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

November 14, 2011

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 (ONS) - REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING THE LICENSE AMENDMENT REQUESTS (LARs) FOR UPGRADING THE LICENSING BASIS FOR HIGH ENERGY LINE BREAK MITIGATION (TAC NOS. ME5202, ME5203, ME5204, ME5205, ME5206, AND ME5207)

Dear Mr. Gillespie:

By letters dated June 26, 2008 (two letters), December 22, 2008, and June 29, 2009, Duke Energy Carolinas, LLC (the licensee), submitted LARs for ONS, which propose revisions to the current licensing basis regarding tornado and high energy line break (HELB) mitigating strategies.

The 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 RAIs were provided to your staff electronically, and numerous 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. Please provide responses to the RAIs by December 16, 2011. If you cannot respond by December 16, 2011, please provide the reason and a schedule of when you can respond to the RAIs.

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

Sincerely,

John Stang

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

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION (RAI)

LICENSE AMENDMENT REQUESTS (LARs)

TO REVISE PORTIONS OF THE UPDATED FINAL SAFETY ANAYLSIS REPORT (UFSAR)

RELATED TO THE

TORNADO AND HIGH ENERGY LINE BREAK (HELB) MITIGATION LICENSING BASIS

DUKE ENERGY CAROLINAS, LLC

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 (ONS)

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

By letters dated June 26, 2008 (two letters), December 22, 2008, and June 29, 2009, to the U.S. Nuclear Regulatory Commission (NRC) (Agencywide Documents Access and Management System, (ADAMS) Accession Nos. ML081910559, ML08184371, ML090020355, and ML091870501, respectively), Duke Energy Carolinas, LLC (the licensee, Duke), submitted LARs for ONS, which proposed revisions to the current licensing basis regarding HELB mitigating strategies. The NRC staff is in the process of reviewing the LARs and has determined that the following RAIs are required in order to complete the review.

By letters dated July 6, 2009 (ADAMS Accession No. ML091700738), July 24, 2009 (ADAMS Accession No. ML091830265), May 25, 2010 (ADAMS Accession No. ML101310425), and October 8, 2010 (ADAMS Accession No. ML102650017), the NRC staff issued RAIs. The licensee responded to the RAIs by letter dated September 2, 2009 (ADAMS Accession No. 092520189), October 23, 2009 (ADAMS Accession No. ML093000501), May 6, 2010 (ADAMS Accession No. ML101340437), June 24, 2010 (ADAMS Accession No. ML101830011), August 31, 2010 (ADAMS Accession No. ML102460015), and December 7, 2010 (ADAMS Accession No. ML103470388). To facilitate review, the RAIs have been annotated with **[T]** for tornado and/or **[H]** for HELB applicability.

RAI 61 [T/H]

Provide a complete event sequence following a tornado and/or an HELB. In your response, provide a summary of the sequence of actions required for achieving each phase of the mitigating strategies showing how MODES of operation 3, 4, and 5 as defined in Table 1.1-1 of your Technical Specifications (TSs) will be achieved. Identify all equipment that will be available following the events to mitigate a tornado and/or an HELB. Identify all required operator actions, and when each operator action has to be completed. Identify all required repairs, and when they must be completed. For any necessary repairs provide the actions required, manpower required, and all equipment and parts that are necessary to complete the repairs. Demonstrate that the sequence of events would not result in unacceptable radiological consequences. Identify and justify the selected acceptance criteria (fission product barriers are maintained, and the spent fuel remains within the licensing basis). Provide a detailed description of the analyses performed to support the conclusions.

RAI 62 [T/H]

Provide a complete list of all modifications, design packages, and supporting calculations which require prior NRC review and approval prior to changing the UFSAR associated with the LARs. In addition provide an executive summary for each calculation. The summary should include initial conditions, all assumptions, analyses performed, acceptance criteria, and a justification for the conclusion reached.

RAI 63 [T/H]

By letter dated May 25, 2010, the NRC issued RAI 2-28. The licensee responded to the RAI by letter dated August 31, 2010. The response stated, "The battery terminal voltage is based on a minimum value of 105 volt (V) direct current (DC)." Explain the basis for the minimum battery terminal voltage of 105 V DC, and discuss how this value ensures that the minimum voltage requirements of all the downstream equipment fed by the battery will be met. Also describe how the equipment will be capable of performing its design functions at that voltage or component fed from the battery and 105 V DC whichever is higher.

