities Report (PSDAR) (Reference 4) which also includes the costs for managing irradiated fuel and site restoration. The PSDAR approach for managing spent fuel contains some material differences from what was assumed in Reference 1. Therefore, this update to the Irradiated Fuel Management Program is being submitted concurrent with Reference 4.

The Attachment to this letter includes a discussion on financial assurance for spent fuel management and site restoration. An element of the financial assurance demonstration includes relying on decommissioning trust funds for spent fuel management and site restoration. Use of decommissioning trust funds for spent fuel management is based upon the Declaratory Statement issued by the Florida Public Service Commission (FPSC) (Reference 5) establishing the FPSC's intention that decommissioning funds collected from DEF customers be used for license termination, spent fuel management, and site restoration purposes. DEF recognizes that use of the decommissioning funds for spent fuel management necessitates further interactions with the NRC Staff.

There are no new regulatory commitments made within this submittal.

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

Sincerely,

Terry D. Hobbs
Decommissioning Director

TDH/drw

Attachment: Updated Irradiated Fuel Management Program – 10 CFR 50.54(bb)

xc: NRR Project Manager
Regional Administrator, Region I

DUKE ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50-302 / LICENSE NUMBER DPR-72

ATTACHMENT

UPDATED IRRADIATED FUEL MANAGEMENT PROGRAM – 10 CFR 50.54(bb)

UPDATED IRRADIATED FUEL MANAGEMENT PROGRAM – 10 CFR 50.54(bb)

I. Background and Introduction

By letter dated November 29, 2011 (Reference 1), Duke Energy Florida, Inc. (DEF) submitted the initial Program for Maintenance of Irradiated Fuel for Crystal River Unit 3 (CR-3), pursuant to 10 CFR 50.54(bb). 10 CFR 50.54(bb) requires submittal of this report five years prior to the expiration of the reactor operating license. This report was submitted in 2011 because, at that time, CR-3 was approaching five years from the scheduled operating license expiration of December 3, 2016. By letter dated September 28, 2012 (Reference 2), the NRC Staff notified CR-3 that the Irradiated Fuel Management Program submitted by CR-3 complied with 10 CFR 50.54(bb) and approved the program on a preliminary basis.

CR-3 has been shutdown since September 26, 2009, when the plant entered the Cycle 16 refueling outage to replace the steam generators. Twice during the course of the extended outage, all fuel assemblies were offloaded to the spent fuel pools. The final removal of fuel from the reactor vessel was completed on May 28, 2011. As of that date, all fuel assemblies have been removed from the reactor vessel and are located in the spent fuel pools for temporary storage. Certification of the permanent cessation of power operations and defueling was submitted by CR-3 to the Nuclear Regulatory Commission (NRC) by letter dated February 20, 2013 (Reference 3). In Reference 4, the NRC acknowledged CR-3's certification of permanent cessation of power operation and permanent removal of fuel from the reactor vessel.

Pursuant to 10 CFR 50.54(bb), licensees are required to notify the NRC of any significant changes in the proposed Irradiated Fuel Management Program as described in the initial notification. As a result of changes in timing of the decommissioning approach, DEF is revising the CR-3 Irradiated Fuel Management Program and is submitting this program update to notify the NRC of these changes in accordance with 10 CFR 50.54(bb).

TLG Services, Inc. (TLG) was contracted by DEF to prepare the site-specific Decommissioning Cost Estimate (DCE) contained in the Post-Shutdown Decommissioning Activities Report (PSDAR) (Reference 5). The methodology used by TLG to develop the DCE follows the basic approach originally advanced by the Atomic Industrial Forum (AIF) in their program to develop a standardized model for decommissioning cost estimates. The results of its program were published as AIF/NESP-036, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," (Reference 6). The AIF report presents a unit cost factor method for estimating direct activity costs, simplifying the estimating process. The unit cost factors used in the study reflect the latest available data, at the time of the study, concerning worker productivity during decommissioning.

