



10 CFR 50.46

July 5, 2012

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

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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 and Annual 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 System (ECCS) evaluation models (EMs), or in the application of such models that affect the temperature calculation. As such, Duke Energy hereby submits information regarding the results of a full reanalysis of the Loss of Coolant Accident (LOCA) for the Oconee Nuclear Station (ONS), considering a full-core of Mk-B-HTP fuel. ONS Unit 3 Cycle 27 began operation on June 6, 2012, transitioning to loading patterns with a full-core of Mk-B-HTP fuel. ONS Unit 2 transitioned to full-core Mk-B-HTP loading patterns in December 2011, and the resultant impact on ECCS evaluation model results were reported to the NRC on December 8, 2011 [ADAMS Accession No. ML11347A193]. ONS Unit 1 will transition to full-core Mk-B-HTP loading patterns in late 2013. Therefore, at this time, the full-core Mk-B-HTP LOCA analysis results provided herein are only applicable to ONS Units 2 and 3.

The full-core Mk-B-HTP Large Break LOCA PCT result is 1913°F, which represents a significant reduction in PCT (absolute value of the PCT change greater than 50°F), as defined in 10 CFR 50.46 (a)(3)(i), versus the previous analysis of record PCT of 2020°F for a mixed-core of Mk-B11 and Mk-B-HTP fuel. The absolute value change in PCT for Large Break LOCA is determined to be 107°F and is considered to be a significant change per the definition in 10 CFR 50.46 (a)(3)(i).

For the Small Break LOCA, the full-core Mk-B-HTP result is 1598°F. The Small Break LOCA analysis of record PCT for a mixed-core of Mk-B11 and Mk-B-HTP fuel was 1397°F. In a letter dated August 19, 2010, Duke Energy reported an error associated with this value and applied a 225°F penalty which resulted in a final Licensing Bases PCT of 1622°F for the mixed-core, thus the Change in PCT for Small Break LOCA is determined to be 23°F and is not a significant change per the definition in 10 CFR 50.46 (a)(3)(i).

10 CFR 50.46 (a)(3)(ii) also specifies that a proposed schedule for reanalysis is to be included for changes that are determined to be significant. The assessment of the PCT impact is based on a plant specific reanalysis for the applicable core configuration and, therefore, no further analysis is needed. The PCT assessment is derived from input information regarding the fuel type configuration (Mk-B-HTP mixed core opposed to Mk-B-HTP Full-core).

This information satisfies the 30-day reporting requirements of 10 CFR 50.46 (a)(3)(ii). During the period from January 1, 2011 to December 31, 2011, there were no errors identified in the application of the large break loss of coolant accident (LBLOCA) EM or the small break loss of coolant accident (SBLOCA) EM. Therefore, this letter also serves as the 2011 annual 10 CFR 50.46 report for ONS.

The new full-core Mk-B-HTP LOCA analyses supports a 24-month fuel cycle with gadolinia as a burnable absorber, and were performed in accordance with the NRC approved LOCA Evaluation Model described in AREVA Topical Report BAW-10192P-A. NRC approval for use of Gadolinia fuel at ONS is provided via Safety Evaluation dated July 21, 2011 [ADAMS Accession No. ML11137A150]. NRC approval for use of 24-month fuel cycles at ONS is provided via Safety Evaluation dated April 20, 2012 [ADAMS Accession No. ML12086A289].

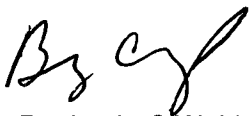
On February 23, 2012, Duke Energy received a letter from AREVA identifying two changes which affect the LBLOCA analysis of record for ONS Units 1, 2, and 3. The first change is an EM application error, and the second change is an EM modeling change. The ONS SBLOCA analyses are not affected by these issues. The impacts to peak cladding temperature (PCT) due to these changes were previously reported to the NRC on March 9, 2012 [ADAMS Accession No. ML12073A354], and are also accounted for in this report.

Included in this report is Mk-B11 fuel LOCA PCT summary tables and Mk-B-HTP mixed-core LOCA PCT summary tables for Unit 1, and full-core Mk-B-HTP LOCA PCT summary tables for Units 2 and 3. The LOCA results for Units 1 and 2 remain unchanged from those previously reported on March 9, 2012, and are provided for completeness. The results for the ONS Unit 3, considering a full-core of Mk-B-HTP fuel, resulted in PCT change of minus 107°F for a Large Break LOCA.