RAI 64 [T/H]

Provide a detailed discussion on the periodic tests that the Protected Service Water (PSW) 125 V DC batteries will be subjected to and how these tests will ensure that the batteries have the capability and capacity to perform their design functions.

RAI 65 [T/H]

Provide a detailed discussion on the PSW battery room ventilation capability and temperature specifications (both minimum and maximum) and explain how the room temperature will be monitored to ensure that there is no adverse impact on battery performance or service life.

RAI 66 [T/H]

By letter dated May 25, 2010, the NRC issued RAI 2-28. The licensee responded to the RAI by letter dated August 31, 2010. The response stated, "The two 300 Ampere (A) DC battery chargers are manufactured by AMETEK." Industry operating experience has shown that momentary overvoltage or undervoltage transients experienced during switching or fault-related perturbations can trigger a self-protecting lockout feature in battery chargers resulting in disabling the chargers. Provide details on magnitude and duration of transient and sustained overvoltage/undervoltage conditions resulting from the perturbations identified above for the 13.8 kiloVolt (kV) Keowee Hydro Unit (KHU) underground circuit and how these conditions were considered in the design and procurement of the PSW system battery chargers. Also discuss a perturbation due to lightning on the alternate 13.8 kV overhead circuits from the new 100/13.8 kV substation to the PSW switchgear building in the discussion.

RAI 67 [T/H]

Provide a summary of the equipment protection and coordination analyses for the entire PSW system, and describe, in detail, the acceptability criteria that were used in determining that adequate protection and coordination would be provided.

RAI 68 [T/H]

The licensee's O-6700 drawing reflects degraded voltage relays and loss of voltage relays on the 13.8 kV PSW switchgears. Provide a summary of the settings for these relays. Also identify the most-limiting equipment or component and provide its minimum voltage requirement. Discuss how the most-limiting equipment or component was considered in determining the degraded voltage relay setpoint.

RAI 69 [T/H]

In Enclosure 2, page 14 of the June 26, 2008, LAR concerning Tornado mitigation, the licensee stated: "The PSW switchgear will also provide a backup power supply to the SSF [Standby Shutdown Facility] via an underground path as additional defense-in-depth." Discuss the following capabilities of the PSW electrical power system to supply backup power to the SSF: (1) automatic or manual operation, (2) expected order of availability of power supply to the SSF, (3) the time frame this back up power will be expected to be available, and (4) evaluation and conclusion of the time for the availability of PSW backup power in automatic and/or in manual operation.

RAI 70 [T/H]

Confirm that all electrical design calculations, analyses, and drawings associated with the proposed PSW electrical power system are approved and final.

RAI 71 [H]

In the June 29, 2009 LAR, the licensee stated that equipment qualification of shutdown components is only required in the east penetration rooms of the auxiliary building for postulated main feedwater and main steam HELBs. Explain why equipment qualification, or more appropriately, environmental qualification of shutdown components in other areas, including the west penetration rooms, is not required.

RAI 72 [T/H]

Explain how the proposed PSW system meets NRC requirements with regard to the design, installation, and testing of electrical equipment.

RAI 73 [T/H]

Explain how you have addressed the findings identified in NRC Inspection Reports 05000269/2010004, 05000270/2010004, and 05000287/2010004 (ADAMS Accession No. ML103020265).

RAI 74 [H]

By letter dated October 8, 2010, the NRC issued RAI 28. The licensee responded to the RAI by letter dated December 7, 2010. In the response to RAI 28, the licensee stated that postulated water entry through the weep holes is not a concern since normal and accident conditions for the penetration rooms does not include spray or submergence. The NRC staff understands that the electrical penetrations will be subjected to a steam environment. Describe the impact of steam entering the penetration boxes through the weep holes on the environmental qualification and performance of the electrical components contained within these penetrations.

RAI 75 [T/H]

Explain how your assessment of the impact of the proposed PSW system on the environmental qualification of equipment was completed without having fully completed the design of the PSW system.