II. Irradiated Fuel Management Strategy

There are 1,319 fuel assemblies currently stored in the spent fuel pools at CR-3. In anticipation of reactor startup in 2011, 76 new fuel assemblies were loaded into the reactor, but were offloaded without being in a critical core. Since these fuel assemblies were never used for power generation, they are not considered irradiated fuel. DEF is actively exploring options for shipping the 76 fresh fuel assemblies offsite for reuse. The Updated Irradiated Fuel Management Program focuses on the maintenance and disposition of the 1,243 fuel assemblies that were used for power generation.

DEF will construct an Independent Spent Fuel Storage Installation (ISFSI) with sufficient capacity to store the 1,243 irradiated fuel assemblies. The ISFSI will be located within the CR-3 owner controlled area and will be operated under a general license per 10 CFR 72.6(b). While spent fuel is stored in the spent fuel pools, spent fuel storage and handling systems will be maintained in operation. Following the transfer of all spent fuel from the spent fuel pools to the CR-3 ISFSI, all spent fuel will be stored at the ISFSI until transferred to the Department of Energy (DOE) for interim storage and/or ultimate disposal.

The CR-3 ISFSI will utilize the standardized NUHOMS® Horizontal Modular Storage System. This system uses a dry shielded canister (DSC) that is designed to hold 32 spent fuel assemblies. The loaded DSCs are transported from the spent fuel pool to the ISFSI in a transfer cask. At the ISFSI, the loaded DSCs are placed in horizontal storage modules (HSMs).

The major periods in the Irradiated Fuel Management Program, including start and end dates as well as associated costs, are identified in Table 1 below. The cost and schedule information, including the basis for the assumed DOE transfer date, is taken from the PSDAR.

Table 1

Irradiated Fuel Management Program
Summary Schedule and Costs

Decommissioning Periods	Start	End	Fuel Management Cost (Thousands of 2013 dollars)	Duration (years)
Period 1: Planning and Preparations	2013	2015	33,638	2
Period 2a: Dormancy with Wet Fuel Storage	2015	2019	147,032	4
Period 2b: Dormancy with Dry Fuel Storage	2019	2036	84,835	17
Total			265,505	23

The $265,505,000 includes the costs to load and transfer the DSCs, as well as operations and maintenance costs (e.g., staffing, security, insurance, and licensing fees, etc.). It does not include $93.8M for ISFSI capital costs such as construction of the pad/apron and purchasing NUHOMS® components. The basis for separating out the ISFSI capital costs is provided in Section III.

Irradiated Fuel Management in Period 1 – Planning and Preparations

The Irradiated Fuel Management Program activities that occur in Period 1 are as follows:

- Creation of an organizational structure to support the decommissioning plan and evolving emergency planning and site security requirements.
- Design and installation of an alternate spent fuel cooling system, including air-cooled heat exchangers to be located on the control complex roof and piped into the existing service

water system and chilled water system.

- Isolation of the spent fuel pools and fuel handling systems so that safe-storage operations may commence on the balance of the plant.
- Initiation of construction of the ISFSI pad and acquisition of the dry fuel storage modules.
- Shipment of the 76 fresh fuel assemblies offsite.

If for some reason the fresh fuel assemblies are not shipped offsite in Period 1, additional DSCs/HSMs are available onsite for storing the 76 assemblies on the ISFSI pad.

Irradiated Fuel Management in Period 2a – Dormancy with Wet Fuel Storage

The Irradiated Fuel Management Program activities that occur in Period 2a include completion of ISFSI construction. Once the ISFSI has been constructed, the spent fuel will be loaded into DSCs and transferred to the HSMs located on the ISFSI pad. The projected schedule for transferring spent fuel from the pools to the ISFSI is outlined in Table 2. The pools will be drained and prepared for long-term storage after spent fuel transfer is completed.

Irradiated Fuel Management in Period 2b – Dormancy with Dry Fuel Storage

Dormancy activities include a 24-hour security force as well as preventive and corrective maintenance on security systems, area lighting, and site facilities. Routine radiological inspections of contaminated structures will also be performed and site environmental and radiation monitoring programs will continue to be conducted.

The principal Irradiated Fuel Management Program activity that occurs in Period 2b is the transfer of the spent fuel from the ISFSI to a DOE facility expected to begin in 2035 and be completed at the end of 2036. Table 2 contains the detailed projection for transferring spent fuel to DOE.