There are no regulatory commitments associated with this letter.

Please address any comments or questions regarding this matter to Paul Guill at (704) 382-4753 ([paul.guill@duke-energy.com](mailto:paul.guill@duke-energy.com)).

Sincerely,



Benjamin C Waldrep

Attachment

- Table 1: Mk-B11 Peak Cladding Temperature Summary – ONS Unit 1
- Table 2: Mk-B-HTP Mixed Core Peak Cladding Temperature Summary – ONS Unit 1
- Table 3: Mk-B-HTP Full Core Peak Cladding Temperature Summary – ONS Units 2 and 3

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## **ATTACHMENT**

**Table 1: Mk-B11 Peak Cladding Temperature Summary – ONS Unit 1**

**Table 2: Mk-B-HTP Mixed Core Peak Cladding Temperature Summary – ONS Unit 1**

**Table 3: Mk-B-HTP Full Core Peak Cladding Temperature Summary – ONS Unit 2 and 3**

### **References for Tables 1, 2, & 3**

- A) Letter, T. C. Geer (Duke) to USNRC, "Report Pursuant to 10 CFR 50.46, Changes to or Errors in an Evaluation Model", December 18, 2007. [ADAMS ML073580171]
- B) Letter, T. C. Geer (Duke) to USNRC, "Report Pursuant to 10 CFR 50.46, Changes to or Errors in an Evaluation Model", July 29, 2008. [ADAMS ML082130096]
- C) Letter, T. C. Geer (Duke) to USNRC, "30-Day Report Pursuant to 10 CFR 50.46, Changes to or Errors in an Evaluation Model", August 19, 2010. [ADAMS ML102360485]
- D) Letter, G. J. St.Clair (AREVA) to S. B. Thomas (Duke), "10 CFR 50.46 LOCA Report of Two EM Error Corrections (AREVA CR 20120165: ECCS Bypass Mathematical Error and AREVA CR 2012-757: Upper Plenum Column Weldment EM Change)", Dated February 23, 2012, AREVA Letter FAB12-120.
- E) Letter, R. M. Glover (Duke) to USNRC, "30-Day Report Pursuant to 10 CFR 50.46, Changes to or Errors in an Evaluation Model", December 8, 2011. [ADAMS ML11347A193]
- F) Letter, D. C. Culp (Duke) to USNRC, "30-Day Report Pursuant to 10 CFR 50.46, Changes to or Errors in an Evaluation Model", March 9, 2012. [ADAMS ML12073A354]

