



Callaway Plant

March 1, 2011

ULNRC-05769

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555-0001

10 CFR 50.46

Ladies and Gentlemen:

**DOCKET NUMBER 50-483  
CALLAWAY PLANT  
UNION ELECTRIC COMPANY  
10 CFR 50.46 ANNUAL REPORT  
ECCS EVALUATION MODEL REVISIONS**

- References:
- 1) ULNRC-05260 dated 3-9-06
  - 2) ULNRC-05378 dated 3-7-07
  - 3) ULNRC-05475 dated 3-4-08
  - 4) ULNRC-05600 dated 3-4-09
  - 5) ULNRC-05683 dated 3-1-10

Ameren Missouri hereby submits the annual report required per 10 CFR 50.46(a)(3) for Callaway Plant. Attachment 1 to this letter describes changes to the Westinghouse ECCS Large Break and Small Break Loss of Coolant Accident (LOCA) Evaluation Models which have been implemented for Callaway during the time period from March 2010 to March 2011. Attachment 2 provides an ECCS Evaluation Model Margin Assessment which accounts for all peak cladding temperature (PCT) changes resulting from the resolution of prior issues as they apply to Callaway. No new PCT penalties are included in these attachments. References 1 through 5 provided annual 10 CFR 50.46 reports that were issued after the LOCA analyses were revised to reflect the installation of the replacement steam generators in 2005.

The PCT values determined in the Large Break and Small Break LOCA analyses of record, when combined with all PCT margin allocations, remain below the 2200°F regulatory limit. As such, no reanalysis is planned by Ameren Missouri.

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This letter does not contain any new commitments. If you have any questions on this report, please contact Mr. Tom Elwood at (314) 225-1905.

Very truly yours,

A handwritten signature in black ink, appearing to read "Scott M" followed by a large, stylized flourish or loop.

Scott Maglio  
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GGY/nls  
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**ATTACHMENT ONE**

**CHANGES TO THE WESTINGHOUSE**

**ECCS EVALUATION MODEL**

**AND PCT PENALTY ASSESSMENTS**

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1. URANIA-GADOLINIA PELLET THERMAL CONDUCTIVITY CALCULATION
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4. GENERAL CODE MAINTENANCE
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## **1. URANIA-GADOLINIA PELLET THERMAL CONDUCTIVITY CALCULATION**

Two errors were discovered in the pellet thermal conductivity calculation for urania-gadolinia pellets in the SBLOCTA code. First, the calculation did not include the terms required to adjust for pellet densities other than 95% of the theoretical density. Second, the conversion from Fahrenheit to Rankine temperatures used an addend of 459 instead of 459.67. These errors have been corrected and evaluated for impact on existing Small Break LOCA analysis results. These changes represent a closely-related group of Non-Discretionary Changes in accordance with Section 4.1.2 of WCAP-13451.

SBLOCTA sensitivity calculations performed by Westinghouse have resulted in an estimated PCT impact of 0°F for existing Small Break LOCA analysis results.

## **2. PELLET CRACK AND DISH VOLUME CALCULATION**

Two errors were discovered in the calculation of the normalized pellet crack and dish volumes in the SBLOCTA code. First, an incorrect operator was used to select between two tables of normalized volume vs. linear heat generation rate. Second, the normalized volume corresponding to a linear heat generation rate of 18 kW/ft was incorrectly programmed in one of the tables as 1.58 instead of 1.59. These errors have been corrected in the SBLOCTA code and will be corrected (where applicable) in future versions of the BASH and LOCBART codes. These changes represent a closely-related group of Non-Discretionary Changes in accordance with Section 4.1.2 of WCAP-13451.

Based on a combination of SBLOCTA sensitivity calculations and engineering judgment, Westinghouse has estimated a PCT impact of 0°F for existing Large and Small Break LOCA analysis results.

## **3. TREATMENT OF VESSEL AVERAGE TEMPERATURE UNCERTAINTY**

Historically, the overall vessel average temperature uncertainty calculated by Westinghouse considered only negatively-valued instrument uncertainties corresponding to the indicated temperature being lower than the actual temperature. This uncertainty was then applied as a “+/-” uncertainty in some LOCA analyses, rather than using specific positive “+” and negative “-” uncertainties. This discrepancy has been evaluated for impact on existing Small Break LOCA analysis results, and its resolution represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

Westinghouse has judged this issue to have a negligible impact on existing Small Break LOCA analysis results, leading to an estimated PCT impact of 0°F.

## **4. GENERAL CODE MAINTENANCE**

Various changes have been made to enhance the usability of the codes and to help preclude errors in analyses. This includes items such as modifying input variable definitions, units, and defaults; improving the input diagnostic checks; enhancing the code output; optimizing active coding; and eliminating inactive coding. These changes have been evaluated for impact on existing Small Break

LOCA analysis results and they represent Discretionary Changes that will be implemented on a forward-fit basis in accordance with Section 4.1.1 of WCAP-13451.

Westinghouse has judged this issue to have an estimated PCT impact of 0°F on existing Small Break LOCA analysis results.

## **5. CONSIDERATION OF SAFETY INJECTION PUMP HEAT**

Westinghouse letter SCP-10-21, "TB-09-4, Rev. 1 – Impact of Auxiliary Pump Heat on Westinghouse and Combustion Engineering Analyses/Methodologies," dated April 13, 2010, provided a Westinghouse Technical Bulletin documenting an evaluation of the addition of auxiliary feedwater (AFW) pump heat on various non-LOCA transients. Ameren Missouri subsequently requested that Westinghouse also address the impact of Safety Injection (SI) pump heat addition on Callaway's Appendix K Small Break LOCA (SBLOCA) and Appendix K Large Break LOCA (LBLOCA) analyses of record.

The effect of SI pump heat was considered for the Callaway Appendix K SBLOCA and Appendix K LBLOCA analyses. Westinghouse determined that the inclusion of SI pump heat will produce a negligible effect on the results of the Large Break and Small Break LOCA analyses, leading to an estimated PCT impact of 0°F for 10 CFR 50.46 reporting purposes.



**ATTACHMENT TWO**

**ECCS EVALUATION MODEL**

**MARGIN ASSESSMENT FOR CALLAWAY**

## LARGE BREAK LOCA

A.	ANALYSIS OF RECORD (AOR)	PCT = 1939°F
B.	PRIOR ECCS MODEL ASSESSMENTS	+ 17°F
C.	CURRENT LOCA MODEL ASSESSMENTS -	+ 0°F

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LICENSING BASIS PCT + MARGIN ALLOCATIONS	1956°F
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ABSOLUTE MAGNITUDE OF MARGIN ALLOCATIONS SINCE LAST LBLOCA 30-DAY REPORT	17°F
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## SMALL BREAK LOCA

A.	ANALYSIS OF RECORD (AOR)	PCT = 1043°F
B.	PRIOR ECCS MODEL ASSESSMENTS	+ 0°F
C.	CURRENT ECCS MODEL ASSESSMENTS -	+ 0°F

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LICENSING BASIS PCT + MARGIN ALLOCATIONS	1043°F
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ABSOLUTE MAGNITUDE OF MARGIN ALLOCATIONS SINCE LAST SBLOCA 30-DAY REPORT	0°F
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