J. Ed Burchfield, Jr.
Vice President
Oconee Nuclear Station

Duke Energy
ON01VP | 7800 Rochester Hwy
Seneca, SC 29672

o: 864.873.3478
f: 864.873.5791
Ed.Burchfield@duke-energy.com

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Document Control Desk
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Duke Energy Carolinas, LLC (Duke Energy)
Oconee Nuclear Station (ONS), Units 1, 2, and 3
Docket Numbers 50-269, 50-270, 50-287
Renewed License Numbers DPR-38, DPR-47, DPR-55

Subject: Duke Energy Response to NRC Request for Additional Information (RAI) Related to Oconee License Amendment Request 2018-05

References:

1. Duke Energy Letter to USNRC, *License Amendment Request Proposing a Revised Set of Fission Gas Gap Release Fractions for High Burnup Fuel Rods that Exceed the Linear Heat Generation Rate Limit Detailed in Regulatory Guide 1.183, Table 3, Footnote 11; License Amendment Request No. 2018-05,* dated November 1, 2018 (ML18318A320).
2. NRC Email, A. Klett (NRC) to A. Zaremba (Duke Energy), *NRC Request for Additional Information for Oconee LAR 2018-05 (L-2018-LLA-0300),* dated February 19, 2019.

By letter dated November 1, 2018, Duke Energy submitted a License Amendment Request (LAR) to the U.S. Nuclear Regulatory Commission (NRC) proposing to revise the facility as described in the Oconee Updated Final Safety Analysis Report with respect to the fission gas gap release fractions calculated for high burnup fuel rods. By email dated February 19, 2019 (Reference 2), the NRC requested additional information associated with the Reference 1 LAR. The NRC request for additional information (RAI) and the Duke Energy responses are provided in the enclosure to this letter.

The responses to the RAIs do not affect the conclusions of the No Significant Hazards Consideration provided in the Reference 1 LAR.

This letter contains no new or revised commitments. Should you have any questions regarding this submittal, please contact Mr. Art Zaremba, Fleet Nuclear Licensing Manager, at (980) 373-2062.

I declare under penalty of perjury that the foregoing is true and correct. Executed on March 7, 2019.

Sincerely,

J. Ed Burchfield, Jr.
Vice President
Oconee Nuclear Station

Enclosure: Duke Energy Response to NRC Request for Additional Information (RAI)

Cc (w/enclosure):

Ms. Catherine Haney, Administrator, Region II
U.S. Nuclear Regulatory Commission
Marquis One Tower
245 Peachtree Center Ave., NE, Suite 1200
Atlanta, GA 30303-1257

Ms. Audrey Klett, Project Manager
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Mail Stop O-8G9A
11555 Rockville Pike
Rockville, Maryland 20852

Mr. Eddy Crowe
NRC Senior Resident Inspector
Oconee Nuclear Station

Duke Energy Response to NRC Request for Additional Information (RAI)

By application dated November 1, 2018 (Agencywide Documents Access and Management System Accession Numbers ML18318A320), Duke Energy Carolinas, LLC (the licensee) proposed changes to the licensing basis for Oconee Nuclear Station, Units 1, 2, and 3 (Oconee). The licensee proposed to revise the facility as described in the updated final safety analysis report (UFSAR) to provide gap release fractions for high-burnup fuel rods (i.e., greater than 54 gigawatt days per metric ton of uranium (GWD/MTU)) that exceed the 6.3 kilowatt per foot (kW/ft) linear heat generation rate (LHGR) limit detailed in Table 3 of Regulatory Guide (RG) 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," dated July 2000.

During the U.S. Nuclear Regulatory Commission (NRC) staff's review the NRC staff determined that more information was needed to complete the review. The staff emailed a draft request for additional information (RAI) to the licensee on February 11, 2019. Based on an email from Mr. Chris Wasik of the licensee's staff dated February 12, 2019, the staff determined that it needed to clarify the RAI. The email correspondence is in ADAMS at Accession No. ML19050A220. As discussed with Mr. Chris Wasik on February 14, 2019, the staff is requesting the licensee to respond to this request within 30 days of receipt.

