Duke Energy®

10 CFR 50.46

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U. S. Nuclear Regulatory Commission
Washington, D. C. 20555-001
Attention: Document Control Desk

Subject: Duke Energy Carolinas, LLC (Duke Energy)
Oconee Nuclear Station, Units 1, 2, and 3
Docket Numbers 50-269, 50-270, and 50-287

30-Day Report Pursuant to 10 CFR 50.46, Changes to or Errors in an Evaluation Model

10 CFR 50.46 (a)(3)(ii) requires the reporting of changes to or errors in Emergency Core Cooling (ECCS) evaluation models (EMs), or in the application of such models that affect the temperature calculation. On August 9, 2010, Duke Energy received a letter from AREVA identifying a small break loss of coolant accident (SB LOCA) EM error correction which affects the reported SBLOCA analysis of record results for Oconee Units 1, 2, and 3. The Large Break LOCA analyses are not affected by this issue.

The enclosed Attachment provides a description of the LOCA EM error and the associated impact to Oconee SBLOCA analysis of record. AREVA identified that the SBLOCA axial power shape defined in the applicable ECCS evaluation model may not be bounding for middle- to end-of-cycle conditions. Based on information supplied by AREVA, an assessment of the error results in a peak cladding temperature (PCT) increase of 225 °F from the previously reported full-power SBLOCA analysis PCT values. The new estimated PCTs for the full-power SBLOCA analysis are 1686 °F for Mark-B11 fuel, and 1622 °F for Mark-B-HTP fuel. This PCT assessment represents a significant change in reported PCT (greater than 50 °F), as defined in 10 CFR 50.46 (a)(3)(i).

The Oconee Units also have a 75% partial-power SBLOCA analysis with one High Pressure Injection (HPI) pump out of service that supports a 30 day LCO operational window, per Oconee Technical Specification 3.5.2. Previously reported PCTs for the part-power analysis are 1788 °F for Mark-B-HTP fuel and 1774 °F for Mark-B11 fuel. At this time, it is unclear if the axial power shape used for the plant, as defined in the applicable LOCA EM, is bounding. Additional analysis by AREVA is required, therefore, no PCT estimates are provided for the partial power SBLOCA analysis with one-HPI pump out of service. However, at this time entry into the LCO window is administratively not allowed, pending completion of new SBLOCA analyses that will address this issue. This issue has been entered into Oconee's corrective action system.

Currently, new full-core Mark-B-HTP SBLOCA analyses are being performed by AREVA for the Oconee units that will include the effects of the LOCA EM error correction to ensure usage of a bounding axial power shape. It is noted that the full core Mark-B-HTP SBLOCA analyses includes new partial-power SBLOCA analyses that will include the effects of the skewed axial power shape if needed. The new SBLOCA analysis will be completed by October 29, 2010.

This information satisfies the 30-day reporting requirements of 10 CFR 50.46 (a)(3)(ii).

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There are no regulatory commitments associated with this letter.

Please address any comments or questions regarding this matter to L. B. Jones at (704) 382-4753.

Sincerely,

Thomas C. Geer
Vice President, Nuclear Engineering

Attachments

Report of Error Correction on AREVA SBLOCA ECCS Evaluation Model

Table 1 – Mark-B11 Peak Cladding Temperature Summary – Oconee Units 1, 2, and 3

Table 2 – Mark-B-HTP Mixed Core Peak Cladding Temperature Summary – Oconee Units 1, 2, and 3

xc: (with attachments)

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ATTACHMENTS

Report of Error Correction on AREVA SBLOCA ECCS Evaluation Model

Table 1 – Mark-B11 Peak Cladding Temperature Summary – Oconee Units 1, 2, and 3

Table 2 – Mark-B-HTP Mixed Core Peak Cladding Temperature Summary – Oconee Units 1, 2, and 3

Report of Error Correction on AREVA SBLOCA ECCS Evaluation Model

Per letter dated August 9, 2010 (Reference 1), AREVA has notified Duke Energy that the SBLOCA axial power shape defined in BAW-10192P-A Rev. 0 (Reference 2) may not be bounding for middle- to end-of-cycle (MOC to EOC) conditions. This is a generic issue applicable to all B&W plants licensed to utilize BAW-10192P-A Rev. 0 for LOCA analyses. Since the SBLOCA analyses are designed to be independent of time in cycle, a bounding peak should be used to be consistent with the requirements identified in Section I.A of 10 CFR 50 Appendix K. As a result, a bounding EOC axial power shape peaked at a core elevation of 11 feet was developed by AREVA that conservatively meets all requirements for the all Oconee units operating at full power. The bounding axial power shape results in an increase in the reported full-power SBLOCA PCT. An assessment was performed by AREVA, and the new estimated SBLOCA PCTs of 1622 °F for Mark-B-HTP fuel and 1686 °F for Mark-B11 fuel were assigned to the Oconee units to account for the 11-ft axial power shape. This generic PCT assessment represents an increase of +225 °F (Table 1-1 of Reference 3) from the previously reported SBLOCA PCTs of 1397 °F for Mark-B-HTP fuel and 1461 °F for Mark-B11 fuel (Reference 4).

The Oconee Units also have a partial power SBLOCA analysis with one-HPI pump out of service that supports a 30 day LCO operational window per Oconee Technical Specification 3.5.2. The partial-power SBLOCA analysis has a currently reported PCT of 1788 °F for Mark-B-HTP fuel and 1774 °F for Mark-B11 fuel (Reference 4). It is unclear if the current axial power shape used in the partial power SBLOCA analysis, which is peaked at a core elevation of approximately 9.5 feet per BAW-10192P-A, Rev. 0, is bounding. Additional analysis by AREVA is required, therefore, no PCT estimates are provided for the partial power SBLOCA analysis with one-HPI pump out of service. However, at this time entry into the LCO window is administratively not allowed, pending completion of new SBLOCA analyses that will address this issue. This issue has been entered into Oconee's corrective action system.

