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

March 21, 2012

Mr. Preston Gillespie
Site Vice President
Oconee Nuclear Station
Duke Energy Carolinas, LLC
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 – REQUEST FOR ADDITIONAL INFORMATION REGARDING THE LICENSE AMENDMENT REQUESTS FOR A MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATE (TAC NOS. ME7164, ME7165, AND ME7166)

Dear Mr. Gillespie:

By letter dated September 20, 2011, as supplemented by letter November 21, 2011, Duke Energy Carolinas, LLC (the licensee), submitted a license amendment request (LAR) for Oconee Nuclear Station (ONS) which proposes revisions to the current licensing basis to allow a measurement uncertainty recapture (MUR) power uprate.

The U. S. Nuclear Regulatory Commission (NRC) staff is in the process of reviewing the LARs and has determined that additional information is required in order to complete the review. The requested additional information is enclosed. Draft requests for additional information (RAIs) were provided to your staff electronically, and telephone calls between your staff and the NRC staff have occurred to ensure that the right level of detail is provided in the RAI responses. Mr. Kent Alter of your staff has agreed to respond to the RAIs by April 4, 2012.

If you have any questions, please contact me at 301-415-1345.

Sincerely,

John Stang, Senior Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosure:
RAI

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REQUEST FOR ADDITIONAL INFORMATION

LICENSE AMENDMENT REQUESTS

TO REVISE PORTIONS OF THE UPDATED FINAL SAFETY ANAYLSIS REPORT

RELATED TO THE

MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATE

DUKE ENERGY CAROLINAS, LLC

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3

DOCKET NOS. 50-269, 50-270, AND 50-287

By letters dated September 20, 2011 (Agencywide Documents Access and Management System, (ADAMS) Accession No. ML11269A127), as supplemented by letter dated November 21, 2011 (ADAMS Accession No. ML11326A296), Duke Energy Carolinas, LLC (the licensee), submitted a license amendment request (LAR) to the U.S. Nuclear Regulatory Commission (NRC) for Oconee Nuclear Station Unit 1, 2, and 3 (ONS 1/2/3) which propose revisions to the current licensing basis to allow a measurement uncertainty recapture (MUR) power uprate. The NRC staff is in the process of reviewing the LAR and has determined that the following requests for additional information (RAIs) are required in order to complete the review.

RAI 25 EMCB

Section IV.1.D of Regulatory Issue Summary (RIS) 2002-03, "Guidance on the Content of Measurement Uncertainty Recapture Power Uprate Applications," dated January 31, 2002 ADAMS, Accession No. ML013530183), requests licensees to identify the code of record used to evaluate structures, systems and components (SSCs) in support of a proposed MUR power uprate. Please identify the design basis code of record used to qualify the reactor vessel internals (RVIs) for operation at the current licensed thermal power level and verify that this code of record was used as the basis for the structural evaluation of the RVIs at MUR conditions. If no code of record is identified, please specify the design basis acceptance criteria used to qualify the RVIs at the applicable service levels and confirm these were used as the basis for the structural evaluation of the RVIs at MUR conditions.

RAI 26 EMCB

With regards to the structural evaluations and analyses performed to support the proposed MUR power uprate at ONS 1/2/3, please confirm that all analyses and evaluations for SSCs which were within the scope of the ONS license renewal efforts were done in accordance and consistent with the methodologies approved and referenced in NUREG-1723 "Safety Evaluation

Related to License Renewal of ONS 1/2/3" (ADAMS Accession No. ML003695154). Otherwise, please state the changes for all structural evaluations and analyses performed to support the proposed MUR conditions that were not performed in accordance with NUREG-1723. Justification should also be provided with regards to the acceptability of these changes.

RAI 27 EMCB

ONS updated final safety analysis report (UFSAR) Section 4.5.1.2, "Design Bases," for the RVIs discusses the results of time-limited aging analyses and license renewal reviews and states that:

> In regards to transient cycle count assumptions for replacement bolting- the ongoing programmatic actions under the Thermal Fatigue Management Program assures the validity of the design assumptions in the period of extended operation

Please provide further information and confirm that the proposed MUR conditions will not have an impact on the above programs. If the MUR has an adverse impact, please provide details on the nature of the changes and a summary of the re-evaluation that demonstrates satisfactory compliance with the applicable design basis acceptance criteria.

RAI 28 EMCB

Please confirm that the maximum deflection values allowed for the reactor vessel internal support structures will be maintained under design basis loading conditions when the effects of MUR implementation on these deflections are considered.

RAI 29 EMCB

In regards to ONS 1/2/3 MUR power uprate LAR Section IV.1.A.ix "Safety-Related Valves," please provide additional information in a tabular format that includes, but is not limited to:

1) State the safety-related valves affected by the proposed MUR power uprate. For those affected valves, provide the loads are used in the analyses of record for the structural evaluations of the valves for all applicable service conditions (Normal, Emergency, Upset and Faulted);

2) For each service level, state which of these loads are affected by the proposed MUR conditions and provide the magnitude of the change(s); and

3) Verify and confirm that the increased loads from the proposed MUR conditions are still acceptable and in accordance with the applicable codes of record for the pressure-retaining portions of the valve(s).