Table 2

Decommissioning Fuel Movement Schedule

Year	CR-3 Pool Inventory (assemblies)	Fresh Fuel Shipment (assemblies)	Pool to ISFSI (assemblies)	ISFSI Inventory (assemblies)	ISFSI Casks Loaded	ISFSI Casks Transferred to DOE
2013	1319		0			
2014	1319		0			
2015	1243	76	0			
2016	1243		0			
2017	635		608	608	19	0
2018	0		635	1243	20	0
2019 - 2034	0			1243		0
2035	0			635		19
2036	0			0		20

III. Financial Assurance

Attachment 1 of the PSDAR (Reference 5) contains an estimate of the costs for license termination, spent fuel management, and site restoration. Tables 3.2, 3.3, and 3.4 in Attachment 1 delineate the annual expenditures for license termination, spent fuel management, and site restoration respectively (Reference 5). This annual expenditure information is used in the cash flow analysis in Table 3. The purpose of the cash flow analysis is to demonstrate that the balance in the CR-3 Decommissioning Trust Fund (DTF) is sufficient to cover license termination, spent fuel management, and site restoration expenses excluding ISFSI capital costs. The analysis in Table 3 assumes a 1.65% real rate of return on the DTF and 0% escalation on license termination, spent fuel management, and site restoration costs.

Table Inputs:

1. Total costs reported (i.e., there is no cost allocation by ownership share)
2. The City of Tallahassee funds can only be used for License Termination activities per NRC Order (ADAMS Accession No. ML020670117) dated September 8, 1999
3. The aggregate fund balance, as of September 30, 2013, used as year-end 2013 balance
4. $93.8M in ISFSI capital costs funded from sources outside the DTF are not included in the Spent Fuel Management Cost total

Table 3
Decommissioning Funding Plan
(thousands, dollars)

Basis Year		2013				
Fund Balance		$778,565	(thousands)			
Annual Escalation		0.00%				
Annual Earnings		1.65%				
	A	B	C	D	E	F
Year	50.75 License Termination Cost (thousands)	50.54(bb) Spent Fuel Management Cost (thousands)	Site Restoration Cost (thousands)	Total License Termination, Spent Fuel Management and Site Restoration Cost (thousands)	Total Cost Escalated at 0% (thousands)	Decommissioning Trust Fund Escalated at 1.65% (minus expenses) (thousands)
2013	33,652	9,408	-	43,060	43,060	735,504
2014	67,500	16,198	-	83,698	83,698	663,943
2015	47,935	26,020	-	73,955	73,955	600,942
2016	6,831	35,780	-	42,612	42,612	568,246
2017	6,812	35,683	-	42,495	42,495	535,127
2018	6,812	35,683	-	42,495	42,495	501,462
2019	6,275	23,675	-	29,950	29,950	479,786

Table 3 (continued)
Decommissioning Funding Plan
(thousands, dollars)

Basis Year		2013				
Fund Balance		$778,565	(thousands)			
Annual Escalation		0.00%				
Annual Earnings		1.65%				
	A	B	C	D	E	F
Year	50.75 License Termination Cost (thousands)	50.54(bb) Spent Fuel Management Cost (thousands)	Site Restoration Cost (thousands)	Total License Termination, Spent Fuel Management and Site Restoration Cost (thousands)	Total Cost Escalated at 0% (thousands)	Decommissioning Trust Fund Escalated at 1.65% (minus expenses) (thousands)
2020	5,437	4,611	-	10,048	10,048	477,655
2021	5,422	4,598	-	10,020	10,020	475,516
2022	5,422	4,598	-	10,020	10,020	473,342
2023	5,422	4,598	-	10,020	10,020	471,132
2024	5,437	4,611	-	10,048	10,048	468,858
2025	5,422	4,598	-	10,020	10,020	466,574
2026	5,422	4,598	-	10,020	10,020	464,253
2027	5,422	4,598	-	10,020	10,020	461,893
2028	5,437	4,611	-	10,048	10,048	459,466
2029	5,422	4,598	-	10,020	10,020	457,028
2030	5,422	4,598	-	10,020	10,020	454,548
2031	5,422	4,598	-	10,020	10,020	452,028
2032	5,437	4,611	-	10,048	10,048	449,439
2033	5,422	4,598	-	10,020	10,020	446,835
2034	5,422	4,598	-	10,020	10,020	444,188
2035	5,422	7,358	-	12,780	12,780	438,737
2036	5,437	6,681	-	12,118	12,118	433,858
2037	5,390	-	-	5,390	5,390	435,627
2038	5,390	-	-	5,390	5,390	437,425
2039	5,390	-	-	5,390	5,390	439,253
2040	5,404	-	-	5,404	5,404	441,096
2041	5,390	-	-	5,390	5,390	442,985
2042	5,390	-	-	5,390	5,390	444,904
2043	5,390	-	-	5,390	5,390	446,855
2044	5,404	-	-	5,404	5,404	448,824
2045	5,390	-	-	5,390	5,390	450,840
2046	5,390	-	-	5,390	5,390	452,889
2047	5,390	-	-	5,390	5,390	454,972
2048	5,404	-	-	5,404	5,404	457,075

