



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

July 24, 2009

Mr. Dave Baxter  
Vice President, Oconee Site  
Duke Energy Carolinas, LLC  
7800 Rochester Highway  
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION UNIT 1 - REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING THE LICENSEE AMENDMENT REQUEST FOR UPGRADING THE LICENSING BASIS FOR HIGH ENERGY LINE BREAK MITIGATION (TAC NO. MD9029)

Dear Mr. Baxter:

By letter dated June 26, 2008, to the U.S. Nuclear Regulatory Commission (NRC), Duke Energy Carolinas, LLC submitted a license amendment request (LAR) for the Oconee Nuclear Station, Unit 1, which proposes revisions to the current licensing basis regarding high energy line break mitigation. The NRC staff has reviewed the LAR and determined that additional information is required in order to complete the review. The requested additional information is enclosed. In a telephone conversation with members of your staff on June 15, 2009, to provide clarification of the requested information, your staff committed to provide the requested information 90 days from the date of this letter.

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

Sincerely,

A handwritten signature in black ink, appearing to read "John Stang".

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

Docket No. 50-269

Enclosure:  
RAI

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION  
LICENSE AMENDMENT REQUEST  
TO REVISE PORTIONS OF THE UFSAR RELATED TO THE  
HIGH ENERGY LINE BREAK MITIGATION LICENSING BASIS  
DUKE ENERGY CAROLINAS, LLC  
OCONEE NUCLEAR STATION, UNIT 1  
DOCKET NO. 50-269

By letter dated June 26, 2008, to the U.S. Nuclear Regulatory Commission (NRC) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML081910559), Duke Energy Carolinas, LLC (the licensee, Duke) submitted a license amendment request (LAR) for the Oconee Nuclear Station (ONS), Unit 1, which proposes revisions to the current licensing basis regarding High Energy line break (HELB) mitigation. The NRC staff has reviewed the LAR and determined that the following request for additional information (RAI) is required in order to complete the review. In a telephone conversation with the licensee on June 15, 2009, to provide clarification of the requested information the licensee committed to provide the requested information 90 days from the date of this letter.

RAI 1

Page 4 of Enclosure 2 of the LAR, states, "The enclosed HELB report includes safe shutdown analyses for HELBs postulated throughout the plant" and that these analyses are for structures, systems, and components required to achieve safe shutdown. Further, the LAR indicates that "ongoing safety analysis work is in progress" for the main steam and "other" HELBs. On page 7, in the significant hazards consideration section, it states that "This report provides the completed analysis for ONS HELBs."

- a) Specify for which unit the main steam analysis is in progress and the corresponding proposed changes. Also, specify which HELBs the word "other" on page 4 refers to.
- b) Explain the apparent inconsistency between these statements (i.e. "ongoing" vs. "completed").

RAI 2

The proposed LAR states that ONS' current regulatory criteria for HELB are in accordance with the provisions of the (1972-73) Giambusso/Schwencer letters. It also states that the proposed LAR, in addition to the Giambusso/Schwencer letters, will utilize Sections 3.6.1 and 3.6.2 of the Standard Review Plan (SRP) 1981 (NUREG-0800 "Review of Safety Analysis Reports for Nuclear Power Plants") and Revision 2 of Branch Technical Position (BTP) Mechanical Engineering Branch (MEB) 3-1. It appears that the proposed LAR contains a mixture of various regulatory guidance to evaluate HELB from 1972 Giambusso letters and SRP 1981. Provide the following information:

Enclosure

- a) Specify whether the proposed LAR meets all the criteria in BTP MEB 3-1, Rev. 2.
- b) If not all of the criteria in BTP MEB 3-1, Rev. 2, are met, provide a detailed comparison of the full criteria contained in BTP MEB 3-1 with the ONS proposed LAR HELB criteria. In addition, for each deviation, provide a corresponding technical justification.

### RAI 3

Revision 2 of BTP MEB 3-1, Section B.2.e, "Fluid Systems Qualifying as High-Energy or Moderate Energy," and Footnote 5 refer to "short operational period" requirements where "leakage cracks instead of breaks may be postulated." The footnote in Section B.2.e states:

"The operational period is considered "short" if the fraction of time that the system operates within the pressure-temperature conditions specified for high-energy fluid systems is about 2 percent of the time that the system operates as a moderate-energy fluid system (e.g., systems such as the reactor decay heat removal system qualify as moderate-energy fluid systems; however, systems such as auxiliary feedwater systems operated during PWR [pressurized-water reactor] reactor startup, hot standby, or shutdown qualify as high-energy fluid systems)."