Regulatory Analysis Basis

Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.67, "Accident source term," Paragraph (b)(2) states, in part, that the NRC may issue the amendment only if the applicant's analysis demonstrates with reasonable assurance that:

(i) An individual located at any point on the boundary of the exclusion area for any 2-hour period following the onset of the postulated fission product release, would not receive a radiation dose in excess of 0.25 Sv (25 rem) total effective dose equivalent (TEDE).

(ii) An individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), would not receive a radiation dose in excess of 0.25 Sv (25 rem) TEDE.

(iii) Adequate radiation protection is provided to permit access to and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 0.05 Sv (5 rem) TEDE for the duration of the accident.

RG 1.183 provides the methodology for analyzing the radiological consequences of several design basis accidents to show compliance with 10 CFR 50.67.

10 CFR 50.36, "Technical specifications," in part, requires that the technical specifications (TSs) be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto and includes items in following categories: (1) safety limits, limiting safety systems settings, and limiting control settings; (2) limiting conditions for operation; (3) surveillance requirements; (4) design features; (5) administrative controls; (6) decommissioning; (7) initial notifications; and (8) written reports.

Technical Basis for RAI-1

In its application, the licensee proposed gap release fractions for high-burnup fuel rods (i.e., greater than 54 GWD/MTU) that exceed the 6.3 kW/ft LHGR limit in Footnote 11 of Table 3, "Non-LOCA [loss of coolant accident] Fraction of Fission Product Inventory in Gap," in RG 1.183. The non-LOCA gap fractions stated in Table 3 of RG 1.183 are applied to the non-LOCA accidents if fuel failure occurs during the accident. The following accidents at Oconee assume fuel failure: fuel handling accident, fuel cask handling accident, locked rotor accident, and control rod ejection accident. In its application, the licensee stated that no non-LOCA accidents that may result in departure from nucleate boiling are considered (e.g., locked rotor accident or rod ejection accident) because the fuel cycles for Oconee are designed so that no fuel rod predicted to enter departure from nucleate boiling will have been operated beyond the current limit in RG 1.183, Footnote 11 for maximum LHGR. Because of this, the NRC would be approving a change to the gap fractions for only the FHA. However, the application does not incorporate this new design requirement into the licensing basis as reflected in the UFSAR, nor does it place a requirement in Oconee's TSs, such as Section 5.0, "Design Features," or any other document controlled under 10 CFR 50.59, such as the Core Operating Limits Report (COLR).

The UFSAR currently states that the fuel cycle design ensure that none of these fuel pins experience DNB following any design basis accident. This sentence refers to the non-DNB fuel pins that exceed the rod power/burnup criteria of Footnote 11 in RG 1.183 and the new proposed gap fractions provided in the application, which apply to FHA only. The application does not explicitly state that the fuel cycle design ensures that no fuel rod predicted to experience DNB in any other non-LOCA accidents will have operated beyond the power/burnup criteria of Footnote 11 in Regulatory Guide 1.183 and that the gap fractions used in these non-LOCA accidents analyses remain those stated in Table 3 of RG 1.183. The current UFSAR only explains that the rods will not experience DNB following any DBA, but it does not clearly state that the gap fractions in the locked rotor and rod ejection accident remain those in Table 3 of RG 1.183 and that the exceeding the power/burnup criteria in Footnote 11 in RG 1.183 does not apply to these accidents.

RAI-1

The staff requests the licensee to either describe how it will incorporate the new design requirement into the Oconee licensing basis, as reflected in the UFSAR, TSs, or any other document controlled under 10 CFR 50.59 (such as the COLR); *or* provide the revised radiological consequence analyses for the other design basis accidents that assume fuel failure (such as locked rotor accident, control rod ejection accident, etc.) that demonstrate that the regulatory limits will be met with the new proposed gap fractions for high-burnup fuel rods.