Currently, new full core Mark-B-HTP SBLOCA analyses are being performed for the Oconee units that include the 11-ft axial power shape. The full core Mark-B-HTP SBLOCA analyses can be used to define the mixed-core Mark-B-HTP results. It is noted that the full core Mark-B-HTP SBLOCA analyses includes new partial power SBLOCA analyses that will include the effects of the skewed axial power shape if needed. AREVA will also provide Oconee-specific PCT assessments for the SBLOCA analyses of Mark-B11 fuel. Therefore, the implementation of the new full core Mark-B-HTP SBLOCA analyses ends the period in which the estimated PCT results are applicable. The new SBLOCA analyses will be completed by October 29, 2010.

The revised full power PCTs remain well within the 10 CFR 50.46 acceptance criterion. The margin to the limits of the local oxidation and whole core hydrogen generation criteria are also sufficient to assure compliance to these criteria remains unchanged. In addition, consideration of the revised SBLOCA axial power shapes does not impact the conclusions that a coolable core geometry and long-term core cooling can be maintained following any licensing basis SBLOCA.

This error correction is limited to the full power SBLOCA applications; therefore, the PCT for LBLOCA and the bounding plant linear heat rate limits for Oconee's currently operating cycles are unaffected. The one HPI pump partial-power 30-day LCO operational window per TS 3.5.2 is administratively not allowed, pending completion of new SBLOCA analyses that will address this issue.

The enclosed tables summarize the effect of the error correction on the limiting SBLOCA PCT for Oconee Units 1, 2 and 3 Small Break LOCA licensing basis.

References:

1. AREVA Letter FAB10-543 to T. C. Geer (Duke Energy), "10 CFR 50.46 LOCA Report of EM Error Correction (AREVA CR 2010-4150: EOC SBLOCA axial power shape)," August 9, 2010.

2. AREVA NP Topical Report BAW-10192P-A, Rev. 0, "BWNT LOCA – BWNT Loss-of-Coolant Accident Evaluation Model for Once-Through Steam Generator Plants", June 1998.

3. AREVA Letter to USNRC Document Control Desk, Response to Request for Additional Information (RAI) Regarding Topical Report BAW-10192P, Revision 2, "BWNT LOCA – BWNT Loss of Coolant Accident Evaluation Model for Once-Through Steam Generator Plants," July 27, 2010. [NRC ADAMS Accession No. ML102100201].

4. Duke Letter from T. C. Geer to USNRC Document Control Desk, "Report Pursuant to 10 CFR 50.46, Changes to or Errors in an ECCS Evaluation Model," 2009 Annual Report, June 10, 2010.

Table 1: Mark-B11 Peak Cladding Temperature Summary – Oconee Units 1, 2, and 3

SBLOCA	PCT(°F)	Comments
Evaluation model: RELAP5/MOD2-B&W		
Analysis of record PCT	1461	Full Power -100% FP (2 HPI Case) 0.15 ft^2 break
Prior errors (ΔPCT) 1. None	0	
Prior evaluation model changes (ΔPCT) 1. None	0	
Errors (ΔPCT) 1. None	+225	EOC SBLOCA Axial Power Shape Error
Evaluation model changes (ΔPCT) 1. None	0	
Absolute value of errors/changes for this report (ΔPCT)	225	
Net change in PCT for this report	+225	
Final PCT	1686	

SBLOCA	PCT(°F)	Comments
Analysis of record PCT	1774	Reduced Power – 75% FP (1 HPI case) 0.075 ft^2 break
Prior errors (ΔPCT) 1. None	0	
Prior evaluation model changes (ΔPCT) 1. None	0	
Errors (ΔPCT) 1. None	Unknown	EOC SBLOCA Axial Power Shape Error
Evaluation model changes (ΔPCT) 1. None	0	
Absolute value of errors/changes for this report (ΔPCT)	Unknown	
Net change in PCT for this report	Unknown	
Final PCT	Unknown	Operation Not Justified

Table 2: Mark-B-HTP Mixed Core Peak Cladding Temperature Summary – Oconee Units 1, 2, and 3

SBLOCA	PCT(°F)	Comments
Evaluation model: RELAP5/MOD2-B&W		
Analysis of record PCT	1397	Full Power -100% FP (2 HPI Case) 0.15 ft^2 break
Prior errors (ΔPCT) 1. None	0	
Prior evaluation model changes (ΔPCT) 1. None	0	
Errors (ΔPCT) 1. None	+225	EOC SBLOCA Axial Power Shape Error
Evaluation model changes (ΔPCT) 1. None	0	
Absolute value of errors/changes for this report (ΔPCT)	225	
Net change in PCT for this report	+225	
Final PCT	1622	

SBLOCA	PCT(°F)	Comments
Analysis of record PCT	1788	Reduced Power – 75% FP (1 HPI case) 0.075 ft^2 break
Prior errors (ΔPCT) 1. None	N/A	
Prior evaluation model changes (ΔPCT) 1. None	N/A	
Errors (ΔPCT) 1. None	Unknown	EOC SBLOCA Axial Power Shape Error
Evaluation model changes (ΔPCT) 1. None	0	
Absolute value of errors/changes for this report (ΔPCT)	Unknown	
Net change in PCT for this report	Unknown	
Final PCT	Unknown	Operation Not Justified