**Table 1: Mk-B11 Peak Cladding Temperature Summary – ONS Unit 1**

| <b>LBLOCA</b>  | <b>PCT(°F)</b> | <b>Comments</b>                                 |
|--|----------------|---|
| Evaluation model: RELAP5/MOD2-B&W  |                |   |
| Analysis of record PCT   | 2035           | Mark-B11 (M5), 17.7 kW/ft at 6.021 ft elevation |
| Prior errors ( $\Delta$ PCT)<br>1. Various   | 0              | References A and B                              |
| Prior evaluation model changes ( $\Delta$ PCT)<br>1. None                            | 0              |   |
| Errors ( $\Delta$ PCT)<br>1. Error in ECCS Bypass Calculation                        | -80            | References D, F                                 |
| Evaluation model changes ( $\Delta$ PCT)<br>1. Upper Plenum Column Weldment Modeling | +80            | References D, F                                 |
| Absolute value of errors/changes for this report ( $\Delta$ PCT)                     | 0              |   |
| Net change in PCT for this report  | 0              |   |
| Final PCT  | 2035           |   |
| <b>SBLOCA Full Power -100% FP</b>  | <b>PCT(°F)</b> | <b>Comments</b>                                 |
| Evaluation model: RELAP5/MOD2-B&W  |                |   |
| Analysis of record PCT   | 1461           | (2 HPI Case) 0.15 ft <sup>2</sup> break         |
| Prior errors ( $\Delta$ PCT)<br>1. None  | 0              |   |
| Prior evaluation model changes ( $\Delta$ PCT)<br>1. None                            | 0              |   |
| Errors ( $\Delta$ PCT)<br>1. EOC SBLOCA Axial Power Shape Error                      | +225           | Reference C                                     |
| Evaluation model changes ( $\Delta$ PCT)<br>1. Upper Plenum Column Weldment Modeling | 0              | Reference D                                     |
| Absolute value of errors/changes for this report ( $\Delta$ PCT)                     | 225            |   |
| Net change in PCT for this report  | +225           |   |
| Final PCT  | 1686           |   |
| <b>SBLOCA Reduced Power – 75% FP [1]</b>   | <b>PCT(°F)</b> | <b>Comments</b>                                 |
| Analysis of record PCT   | 1774           | (1 HPI case) 0.075 ft <sup>2</sup> break        |
| Prior errors ( $\Delta$ PCT)<br>1. None  | 0              |   |
| Prior evaluation model changes ( $\Delta$ PCT)<br>1. None                            | 0              |   |
| Errors ( $\Delta$ PCT)<br>1. EOC SBLOCA Axial Power Shape Error                      | Unknown        | Reference C                                     |
| Evaluation model changes ( $\Delta$ PCT)<br>1. Upper Plenum Column Weldment Modeling | 0              | Reference D                                     |
| Absolute value of errors/changes for this report ( $\Delta$ PCT)                     | Unknown        |   |
| Net change in PCT for this report  | Unknown        |   |
| Final PCT  | Unknown        | Operation Not Justified [2]                     |

**Notes**

1. Partial power SBLOCA analysis with one HPI pump out of service, supports 30 day LCO for TS 3.5.2 Condition B. Also supports TS 3.5.2 Condition C1 and C2.
2. Entry to LCO window administratively not allowed. Refer to ONS corrective action program item PIP O-10-6229 for details.

**Table 2: Mk-B-HTP Mixed Core Peak Cladding Temperature Summary – ONS Unit 1**

| <b>LBLOCA</b>  | <b>PCT(°F)</b> | <b>Comments</b>                          |
|--|----------------|--|
| Evaluation model: RELAP5/MOD2-B&W  |                |  |
| Analysis of record PCT   | 2020           |  |
| Prior errors ( $\Delta$ PCT)<br>1. None  | 0              |  |
| Prior evaluation model changes ( $\Delta$ PCT)<br>1. None  | 0              |  |
| Errors ( $\Delta$ PCT)<br>1. Error in ECCS Bypass Calculation  | -80            | References D, F                          |
| Evaluation model changes ( $\Delta$ PCT)<br>1. Upper Plenum Column Weldment Modeling                 | +80            | References D, F                          |
| Absolute value of errors/changes for this report ( $\Delta$ PCT)                                     | 0              |  |
| Net change in PCT for this report  | 0              |  |
| Final PCT  | 2020           |  |
| <b>SBLOCA Full Power -100% FP</b>  | <b>PCT(°F)</b> | <b>Comments</b>                          |
| Evaluation model: RELAP5/MOD2-B&W  |                |  |
| Analysis of record PCT   | 1397           | (2 HPI Case) 0.15 ft <sup>2</sup> break  |
| Prior errors ( $\Delta$ PCT)<br>1. None  | 0              |  |
| Prior evaluation model changes ( $\Delta$ PCT)<br>1. None  | 0              |  |
| Errors ( $\Delta$ PCT)<br>1. EOC SBLOCA Axial Power Shape Error                                      | +225           | Reference C                              |
| Evaluation model changes ( $\Delta$ PCT)<br>1. Upper Plenum Column Weldment Modeling                 | 0              | Reference D                              |
| Absolute value of errors/changes for this report ( $\Delta$ PCT)                                     | 225            |  |
| Net change in PCT for this report  | +225           |  |
| Final PCT  | 1622           |  |
| <b>SBLOCA Reduced Power – 75% FP [1]</b>   | <b>PCT(°F)</b> | <b>Comments</b>                          |
| Analysis of record PCT   | 1788           | (1 HPI case) 0.075 ft <sup>2</sup> break |
| Prior errors ( $\Delta$ PCT)<br>1. Not Applicable (New Analysis performed in 2008)                   | N/A            |  |
| Prior evaluation model changes ( $\Delta$ PCT)<br>1. Not Applicable (New Analysis performed in 2008) | N/A            |  |
| Errors ( $\Delta$ PCT)<br>1. EOC SBLOCA Axial Power Shape Error                                      | Unknown        | Reference C                              |
| Evaluation model changes ( $\Delta$ PCT)<br>1. Upper Plenum Column Weldment Modeling                 | 0              | Reference D                              |
| Absolute value of errors/changes for this report ( $\Delta$ PCT)                                     | Unknown        |  |
| Net change in PCT for this report  | Unknown        |  |
| Final PCT  | Unknown        | Operation Not Justified [2]              |