RAI 76 [T/H]

By letter dated October 8, 2010, the NRC issued RAI 42. The licensee responded to the RAI by letter dated December 7, 2010. The response stated that a failure modes and effects analysis/single failure analysis (FMEA/SFA) will be performed for the PSW electrical system. Provide the results of the FMEA/SFA for the PSW system.

RAI 77 [T/H]

Describe the capability of the PSW system to be controlled and monitored from the remote/safe shutdown facility.

RAI 78 [T/H]

Provide a detailed discussion on how the electrical power systems of the PSW system will be installed such that they are physically separate and independent.

RAI 79 [H]

By letter dated October 8, 2010, the NRC issued RAI 13. By letter dated December 7, 2010, the licensee responded to the RAI. The response to the RAI included comments concerning the design of structures, separating high energy lines from essential systems and components, covered pressurization and pressure relief features. Regarding this section of the Branch Technical Position (BTP) MEB [Mechanical Engineering Branch] 3-1, please address how impact, pipe whip and jet impingement are addressed, as they can also be consequences of the pipe break.

RAI 80 [H]

By letter dated October 8, 2010, the NRC issued RAI 13. The licensee responded to the RAI by letter dated December 7, 2010. In the response on page 4 of 11 of Table RAI-13 of the Attachment to the RAI, the licensee discusses justification for not defining breaks at locations where thermal stresses exceed 0.8 S_a. In the response, the licensee states:

> Giambusso/Schwencer included the requirement to postulate break locations where the actual stress exceeded .8 S_A. However, BTP MEB 3-1 includes no such requirement. Duke Energy concluded that the omission of the thermal stress threshold in BTP MEB 3-1 is recognition by the regulatory authorities that thermal stress, in the absence of primary stress, cannot cause pipe rupture failures.

In fact, this limit has been modified, not dropped. Credit for margin in sustained stress has been extended to thermal stress. The limit with additional margin is 0.8 ($kS_h + S_a$) in BTP MEB 3-1.

In the response, the licensee stated:

> Repeating cycles of thermal stress exceeding the yield stress may result in cracking due to fatigue, however, the potential for critical crack formation is addressed by the postulation of critical cracks where the actual stress exceeds the crack stress threshold of .4 x ($S_A + S_H$).

The consequences of a crack do not envelope those of a break. For this argument to be effective, the formation of a crack would need to preclude the formation of a break. This would require a demonstration that fatigue cracks would propagate through the pipe wall and cause a leak before they propagated along the wall to create a critical crack leading to fracture; a break. Taken all together, the licensee's arguments offer elements that are all part of the leak-before-break methodology discussed in the Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR (Light Water Reactor) Edition (NUREG-0800), Section 3.6.3, "Leak-Before-Break Evaluation Procedure." Please address whether the ONS units meet the provisions of this document for these elements.

RAI 81 [H]

By letter dated October 8, 2010, the NRC issued RAI 13. The licensee responded to the RAI by letter dated December 7, 2010. The licensee's resonse addressed the inaccessible of girth welds by stating:

> As described in ONDS-351 (Section 8, Item 5) each MFDW guard pipe encloses the postulated MFDW break location(s). Since the downstream elbow girth welds are adjacent to the postulated break location inside the guard pipe, assuming a break at the inaccessible weld(s) would result in no greater consequences than

those that would occur for break(s) postulated inside the guard pipe.

Please address whether there is a separation distance beyond which welds would not be considered adjacent.

RAI 82 [H]

By letter dated October 8, 2010, the NRC issued RAI 32 [H]. The licensee responded to the RAI by letter dated December 7, 2010. In the licensee's response to the RAI, the licensee provided a copy of Revision 3 of "HELB Outside Containment Walkdown Criteria & Requirements" (Reference 10.3.17 of ONDS (Oconee Nuclear Design Study) 351, Revision 2). The NRC staff has reviewed the document and has the following questions and requests for clarification.

Section 5.1, ii) states that "Non-liquid piping systems (air, gas) with a maximum operating pressure less than or equal to 275 psig are not considered high energy, regardless of temperature." Please provide the basis for this statement.