Duke Energy Response to RAI-1

Duke Energy will incorporate the new design requirement into the Oconee licensing basis via the attached proposed revision to the Updated Final Safety Analysis Report (UFSAR). The attached UFSAR mark-up (2 pages) supersedes the UFSAR Section 15.1.10 mark-up included in the November 1, 2018 license amendment request. The remainder of the originally proposed UFSAR changes are not affected by this RAI response.

4. Many of the transient and accident analyses involve control rod movement. These analyses credit the normal withdrawal sequence, overlap, and rod speed, which are controlled by non-safety control systems.
5. For certain failures in the EFW System, credit is taken for realigning EFW flow through the non-safety MFW System.
6. Steaming of the steam generators with manual non-safety atmospheric dump valves is credited.
7. Deleted per 2003 update
8. The capability to remotely throttle certain valves is credited. Some of the controls required to remotely throttle these valves are not safety-grade.
9. Electrical bus voltage and frequency control are credited. These are controlled by non-safety components.
10. The Integrated Control System trips both main feedwater pumps on a high steam generator level indication. A high level indication may occur following a main steam line break due to the pressure drops that result from the blowdown of the steam generator. Tripping of the main feedwater pumps will be assumed to occur in the steam line break analysis only if the plant response is more limiting.

15.1.10 Environmental Consequences Calculation Methodology

Environmental Consequences

A summary of the offsite doses is presented in Table 15-16. A description of each accident analysis is given in the appropriate section.

Fission Product Inventories

Inventory in the Core: Fission product inventories within the core are calculated based on the ORIGEN methodology (e.g., ORIGEN-ARP or SAS2H/ORIGEN-S of the SCALE computer code)(Section 15.1, Ref. 27). The core inventories for the Maximum Hypothetical Accident are shown in Table 15-15.

Inventory in the Fuel Pellet Clad Gap: The fuel pin gap activities were determined using Regulatory Guide 1.183 (Section 15.1, Ref. 35). For non-DNB fuel pins which exceed the rod power/burnup criteria of Footnote 11 in RG 1.183, the gap fractions from RG 1.183 are increased by a factor of 3 for Kr-85, Xe-133, Cs-134 and Cs-137, and increased by a factor of 2 for I-131, and other noble gases, halogens and alkali metals (Reference 46 and 47). A maximum of 25 fuel rods, per fuel assembly, shall be allowed to exceed the rod power/burnup criteria for Footnote 11 in RG 1.183 in accordance with the license amendment request submitted by letter dated July 15, 2015 (Reference 46). The fuel cycle design ensures that none of these fuel pins experience DNB following any design basis accident. The environmental consequences of the control rod ejection accident, and fuel handing accidents are based on the assumption that the fission products in the gap between the fuel pellets and the cladding of the damaged fuel rods are released as a result of cladding failure. The inventories used for the control rod cluster assembly ejection accident are shown in Table 15-50. The gap inventory for the fuel handling accident is shown in Table 15-1.

Insert A

Inventory in the Reactor Coolant: The quantity of fission products released to the reactor coolant during steady state operation is based on the use of escape rate coefficients (sec^{-1}) derived from experiments involving purposely defected fuel elements. (Section 15.1, References 29, 30, 31, 32) These coefficients represent the fraction of the activity in the fuel

Insert A:

For non-DNB fuel pins that exceed the rod power/burnup criteria of Footnote 11 in RG 1.183, the gap fractions from RG 1.183 are increased by a factor of 4 for Kr-85, Cs-134, and Cs-137. The gap fractions for all other isotopes remain at their pertinent RG 1.183, Table 3 values (References 46 and 47). The fuel cycle design ensures that none of these fuel pins experience DNB following any design basis accident. The fuel cycle design also ensures that no fuel rod predicted to experience DNB in any other non-LOCA accidents (e.g., locked rotor accident or rod ejection accident) will have operated beyond the power/burnup criteria of Footnote 11 in Regulatory Guide 1.183 and that the gap fractions used in these non-LOCA accident analyses remain those stated in Table 3 of RG 1.183.