It appears that the proposed LAR utilizes this part of the SRP to reduce the number of the HELB locations. The proposed LAR has the following statements:

"HELBs and Critical Cracks are not postulated on HE [high energy] Lines that operate at HE conditions less than 2 percent of the total system operating time." (LAR Enclosure 3, page 2-2)

And

"HELBs and Critical Cracks are not postulated on HE Lines that operate at HE conditions less than 1 percent of the of the total plant operating time (Normal Plant Conditions)." (LAR Enclosure. 3, page 2-2)

And that

"For systems meeting these limitations, no breaks or cracks are postulated." (LAR Enclosure. 3, page. 8-1)

- a) The criterion cited in the second LAR paragraph above (with reference to the 1 percent time) is not contained in the ONS current regulatory criteria (Giambusso/Schwencer letters) or in any of the proposed LAR referenced SRP editions. Provide the basis and acceptable justification for the short period of operation definition cited in that paragraph. Also, list all locations where this criterion has been applied in order to reduce the number of HELB locations.
- b) Per the LAR criteria cited above, breaks or cracks are not postulated on lines meeting the short period of operation criterion. The SRP guidance is to postulate through-wall leakage

cracks in lieu of breaks for those lines that qualify for the short operational period criterion as stated in the SRP. Provide a technical justification for the apparent deviation. In addition, provide a list of piping systems or sections of piping systems that fall under this requirement, your method of evaluation and whether through-wall leakage cracks have been postulated at those locations, and the corresponding assessment resulting from these leakage crack postulations.

- c) State whether the proposed LAR fully satisfies Footnote 5 of MEB 3-1 in that systems such as auxiliary feedwater systems operated during reactor startup, hot standby, or shutdown have been evaluated as high-energy fluid systems, as specified in the footnote.

#### RAI 4

Enclosure 3 of the LAR contains HELB criteria in Sections 2.2 and 8. Some of these criteria are not consistent. The following is brought to your attention as examples:

Page 8-2 under paragraph letter "C" states that:

"...For unanalyzed branch connections or where the stress at the branch connection is not accurately known, break locations are postulated in accordance with BTP MEB 3-1 (Section B.1.c(3))."

Page 8-2 under paragraph letter "B" states that (similarly, "F" which refers to "B"):

"For piping that is not rigorously analyzed or does not include seismic loadings, intermediate breaks are postulated in accordance with BTP MEB 3-1 (Section B.1.c (3)) (Reference 10.1.5)."

Last bulleted paragraph of page 2-2 states that:

"For piping that is not rigorously analyzed or does not include seismic loadings, HELBs shall be postulated at the terminal ends, and intermediate break locations as provided in BTP MEB 3-1, Section B.1.c.(2)(b)(i). (References 10.1.5, 10.1.6, & 10.1.7)."

- a) The NRC staff accepts the position taken in the paragraph of page 2-2, above, as it is in accordance with the criteria of MEB 3-1 (LAR Ref 10.1.5) Section B.1.c.(2)(b)(i). In addition, it is noted that Section B.1.c.(3)(a)(2) of the referenced MEB 3-1 states that: "Where break locations are selected without the benefit of stress calculations, [circumferential] breaks should be postulated at the piping welds to each fitting, valve, or welded attachment." Please explain the apparent inconsistency between the above cited statements.
- b) Provide the criteria for non-seismic I category piping and its interaction with seismic I category piping and how these criteria have been implemented.
- c) Identify areas where the criteria are inconsistent within the proposed LAR.

#### RAI 5

Enclosure 3, page 8-1, contains the following statement:

“Gas systems (e.g. nitrogen) and oil systems (e.g. EHC) have been excluded [from HELB and leakage crack considerations], since these systems possess limited energy (Reference 10.3.17).”

Page 2-1 also indicates that these systems (see above) “are not defined as high energy systems.”

HELB Report, OS-73.2 titled, “Analysis of Effects Resulting from Postulated Piping Breaks Outside Containment for Oconee Nuclear Station, Units 1, 2, & 3.”, is the original basis for the ONS HELB evaluation, included the electro-hydraulic control and nitrogen systems as postulated pipe breaks. Please address this departure from the previously approved evaluation.

#### RAI 6

The definition of terminal end on pages 1-12 and 8-2 paragraph “C” of the LAR deviates from the cited SRP reference, specifically with regard to boundary valves. The eighth bulleted paragraph on Page 2-2 provides the proposed LAR criterion for closed valves on seismically analyzed pipe runs. The LAR cited criterion is not in accordance with the SRP.