Section 5.4 discusses critical cracks, and leakage cracks, and dismisses the latter from consideration in the HELB criteria or design bases for piping outside containment. BTP MEB 3-1, Revision 2, June 1987, specifically requires addressing leakage cracks. Please confirm that the term leakage crack has the same meaning in both documents. Please address the difference between critical cracks and leakage cracks.

The pipe diameter used for longitudinal crack dimension is specifically mentioned as the inner diameter (ID). BTP MEB 3-1, Revision 2, June 1987, mentions diameter, without specifying ID or outside diameter (OD). Please explain why the ID was chosen over the OD for calculation purposes.

RAI 83 [H]

By letter dated October 8, 2010, the NRC issued RAI 35 [H]. The licensee responded to the RAI by letter dated December 7, 2010. In the licensee's response to the RAI 35 [H], the licensee refers to rigorously analyzed piping, once where seismic loading is included, and once where seismic loading is omitted. Please define rigorously analyzed piping, and address how it differs from piping that is not rigorously analyzed.

RAI 84 [H]

Concerning the application of NUREG/CR-2913, "Two Phase Jet Loads" (ADAMS Accession No. ML073510076), provide the following information:

Since NUREG/CR-2913 applies to breaks, provide justification for applying this NUREG to cracks.

The assessment should be site-specific (i.e., the indicated 10-pipe diameters may not provide a large enough zone of influence for potentially affected systems, structure, and components (SSCs).

RAI 85 [H]

In the June 29, 2009, HELB LAR, the licensee stated the following:

> Thrust Loads for evaluating potential interactions between postulated HELBs and the Turbine Building structural components will be determined in accordance with ANSI 58.2.

NUREG-0800, 3.6.2, Revision 2 – March 2007, page 9 states:

> The ANSI/ANS 58.2 standard has been accepted by the NRC. However, based on recent comments from the Advisory Committee on Reactor Safeguards (ACRS) (V. Ransom and G. Wallis), it appears that some assumptions related to jet expansion modeling in the ANSI/ANS 58.2 standard may lead to nonconservative assessments of the jet impingement loads of postulated pipe breaks on neighboring SSCs.

Please address how these statements regarding the potential nonconservative assessments of jet impingement loads have been addressed or considered.

RAI 86 [H]

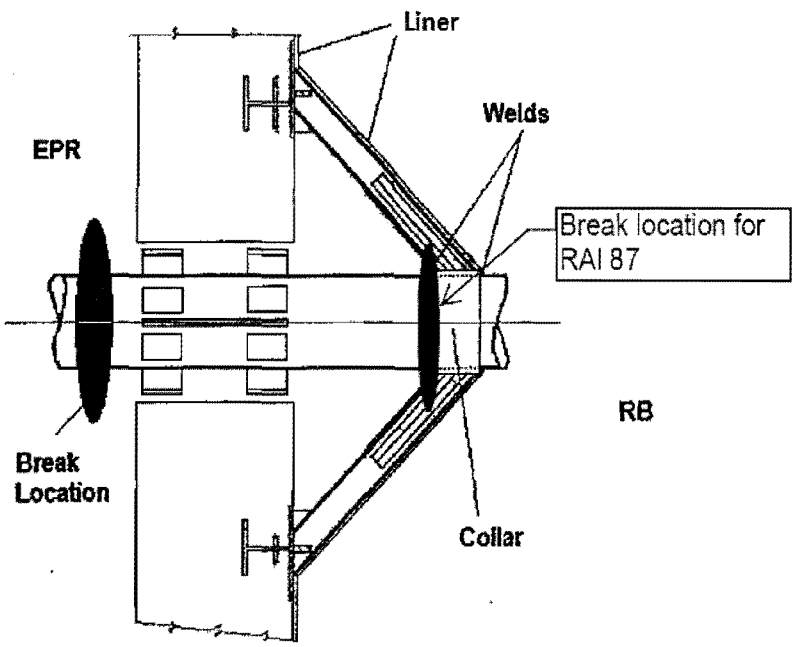
Please address whether containment penetrations have been analyzed for the jet impingement and pipe whip loads associated with breaks outside the containment pressure boundary in the associated penetrating lines.