Table 3 (continued)
Decommissioning Funding Plan
(thousands, dollars)

Basis Year		2013				
Fund Balance		$778,565	(thousands)			
Annual Escalation		0.00%				
Annual Earnings		1.65%				
	A	B	C	D	E	F
Year	50.75 License Termination Cost (thousands)	50.54(bb) Spent Fuel Management Cost (thousands)	Site Restoration Cost (thousands)	Total License Termination, Spent Fuel Management and Site Restoration Cost (thousands)	Total Cost Escalated at 0% (thousands)	Decommissioning Trust Fund Escalated at 1.65% (minus expenses) (thousands)
2049	5,390	-	-	5,390	5,390	459,227
2050	5,390	-	-	5,390	5,390	461,414
2051	5,390	-	-	5,390	5,390	463,638
2052	5,404	-	-	5,404	5,404	465,883
2053	5,390	-	-	5,390	5,390	468,181
2054	5,390	-	-	5,390	5,390	470,516
2055	5,390	-	-	5,390	5,390	472,890
2056	5,404	-	-	5,404	5,404	475,288
2057	5,390	-	-	5,390	5,390	477,740
2058	5,390	-	-	5,390	5,390	480,233
2059	5,390	-	-	5,390	5,390	482,767
2060	5,404	-	-	5,404	5,404	485,329
2061	5,390	-	-	5,390	5,390	487,947
2062	5,390	-	-	5,390	5,390	490,608
2063	5,390	-	-	5,390	5,390	493,314
2064	5,404	-	-	5,404	5,404	496,049
2065	5,390	-	-	5,390	5,390	498,844
2066	5,390	-	-	5,390	5,390	501,685
2067	28,461	-	408	28,868	28,868	481,094
2068	64,677	-	1,319	65,995	65,995	423,037
2069	118,071	-	1,629	119,700	119,700	310,318
2070	89,757	-	997	90,754	90,754	224,684
2071	75,541	-	680	76,221	76,221	152,170
2072	50,584	-	265	50,848	50,848	103,833
2073	4,857	-	27,260	32,117	32,117	73,430
2074	93	-	20,164	20,257	20,257	54,385
Total	861,902	265,505	52,721	1,180,128	1,180,128	

Table Definitions

Column A: 50.75 License Termination Cost
Reflects the annual License Termination (for radiological decontamination and dismantlement) portion of the cost estimate (PSDAR, Attachment 1, Table 3.2).

Column B: 50.54(bb) Spent Fuel Management Cost
Reflects the annual Spent Fuel Management (for loading and transferring the DSCs as well as ISFSI operations and maintenance) portion of the cost estimate (PSDAR, Attachment 1, Table 3.3).

Column C: Site Restoration Cost
Reflects the annual Site Restoration (for dismantlement of non-contaminated site structures) portion of the cost estimate (PSDAR, Attachment 1, Table 3.4).