**Notes**

1. Partial power SBLOCA analysis with one HPI pump out of service, supports 30 day LCO for TS 3.5.2 Condition B. Also supports TS 3.5.2 Condition C1 and C2.
2. Entry to LCO window administratively not allowed. Refer to ONS corrective action program item PIP O-10-6229 for details.

**Table 3: Mk-B-HTP Full Core Peak Cladding Temperature Summary – ONS Unit 2 & 3**

| <b>LBLOCA</b>  | <b>PCT(°F)</b> | <b>Comments</b>                                     |
|--|----------------|---|
| Evaluation model: RELAP5/MOD2-B&W  |                |   |
| Analysis of record PCT   | 1913           |   |
| Prior errors ( $\Delta$ PCT)<br>1. None  | 0              |   |
| Prior evaluation model changes ( $\Delta$ PCT)<br>1. None                            | 0              |   |
| Errors ( $\Delta$ PCT)<br>1. Error in ECCS Bypass Calculation                        | -80            | References D, F                                     |
| Evaluation model changes ( $\Delta$ PCT)<br>1. Upper Plenum Column Weldment Modeling | +80            | References D, F                                     |
| Absolute value of errors/changes for this report ( $\Delta$ PCT)                     | 0              |   |
| Net change in PCT for this report  | 0              |   |
| Final PCT  | 1913           |   |
| <b>SBLOCA Full Power -100% FP</b>  | <b>PCT(°F)</b> | <b>Comments</b>                                     |
| Evaluation model: RELAP5/MOD2-B&W  |                |   |
| Analysis of record PCT   | 1598           | (2 HPI Case) 0.15 ft <sup>2</sup> break             |
| Prior errors ( $\Delta$ PCT)<br>1. None  | 0              |   |
| Prior evaluation model changes ( $\Delta$ PCT)<br>1. None                            | 0              |   |
| Errors ( $\Delta$ PCT)<br>1. None  | 0              |   |
| Evaluation model changes ( $\Delta$ PCT)<br>1. Upper Plenum Column Weldment Modeling | 0              | Reference D   |
| Absolute value of errors/changes for this report ( $\Delta$ PCT)                     | 0              |   |
| Net change in PCT for this report  | 0              |   |
| Final PCT  | 1598           |   |
| <b>SBLOCA Reduced Power – 50% FP [1]</b>   | <b>PCT(°F)</b> | <b>Comments</b>                                     |
| Analysis of record PCT   | N/A            | Will be reported under a separate LAR (Reference E) |
| Prior errors ( $\Delta$ PCT)<br>1.   | N/A            |   |
| Prior evaluation model changes ( $\Delta$ PCT)<br>1.                                 | N/A            |   |
| Errors ( $\Delta$ PCT)<br>1.   | N/A            |   |
| Evaluation model changes ( $\Delta$ PCT)<br>1. Upper Plenum Column Weldment Modeling | 0              | Reference D   |
| Absolute value of errors/changes for this report ( $\Delta$ PCT)                     | N/A            |   |
| Net change in PCT for this report  | N/A            |   |
| Final PCT  | N/A            | Operation Not Justified [2]                         |

**Notes**

1. Partial power SBLOCA analysis with one HPI pump out of service, supports 30 day LCO for TS 3.5.2 Condition B. Also supports TS 3.5.2 Condition C1 and C2.
2. Pending review and approval of separate LAR. Refer to Reference E for additional details.