RAI 87 [H]

It is not clear in the licensee's October 23, 2009, response to RAI 10 how the containment liner was evaluated for jet impingement and pressurization loads resulting from the break depicted in the RAI response.

Please address whether the potential attenuation of loading, due to the presence of the reactor building wall between the break and the liner, was credited for in the evaluation.

Discuss a postulated terminal end break outside the containment boundary on the main steam anchor (see sketch below), and evaluate the effect that this break will have on the containment integrity or provide a technical justification why such a break is not required to be postulated.



Sketch RAI-87

RAI 88 [T]

Attachment 2 of the June 26, 2008, LAR concerning tornado mitigation strategies proposed changes to the Updated Final Safety Analysis Report (UFSAR Section 3.5.1.3.1), second paragraph states: "...This is an updated version of the original TORMIS code developed for the Electric Power Research Institute (EPRI)..." The NRC staff reviewed and approved the tornado missile risk analysis (TORMIS) code developed for EPRI in a 1983 Safety Evaluation Report (SER) for use in demonstrating compliance with the Standard Review Plan (SRP). The NRC staff has not reviewed the updated version of the TORMIS code and cannot conclude the 1983 SER is applicable.

Provide a tabulation of all differences between the original TORMIS analysis that was reviewed by the NRC and is the subject of the 1983 SER and the updated version of the TORMIS code used in the license amendment request. Provide a basis for concluding that the 1983 SER is applicable to the modified version of the TORMIS code.

RAI 89 [T]

Enclosure 2 of the June 26, 2008, Tornado LAR, Section 5.2.13 (page 31), states:

> UFSAR Section 10.4.7.3.6...describes that a PRA [probalistic risk assessment] was developed to address the plant's capability to provide SSDHR [secondary side decay heat removal] via EFW [emergency feed water], SSF [standby shutdown facility] ASW [auxiliary service water], and Station ASW (see UFSAR Section 10.4.7.3.8) in the event of a tornado. As concluded in the accompanying SER, the SRP probabilistic criterion was met based on the probability of failure of

the EFW and Station ASW systems combined with the protection against tornado missiles afforded by the SSF ASW System.

UFSAR Section 10.4.7.3.6 states in part "...Reference 3 concludes that the Standard Review Plan probabilistic criteria is met based upon the probability of failure of the ESW and station ASW Systems combined with the protection against tornado missiles afforded the SSF ASW System."

Reference 3 is "ONOE [Oconee Nuclear Operating Experience] -11376, changes to support multiple unit alignment to the Auxiliary Steam Header." The NRC staff believes the correct reference is "Reference 7 NRC Safety Evaluation Report on the Effect of Tornado Missiles on Oconee emergency feedwater (EFW) Systems, dated July 28, 1989 (ADAMS Accession No. 8908030311)."

The NRC staff has previously addressed the use of the 1989 SER. Specifically, RAI-11, response transmitted by letter dated September 2, 2009, and RAI 2-1, response transmitted by letter May 6, 2010, both indicated that the probability analysis submitted by the licensee did not meet the SRP 2.2.3 criteria of 10^{-6} per year. The SER stated the acceptance of the licensee's position being reviewed at that time was based on factors other than the probability analysis. As written UFSAR 10.4.7.3.6 can be interpreted to mean that the referenced SER (Reference 7 in UFSAR Section 10.4.9) approved the probability analysis prepared by the licensee. The NRC staff finds this unacceptable.

Provide the following information concerning this issue.

- What is Reference 3 as discussed in UFSAR 10.4.7.3.6.?

- Delete the reference to the 1989 SER where it can be interpreted as approving the probability analysis prepared and submitted to the NRC at that time. Also, the licensee is requested to identify and delete all references to the 1989 SER in other licensing basis documents where the reference can be interpreted as implying that the NRC staff approved the probability analysis. The licensee is also requested to provide proposed revised UFSAR pages where the reference currently resides.