- a) Discuss the inconsistency between your definition of terminal end with that of the SRP and address the exclusion of treating boundary valves as terminal ends.
- b) In addition, provide a list of valves and piping runs for which terminal end postulation of HELB have been excluded due to this definition.

#### RAI 7

Enclosure 3, 8-2, paragraph “C” states that:

“A branch appropriately modeled in a rigorous stress analysis with the run flexibility and applied branch line movements included and where the branch connection stress is accurately known, the stress criteria noted above is used for postulating breaks locations.”

MEB 3-1, R2, B.1.c(1)(a) Footnote 3, states that:

“A branch connection to a main piping run is a terminal end of the branch run, except where the branch run is classified as part of a main run in the stress analysis and is shown to have a significant effect on the main run behavior.”

According to the proposed LAR criterion, branch runs analyzed as part of a main run and do not significantly affect the main run, their connections are not considered terminal end and depending on the stresses, their connection to the main run may not be postulated for pipe

break. This is inconsistent with the MEB 3-1 criterion. Provide a technical justification for the sited departure from the MEB 3-1 criterion for branch runs.

Note: RAIs 7 and 8 are on branch connections and valves. The NRC staff has, in the past, asked the licensee to clarify that it will satisfy the complete criteria contained in Footnote 3 of BTP MEB 3-1. It does not appear that this has taken place in the proposed LAR. In addition, the NRC staff has previously requested the licensee to compare its proposed HELB criteria with the full criteria contained in BTP MEB 3-1 in order for the NRC staff to perform a thorough safety review of the licensee's HELB mitigation strategy. The proposed LAR only addresses the criteria from BTP MEB 3-1, which provides relaxations to the licensing basis HELB criteria.

#### RAI 8

Page 8-3 of the ONS LAR states that, "Dynamic analysis of High Energy Category 1 piping postulated break locations and the effect on associated supports was not accomplished at Oconee." This does not meet the provisions of the Giambusso letter which specify that a summary be provided for the dynamic analysis applicable to the design of Category 1 piping and associated supports which determine the resulting loadings. Please address this apparent departure from the Giambusso letter.

#### RAI 9

Referring to the main feedwater rupture restraint, page 8-4 of the LAR states that "No breaks are postulated immediately downstream of the structural anchor." Terminal ends are on both sides of the anchors and breaks should be postulated on both sides.

- a) Provide an acceptable justification for not postulating breaks on both sides of this anchor.
- b) Please describe the consequences of the terminal end failure of the feedwater system within the auxiliary building that could occur on the reactor building side of the rupture restraint. Provide an analysis supporting this description.
- c) List any other inline anchors where breaks have been postulated on one side only.

#### RAI 10

In reference to the postulated main steam pipe break in the east penetration room (1-MS-065), this break is not postulated at the terminal end which is the anchor point. It is indicated on page 4-8 of the LAR that the break is postulated in the piping run outside the containment wall and remote from the anchor. This is a departure from the ONS MDS Report No. OS-73.2 and from SRP, which specify postulation of breaks at terminal ends such as anchors, where a break is most likely to occur due to the rigid 6-way constraint to the pipe provided by the anchor.

- a) Evaluate the effect of the break at the anchor point/terminal end, as specified in the above discussion, provide an alternative method in lieu of this evaluation; or provide an acceptable justification as to why the alternative location selected is the most likely location for an HELB.

- b) Please describe the consequences that the terminal end failure at the anchor point would have on containment integrity. Provide your findings and corresponding analyses that support your findings.
- c) List all other high energy piping where breaks were not postulated at the penetration anchors because the anchors were located inside containment and respond as in part "a" and "b" of this RAI.

RAI 11 (Section 1.3 - Calculations)

The LAR identifies various sections of the high energy piping that have been excluded due to normal operating temperature and pressure conditions. Please provide a copy of these calculations and justify the exclusions.

RAI 12 (Section 1.5 - Definitions)

Page 1-10 of the LAR states that, "The Initial Operating Conditions are the conditions, upon which the high energy lines & their boundaries are identified." The definition of "Initial Operating Conditions (or "Normal Operating Conditions")" stated in this section is:

"These conditions are the physical parameters that would exist within an ONS Unit with the Unit operating at 100% rated thermal power level (full power)."

This definition is inconsistent with the definition given in reference 10.1.3 (BTP ASB 3-1), which defines Normal Plant Conditions as plant operating conditions during reactor startup, operation at power, hot standby, or reactor cooldown to cold shutdown condition.