RAI 30 EMCB

With respect to the postulation of pipe rupture locations, including high energy line breaks (HELBs) and associated dynamic effects resulting from these postulated breaks, please address the following RAIs as they relate to the implementation of the proposed MUR power uprate at ONS:

1) In accordance with the current licensing basis (CLB) criteria for classifying systems as high energy at ONS, state the piping systems, or portions of systems, identified as high energy at ONS which are affected by the proposed MUR power uprate. Affected piping systems refer to those systems which will experience an increase in temperature, pressure, flow rate or other mechanical loadings.

2) For those affected piping systems, or portions of systems, identified as high energy in part (1) of this request, confirm that the stresses and fatigue usage factors contained in the current analysis of record for those systems, or portions of systems, will remain bounding at MUR conditions.

3) If moderate energy line breaks (MELBs) are included as part of the ONS CLB requirements, confirm that MUR has no effect on the MELB analyses of record.

4) Section IV.1.B.viii of the ONS MUR power uprate LAR does not discuss the impact of the proposed MUR power uprate on the dynamic effects loadings resulting from currently postulated pipe ruptures. Discuss the impact of the proposed MUR power uprate on the analyses of record related to dynamic effects loadings generated from currently postulated HELB locations, including jet impingement and pipe whipping.

RAI 31 EMCB

Please provide further information and confirm that the design basis pressure and temperatures (normal operating and accident temperatures) used in the design of the ONS containment structure, including the steel liner plate, and its internal structures remain bounding following the proposed MUR power uprate.

RAI 32 EMCB

Please provide further information to demonstrate that, for the proposed MUR conditions, the spent fuel pool (SFP) structure, including SFP liner and the spent fuel racks, remain capable of performing their intended design functions and will continue to be in compliance with the ONS station design basis code of record(s) and acceptance criteria.

RAI 33 SRXB

The MUR power uprate LAR identified one accident and transient for which the existing analyses of record does not bound plant operation at the proposed uprated power level was identified as a HELB. The MUR power uprate application stated the current licensing basis requires emergency feedwater injection within 15 minutes and high-pressure injection (HPI) with 60 minutes to mitigate the various HELBs described in the MUR power uprate LAR. There is currently no assurance the licensee can restore HPI injection within the required 60-minute time

frame following a HELB. The licensee considers ONS 1/2/3 to be operable, but degraded/non-conforming (OBDN) for certain HELBs currently. The licensee has determined that the OBDN conclusion remains valid for the MURs uprate power level.

ONS submitted a LAR to the NRC proposing to revise the current licensing basis in regard to mitigation of HELB events occurring outside containment December 16, 2011 (ADAMS Accession Nos. ML12003A063, ML12003A067, ML12003A068, ML12003A069, and ML12003A70). The LAR is currently under review by the NRC staff. The current status of ONS 1/2/3 concerning HELB is OBDN.

Regulatory Criteria

The principal design criteria used at ONS were developed in consideration of the 70 General Design Criteria (GDC) for Nuclear Power Plant Construction Permits proposed by the Atomic Energy Commission in a proposed rule-making published for Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50 in the *Federal Register* of July 11, 1967. The following GDCs are applicable:

ONS Design Criterion 6 states:

Criterion 6 - Reactor Core Design (Category A)

The reactor core shall be designed to function throughout its design lifetime without exceeding acceptable fuel damage limits which have been stipulated and justified. The core design, together with reliable process and decay heat removal systems, shall provide for this capability under all expected conditions of normal operation with appropriate margins for uncertainties and for transient situations which can be anticipated, including the effects of the loss of power to recirculation pumps, tripping out of a turbine generator set, isolation of the reactor from its primary heat sink, and loss of all off-site power.

ONS Design Criterion 28 states:

Criterion 28 - Reactivity Hot Shutdown Capability (Category A)

At least two of the reactivity control systems provided shall independently be capable of making and holding the core subcritical from any hot standby or hot operating condition, including those resulting from power changes, sufficiently fast to prevent exceeding acceptable fuel damage limits.

ONS Design Criterion 29 states:

Criterion 29 - Reactivity Shutdown Capability (Category A)

At least one of the Reactivity Control Systems provided shall be capable of making the core subcritical under any conditions (including anticipated operation transients), sufficiently fast to prevent exceeding acceptable fuel damage limits. Shutdown margins greater than the maximum worth of the most effective control rod when fully withdrawn shall be provided.