RAI 90 [T]

Attachment 2 of the June 26, 2008, Tornado LAR, the proposed change to UFSAR Section 3.5.1.3.1, last paragraph, states: "...the mean annual frequency of a damaging tornado missile strike resulting in a radiological release in excess of [Title 10 of the *Code of Federal Regulations* Part 100] 10 CFR 100 limits was determined to be less than the acceptance criteria of 1E-06 based on the Oconee tornado hazard data (Reference 14)." The cited reference has been withheld from public disclosure at the request of the licensee. By withholding this from public disclosure, the numerical results of the analysis are not contained in the UFSAR.

Provide the results of the analysis that demonstrate compliance with the acceptance criteria of 1E-06.

RIA 91 [T]

In the June 26, 2008, Tornado LAR, Section 5.3 of Attachment 4 (page 8), under SSF South Double Door states: "Various thicknesses of steel plating...to be the appropriate minimum thickness required to produce acceptable damage frequency results." The NRC staff is not familiar with the term acceptable damage frequency results. Define the term acceptable damage frequency results, and provide any references where the term is used in NRC regulations or guidance.

RAI 92 [T]

In the June 26, 2008, Tornado LAR, Section 4, 2nd Section of Attachment 4 states: "Note that these missiles include debris from structures that are expected to fail due to tornado winds." Provide a list of structures that are expected to fail due to tornado winds that are included as sources of tornado missiles.

RAI 93 [T]

In the June 26, 2008, Tornado LAR, Attachment 4, Section 5.1 states "With the modifications associated with the LAR, Oconee will have 2 redundant systems credited for secondary-side decay heat removal (SSDHR) which are the SSF ASW and the PSW system (enhanced replacement for the original Station ASW system)." In order to be considered "redundant" the two systems must be available at the same time. The PSW system is potentially not available for the first 72 hours. Since the PSW system may not be available after a tornado event, provide the justification how 2 redundant systems are credited for SSDHR.

RAI 94 [T]

In Attachment 4, of the June 26, 2008, LAR, Section 5.2 identifies three SSCs as having redundancy and that are evaluated "qualitatively," i.e., not included in the cumulative probability results. The results of the ONS TORMIS analysis are reported in Table 5 as 6.8/6.3/9.0E-07 for Units 1, 2 and 3 respectively. In an NRC memorandum to V. Stello from H. Denton, "POSITION ON USE OF PROBABILITY RISK ASSESSMENT IN TORNADO MISSILE PROTECTION LICENSING ACTIONS," dated November 7, 1983 (ADAMS Accession No. 080870291), the staff states:

> This guidance, which we will use in our probabilistic tornado missile reviews, states that an expected rate of occurrence of potential exposures in excess of the 10 CFR 100 guidelines of approximately 10^{-6} per year is acceptable if, when combined with reasonable qualitative arguments, the risk can be expected to be lower.

Given the narrow margin between the cumulative probabilities reported in the LAR and the acceptance criteria, the NRC staff finds the omission of the probability of these, and other targets that are qualitatively assessed, questionable when one considers what is stated in the November 7, 1983, memo cited above.

Provide a basis for concluding that with reasonable qualitative arguments, the risk can be expected to be lower.

RAI 95 [T]

Attachment 4 of the June 26, 2008, LAR conclusions, states [page 15]: "...Considering these sources of conservatism, especially the availability of PSW for tornado mitigation..." The NRC staff understands that PSW electrical distribution system can be damaged and would need to be repaired in the first 72 hours.

Explain how the PSW is considered a conservatism if the PSW system can be damaged by a tornado.

RAI 96 [T]

By letter dated May 25, 2010, the NRC issued RAI 2-29. The licensee responded to the RAI by letter dated June 24, 2010. The RAI response states that the average tornado warning time is 13 minutes, based on National Weather Service data.

Please provide a reference citation or description of the tornado warning time which includes the methodology and inputs used to estimate the warning time.

Please provide the bases for use of an average warning time and the margins of uncertainty.

RAI 97 [T]

Are all SSCs that are important to safety at ONS designed, as a minimum, to withstand either the design-basis tornado described in Regulatory Guide (RG) 1.76, Revision 0, "Design-Basis Tornado for Nuclear Power Plants," or the design-basis tornado and design-basis tornado-generated missile spectrum described in RG 1.76, Revision 1, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants," for Region I tornadoes? In your response, please discuss whether the RG 1.76, Revision 0, or RG 1.76, Revision 1, guidance applies to all current structures, systems, and components that are important to safety, as well as any new, or current structures, systems, and components that are modified as part of the current license amendment request. If the design-basis tornado proposed for ONS is characterized by less-conservative parameter values than specified in RG 1.76, Revision 0, or RG 1.76, Revision 1, provide a comprehensive analysis to justify the selection of the less-conservative design-basis tornado.