- a) Please provide a basis for the use of a definition different than that in the SRP.
- b) This RAI also ties to the LAR definition of HE line. Therefore, please delineate which specific fluid systems were eliminated from HELB considerations due to this alternate definition.

RAI 13 (Section 1.5 - Definitions)

On page 1-11 of the LAR, the definition of "Normal Plant Conditions" notes that the definition is used to exclude certain piping sections from the requirement of postulating HELBs on these sections. Please explain how this definition was used to exclude certain piping sections, and provide a list of all those sections of piping where this definition was used to exclude them from postulating HELBs.

RAI 14

In the last sentence of page 8-22 of Enclosure 3 of the SAR, it states that, "The (Main) Feedwater System high energy piping is seismically analyzed from the inlet valves IFDW-26 & 1 FDW-2 1, of the "A" HP Feedwater Heaters to the Containment Penetrations. The seismically analyzed portions of the FDW piping are Duke piping Class "G" from these valves to the Feedwater valves 1FDW-41 & IFDW-42 and IFDW-32 & 1FDW-33." According to Updated

Final Safety Analysis Report Table 3-1, Piping Class "G" was not designed for seismic loading. Please reconcile the apparent discrepancy between the FSAR table and the above statements in the new report ONDS-351, Rev 0, "Analysis of Postulated High Energy Line Breaks (HELBs) Outside of Containment."

RAI 15

Provide a list of all the equipment types (such as manufacturer, model number, etc.) that need to be qualified for the environmental conditions of this LAR. Identify any new components added to the equipment qualification (EQ) program. Identify any existing components that were replaced due to the LAR. Confirm that all the components identified above are qualified in accordance with Title 10 of *the Code of Federal Regulations* (10 CFR) Part 50, Section 50.49.

RAI 16

Provide the environmental profiles and demonstrate that the environmental conditions of this LAR are enveloped by the existing EQ profiles or demonstrate qualification of the components to the environmental conditions of this LAR.

RAI 17

In section 9 of the LAR, the licensee stated that the 125 VDC cable will be rerouted or will be protected from the postulated HELBs. If this cable is not rerouted, then please explain how it will be protected from the postulated HELBs.

RAI 18

In section 9 of the LAR, the licensee stated that the weep holes will be installed in Viking Electrical Penetration Enclosures. The licensee also stated that these weep holes will prevent the buildup of water within the enclosures. The NRC staff requests the licensee to confirm that 1) an appropriate drainage is provided for all junction boxes which contain components that are required to mitigate the environmental conditions of this LAR, and 2) the weep holes of these junction boxes will be inspected for blockage at appropriate intervals.

RAI 19

The NRC staff requests the licensee to confirm that failure of a non-safety related component would not adversely affect the safety function of a safety related component under postulated environmental conditions.

RAI 20

The NRC staff requests the licensee to identify if any components that are exposed to direct jet impingement due to main feed water HELBs and confirm that these components are qualified to survive the HELB.

RAI 21

In section 3.8 of ONDS-351, Page 3-17, the licensee stated that the protect service water system provided power to the systems and components such as high pressure injection makeup to the reactor coolant system (RCS) from the borated water storage tank, reactor coolant pump seal injection flow control, reactor vessel head vent valves, RCS high point vent valves, pressurizer heaters and vital instrumentation and control battery chargers. The NRC staff requests the licensee to provide qualification basis for these components, if these components are affected by the postulated HELBs.

July 24, 2009

Mr. Dave Baxter  
Vice President, Oconee Site  
Duke Energy Carolinas, LLC  
7800 Rochester Highway  
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION UNIT 1 - REQUEST FOR ADDITIONAL INFORMATION REGARDING (RAI) THE LICENSEE AMENDMENT REQUEST FOR UPGRADING THE LICENSING BASIS FOR HIGH ENERGY LINE BREAK MITIGATION (TAC NO. MD9029)

Dear Mr. Baxter:

By letter dated June 26, 2008, to the U.S. Nuclear Regulatory Commission (NRC), Duke Energy Carolinas, LLC submitted a license amendment request (LAR) for the Oconee Nuclear Station, Unit 1, which proposes revisions to the current licensing basis regarding high energy line break mitigation. The NRC staff has reviewed the LAR and determined that additional information is required in order to complete the review. The requested additional information is enclosed. In a telephone conversation with members of your staff on June 15, 2009, to provide clarification of the requested information, your staff committed to provide the requested information 90 days from the date of this letter.

If you have any questions, please call 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 No. 50-269

Enclosure:  
RAI

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