RIS 2002-03 contains the following for accidents and transients for which the existing analyses of record do not bound plant operation at the proposed uprated power level:

For analyses that are covered by the NRC approved reload methodology for the plant, the licensee should:

A. Identify the transient/accident that is the subject of the analysis

B. Provide an explicit commitment to re-analyze the transient/accident, consistent with the reload methodology, prior to implementation of the power uprate

C. Provide an explicit commitment to submit the analysis for NRC review, prior to operation at the uprated power level, if NRC review is deemed necessary by the criteria in 10 CFR 50.59

D. Provide a reference to the NRC's approval of the plant's reload methodology

Please identify and describe the current licensing basis for meeting Criterion 6.

Please describe how ONS can make and hold the reactor subcritical in accordance with Criterion 28 and 29 for postulated HELB events in accordance with the current licensing basis.

Please describe how the MUR power uprate LAR is consistent with items 2.B and 2.C of the guidance contained in RIS 2002-03.

RAI 34 EICB

The MUR power uprate LAR Attachments 6-2 through 6-4 provide Caldon® Ultrasonics Engineering Reports ER-813, ER-824, and ER-825 for ONS 1/2/3, respectively. These reports provide the analysis of the uncertainty contribution of the linear elastic fracture mechanics (LEFM) CheckPlus System to the overall thermal power uncertainty of Oconee 1/2/3, respectively. These Engineering Reports (ERs) contain several appendices labeled "A.1, A.2, A.3, A.4, & A.5." These appendices contain detailed calculations, the results of which appear to be summarized in Appendix C Table I. These calculations are based on the following references:

- Cameron Topical Report ER-80P, "Improving Thermal Power Accuracy and Plant Safety While Increasing Operating Power Level Using the LEFM Check System," Revision 0.
- Cameron Engineering Report ER-157P, "Supplement to Cameron Topical Report ER-80P: Basis for Power Uprates with an LEFM Check or an LEFM CheckPlus," dated October 2001, Revision 5.

1. Because the calculations provided in the Engineering Report Appendices are summaries of the methodology described in the referenced documents, the NRC staff cannot readily identify the equations used in the calculations, nor perform a cross-reference between the referenced documents and the data provided in the Appendices. To assist the NRC staff review, please provide the following:

a. To understand the cross reference between the Appendices in the Engineering Reports submitted with the LAR and the associated approved topical report equations, the NRC staff identified the following items and is requesting the licensee to trace them back from the LAR to the Caldon ER-157P. To facilitate this request, the NRC staff recommends meeting with the licensee to perform this review during an audit.

    i. Trace back the value of the geometry factors and feedwater enthalpy used in the calculation of the thermal power uncertainty calculation, which are reported in ER-813 Appendix B, to the ER-157P and any other applicable references.

    ii. Demonstrate and trace back the equation used to determine the thermal power uncertainties, which is described in ER-813 Appendix C, Section III, and reported in Table I of this Appendix, from the LAR to the CALDON ER-80P.

b. Please confirm that the assumptions listed in Cameron Caldon Ultrasonics Engineering Report No. ER-157(P-A) Revision 8 and Revision 8 Errata Appendix A are valid for the Oconee 1/2/3 application.

2. Table I, "Reconciliation of Oconee Unit 1 Nuclear Generating Station Uncertainties with Cameron Reports," of Appendix C (page 5) of Cameron Engineering Reports ER-813, ER-824, and ER-825 Revision 1 were compared with Table A-1, "Representative Thermal Power Uncertainties for a Total Feedwater Flow Measurement in a PWR or BWR Using LEFM Check and LEFM CheckPlus" of ER-157(P-A) Revision 8 and Revision 8 Errata (ADAMS Accession No. ML102950246).

    i. The Oconee document seems to misquote the numbers in the approved topical report in some places, for example:

    - Table I of Appendix C identifies the ER-157P value for the Hydraulics Profile Factor as being "[plus or minus]+/-0.25 [percent] %" while the value in ER-157(P-A) Revision 8 and Revision 8 Errata is "+/-0.22%."

    - Table I of Appendix C identifies the ER-157P value for the Time Measurements as being "+/-0.05%" while the value in ER-157(P-A) Revision 8 and Revision 8 Errata is "+/- 0.06%."

    - Please clarify why the values reported on Table I differ from the values in ER-157(P-A) Revision 8 and Revision 8 Errata, and confirm which values were actually used to determine the bounding uncertainties for Oconee 1/2/3.

    ii. Appendix C also indicates that the Oconee system is credited as being better than the bounding topical report. However, there are several instances in which the Oconee system is lower than the bounding topical report, for example:

- Table I of Appendix C identifies the Oconee Unit 1 value for the Hydraulics as being "+/- 0.21%" while the value in ER-157(P-A) Revision 8 and Revision 8 Errata is "+/- 0.25%."

- Table I of Appendix C identifies the Oconee Unit 2 value for the Subtotal Mass Flow Uncertainty as being "+/- 0.27%" while the value in ER-157(P-A) Revision 8 and Revision 8 Errata is "+/- 0.28%."

Please confirm that the values used in the Oconee-specific calculations are appropriate for the ONS 1/2/3 configuration.

March 21, 2012

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Enclosure:
RAI

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