Column D: Total License Termination, Spent Fuel Management and Site Restoration Cost
Reflects the total annual License Termination, Spent Fuel Management, and Site Restoration cost.
Calculation for Column D = A + B + C

Column E: Total Cost Escalated at 0%
Reflects the total annual License Termination, Spent Fuel Management, and Site Restoration cost at a 0.0% escalation rate.
Calculation for Column E= Column D = $(D)*(1+0\%)^{\wedge(\text{current year} - 2013)}$

Column F: Decommissioning Trust Fund Escalated at 1.65%
Reflects the difference between earnings on the Decommissioning Trust Fund and annual decommissioning expenditures.
A 1.65 % real rate of return fund growth rate is used for 2013 through 2074 over a 0 % cost escalation rate.
Calculation for Column F = (Previous year's fund balance) * (1 + .0165) – E (current year's decommissioning expenditures).

The cash flow calculation in Table 3 indicates that a surplus of approximately $54M is available in the DTF after 60 years. The cash flow analysis assumes withdrawals from the DTF for spent fuel management and site restoration purposes. Use of the decommissioning trust fund for spent fuel management and site restoration is based upon the Declaratory Statement issued by the Florida Public Service Commission (FPSC) (Reference 7) establishing the FPSC's intention that decommissioning funds collected from DEF customers be used for license termination, spent fuel management, and site restoration purposes. DEF recognizes that use of decommissioning funds for spent fuel management and site restoration necessitates further discussions with and approval by the NRC Staff, which includes an exemption from 10 CFR 50.82(a)(8)(i)(A). DEF has initiated these discussions.

With respect to the $93.8M estimate for ISFSI capital costs, these costs are not recoverable from the DTF. Because DEF may obtain reimbursement from the DOE for these costs, Internal Revenue Service (IRS) regulations do not permit recovery of these costs from a qualified DTF. Instead DEF anticipates that these capital expenses will most likely be recovered through a Revised Settlement Agreement that was recently approved by the FPSC in Order No PSC-13-0598-FOF-EI (Reference 8). Paragraph 5e(1) of the Revised Settlement Agreement allows DEF to petition the FPSC for ISFSI capital expenses.

IV. Summary

The spent fuel management activities described in this updated Irradiated Fuel Management Program must be performed in conjunction with license termination activities. The annual cash flow analysis in the updated program demonstrates that the CR-3 DTF with projected earnings is sufficient to cover license termination, spent fuel management, and site restoration expenses excluding ISFSI capital costs.

DEF is an electric utility as defined in 10 CFR 50.2 and is regulated by the FPSC pursuant to Chapter 366 of the Florida Statutes. FPSC Order No PSC-13-0598-FOF-EI allows DEF to petition the FPSC for ISFSI capital costs. Financial assurance for ISFSI capital costs is provided by the Florida Statutes and the FPSC Order.

V. References

1. CR-3 to NRC letter, "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)," dated November 29, 2011. (ADAMS Accession No. ML11339A040)

2. NRC to CR-3 letter, "Crystal River Unit 3 Nuclear Generating Plant – Review of Spent Fuel Management Program and the Preliminary Decommissioning Cost Estimate (TAC NO. ME7831)," dated September 28, 2012. (ADAMS Accession No. ML12262A245)

3. CR-3 to NRC letter, "Crystal River Unit 3 – Certification of Permanent Cessation of Power Operations and that Fuel Has Been Permanently Removed from the Reactor," dated February 20, 2013. (ADAMS Accession No. ML13056A005)

4. NRC to CR-3 letter, "Crystal River Unit 3 Nuclear Generating Plant Certification of Permanent Cessation of Operation and Permanent Removal of Fuel From the Reactor," dated March 13, 2013. (ADAMS Accession No. ML13058A380)

5. CR-3 to NRC letter, "Crystal River Unit 3 – Post-Shutdown Decommissioning Activities Report," dated December 2, 2013.

6. AIF/NESP-036, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," Atomic Industrial Forum, dated May 1986.

7. Issued October 9, 2013, in Docket No. 130207-EI / Order No. PSC-13-0452-FOF-EI, *In re: Petition for declaratory statement with respect to use of decommissioning trust fund dollars for spent fuel and other non-radiological decommissioning costs for Crystal River 3 Nuclear Plant, Florida Public Service Commission.*

8. Issued November 12, 2013, in Docket No. 130208-EI / Order No. PSC-13-0598-FOF-EI, *In re: Petition for limited proceeding to approve revised and restated stipulation and settlement agreement by Duke Energy Florida, Inc. d/b/a Duke Energy, Florida Public Service Commission.*