RAI 98 [T]

By letter dated July 6, 2009, the NRC issued RAI 15a. The licensee responded to the RAI by letter dated September 2, 2009. The RAI response states "The location of the new 100/13.8 kV substation was selected to provide wide separation from existing ONS backup power supplies to prevent coincident tornado damage of all power supplies at the same time. The 230 kV switchyard is supplied from multiple directions including 2 circuits from Jocassee (from the north) while Keowee Hydro is located east of ONS, and the new 100/13.8kV substation was placed south of ONS. There is a minimum of approximately

3,000 feet between these power supplies. Using Regulatory Guide 1.76, Revision 1, Region I data and equation 1b, the resultant wind speed at the perimeter of the 3,000 foot circle would be approximately 64 mph which is within the design capability of Oconee's power supplies."

Please explain why this scenario is the limiting case. Describe the consequences of the design-basis tornado sequentially striking the power supplies and/or the point of confluence of power lines from several directions, even if the power sources themselves are not impacted.

RAI 99 [T]

By letter dated October 8, 2010, the NRC issued RAI 1 [H]. The licensee responded to the RAI by letter dated December 7, 2010. The licensee's response to the RAI provides atmospheric dispersion factors (χ/Q values) used in the dose assessment for postulated HELBs in the letdown line.

Please provide a reference which documents the establishment of these control room (CR) χ/Q values as licensing basis values for the HELB dose assessment.

Please clarify whether the CR χ/Q values shown on page 4 would apply to the worst-case main steam line break following a tornado.

Provide a reference to any other CR χ/Q values associated with design basis accidents that may result from the occurrence of a tornado.

RAI 100 [H]

The Design Study ONDS-351, Rev. 2, "Analysis of Postulated High Energy Line Breaks Outside of Containment" (HELB Analysis) states in Section 2.4 that single active failures will be imposed for systems required for initial event mitigation, but not for systems required to initiate plant cool down.

Are single active failures imposed on the PSW, and the SSF systems?

RAI 101 [H]

Identify postulated HELBs that are capable of damaging piping or components belonging to the PSW or SSF and support systems that enable the operation of PSW or SSF. If any HELBs that damage or prevent the PSW or SSF from functioning exist, then provide a description of the impact that loss of PSW or SSF would have in that HELB scenario. Also address whether repairs would be necessary and how such repairs could be made.

RAI 102 [H]

As identified in the June 29, 2009, LAR HELB analysis, some HELB interactions result in a breach in the piping of systems required for cold shutdown. In order to proceed from the safe shutdown condition, these piping breaches would need to be repaired. For the largest piping breach resulting from HELB interaction with a cold shutdown system, provide a description of

how such repairs would typically be made and an estimate of the time required to complete those repairs. Can this type of damage be repaired within the 72-hour time frame identified in the HELB Analysis?

RAI 103 [H]

Section 3.2 of the June 29, 2009, LAR HELB analysis credits a submersible pump for replenishing the Unit 2 CCW embedded piping, which is the suction source for PSW and SSF. Assuming the maximum output of these systems, how long can PSW and SSF function before the submersible pump must be in place and functioning? What is the maximum flowrate from the submersible pump, and is it greater than the rate at which PSW or SSF will draw water from the CCW embedded piping? The submersible pump provides a required support function to the PSW and SSF; has a single active failure of the submersible pump been addressed?

RAI 104 [H]

Section 2.3 of the June 29, 2009, LAR HELB analysis states, "Equipment that is used for the detection and isolation for an identified HELB is the only detection and isolation equipment required to be targets of that specific HELB."

Piping impacted by a broken high energy line will need to be isolated, both for flooding concerns and to facilitate efforts to mitigate the event. It is not clear from the statement above that the equipment needed to isolate piping damaged by HELB has been included as a target for HELB. Are there HELBs that result in an unisolable break?

RAI 105 [H]

Item 15 of the Atomic Energy Commission letter dated December 15, 1972 (ADAMS Accession No. 029949) (A. Giambusso letter) requested a discussion of the potential for flooding of safety-related equipment in the event of an HELB. When evaluating possible flooding, were non-safety lines broken by a high energy line considered as additional flooding sources?

RAI 106 [T/H]

Please provide under one cover all documentation associated with the tornado and HELB mitigation strategies. This should include an update to the original application as appropriate, updated regulator commitments, all updated RAIs, diagrams, figures and any other associated documentation. This request is being made because some documentation associated with the LARs has been superseded. The updated documentation will allow the NRC to accelerate the review of the LARs.

RAI 107 [T/H]

To ensure licensing-basis clarity and component operability, Technical Specifications (TSs) need to properly address the PSW system in a manner that is consistent with the Standard TS requirements that have been established for the functions that are being performed by similar systems. For example, the minimum required mission time should be 7 days and the completion times should be limited to 72 hours in most cases. The proposed TS for the PSW system allow the system to be out of service for up to 45 days while maintenance is being performed on the system. The proposed TS does not put restrictions on other diverse systems (SSF) that are also used for tornado, HELB and fire mitigation while the PSW system is out of service. The suction source for the PSW system and the SSF are the same (Unit 2 circulating cooling water piping (CCW)). When the Unit 2 CCW piping is dewatered both the PSW system, and the SSF are out of service and cannot perform their intended functions. The proposed PSW TSs does not address this situation. Please address each of the above concerns.

RAI 108 [T]

Based on the NRC staff's review of the proposed tornado LAR and all supplements, the NRC staff finds that the licensee's proposed changes to the ONS UFSAR concerning the requirements of additional physical protection for SSCs against tornado guided missiles, and the addition of the new Section 3.5.1.3.1 TORMIS Methodology to the UFSAR to describe the EPRI methodology used for the ONS probabilistic missile strike analysis, is unacceptable. Based on the NRC staff's review of the information that was submitted, the NRC staff has identified the following two specific deficiencies. First, the licensee incorrectly limited the target set to equipment required to support the initial 72 hours after a tornado. This fails to include the additional SSCs that are required to achieve the safe and stable plant condition. Second, the licensee has failed to demonstrate that it has applied a systematic and structured process supporting the development of a final target list which would provide confidence that all unprotected SSCs important to safety to withstand a tornado missile threat have been identified.

Describe how all the SSCs needed to maintain safe and stable conditions following a tornado will be protected.

November 14, 2011

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 (ONS) - REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING THE LICENSE AMENDMENT REQUESTS (LARs) FOR UPGRADING THE LICENSING BASIS FOR HIGH ENERGY LINE BREAK MITIGATION (TAC NOS. ME5202, ME5203, ME5204, ME5205, ME5206, AND ME5207)

Dear Mr. Gillespie:

By letters dated June 26, 2008 (two letters), December 22, 2008, and June 29, 2009, Duke Energy Carolinas, LLC (the licensee), submitted LARs for ONS, which propose revisions to the current licensing basis regarding tornado and high energy line break (HELB) mitigating strategies.

The 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 RAIs were provided to your staff electronically, and numerous 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. Please provide responses to the RAIs by December 16, 2011. If you cannot respond by December 16, 2011, please provide the reason and a schedule of when you can respond to the RAIs.

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

Sincerely,

/RA/

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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ADAMS Accession No. ML11292A110 ***RAIs transmitted by memos dated**

OFFICE	NRR/LPL2-1/PM	NRR/LPL2-1/LA	SBPB/BC	EEEB/BC	AADB/BC	NRR/EMCB/BC	NRR/LPL2-1/BC	NRR/LPL2-1/PM
NAME	JStang	MO'Brien	GCasto* (2 SEs)	RMathew*	TTate*	MKhanna*	GKulesa (VSreenivas for)	JStang
DATE	11/14/11	11/14/11	05/03/2011 05/13/2011	03/18/2011	05/13/2011	04/19/2011	11/14/11	11/14/11

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