March 31, 2020

ULNRC-06571

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 UNIT 1
UNION ELECTRIC CO.
RENEWED FACILITY OPERATING LICENSE NPF-30
10 CFR 50.46 ANNUAL REPORT
ECCS EVALUATION MODEL REVISIONS

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 2019 to March 2020. 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 14 provided annual 10 CFR 50.46 reports that were issued after the LOCA analysis 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 analysis of record, when combined with all PCT margin allocations, remain below the 2200°F regulatory limit. However, in March 2014, Ameren Missouri was informed by Westinghouse that the absolute magnitude of the Large Break Loss of Coolant Accident (LBLOCA) penalty assessments that have accumulated since the current analysis of record (replacement steam generator analysis approved in Callaway License Amendment 168) exceeded 50°F. As such, Reference 9 was submitted within the requirements of 10 CFR 50.46(a)(3)(ii), and contains a commitment to reanalyze the Large Break and Small Break Loss of Coolant Accidents using the NRC-approved version of WCAP-16996-P, "Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology)". This reanalysis will be completed on a schedule to be determined as part of the 10 CFR 50.46c rulemaking process.

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

Sincerely,

Roger Wink,
Manger, Regulatory Affairs

JBL/mls

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
6) ULNRC-05769 dated 3-1-11
7) ULNRC-05840 dated 3-1-12
8) ULNRC-05968 dated 3-6-13
9) ULNRC-06098 dated 3-25-14
10) ULNRC-06203 dated 3-31-15
11) ULNRC-06292 dated 3-30-16
12) ULNRC-06361 dated 3-30-17
13) ULNRC-06428 dated 3-29-18
14) ULNRC-06497 dated 3-28-19

Attachments:

1. Changes to the Westinghouse ECCS Evaluation Model and PCT Penalty Assessments
2. ECCS Evaluation Model Margin Assessment for Callaway

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ATTACHMENT ONE

CHANGES TO THE WESTINGHOUSE ECCS EVALUATION MODEL AND PCT PENALTY ASSESSMENTS

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1. FUEL ROD GAP CONDUCTANCE ERROR

An error was identified in the fuel rod gap conductance model in the NOTRUMP computer code (reactor coolant system response model). The error is associated with the use of an incorrect temperature in the calculation of the cladding emissivity term. This error corresponds to a Non-Discretionary Change as described in Section 4.1.2 of WCAP-13451.

Based on a combination of engineering judgment of the phenomena and physics of a small break LOCA, and sensitivity calculations performed with the advanced plant version of NOTRUMP, Westinghouse has concluded that this error has a negligible effect, leading to an estimated Peak Cladding Temperature (PCT) impact of 0°F on small break LOCA analysis results.

2. RADIATION HEAT TRANSFER MODEL ERROR

Two errors were discovered in the calculation of the radiation heat transfer coefficient within the fuel rod model of the NOTRUMP computer code (reactor coolant system response model). First, existing logic did not preclude non-physical negative or large (negative or positive) radiation heat transfer coefficients from being calculated. These erroneous calculations occurred when the vapor temperature exceeded the cladding surface temperature or when the predicted temperature difference was less than 1°F. Second, a temperature term incorrectly used degrees Fahrenheit instead of Rankine. These errors represent a closely related group of Non-Discretionary problems in accordance with Section 4.1.2 of WCAP-13451.

Based on a combination of engineering judgment of the phenomena and physics of a small break LOCA, and sensitivity calculations performed with the advanced plant version of NOTRUMP, Westinghouse has concluded that this error has a negligible effect, leading to an estimated Peak Cladding Temperature (PCT) impact of 0°F on small break LOCA analysis results.

3. SBLOCTA PRE-DNB CLADDING SURFACE HEAT TRANSFER COEFFICIENT CALCULATION

Two errors were discovered in the pre-departure from nucleate boiling (pre-DNB) cladding surface heat transfer coefficient calculation in the SBLOCTA code (cladding heat-up calculations). The first error is a result of inconsistent time units (hours vs. seconds) in the parameters used for the calculation of the Reynolds and Prandtl numbers, and the second error relates to an incorrect diameter used to develop the area term in the cladding surface heat flux calculation. Both of these issues impact the calculation of the pre-DNB convective heat transfer coefficient, representing a closely related group of Non-Discretionary Changes to the Evaluation Model as described in Section 4.1.2 of WCAP-13451.

These errors have been corrected in the SBLOCTA code. Because this condition occurred prior to DNB, it was judged that these errors had no direct impact on the cladding heat-up related to the core uncover period. A series of validation tests were performed by Westinghouse and confirmed that these errors have a negligible effect on SBLOCA analysis results, leading to an estimated Peak Cladding Temperature (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-1345.

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

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	+ 58°F
C.	CURRENT LOCA MODEL ASSESSMENTS - March 2018	+ 0°F
	LICENSING BASIS PCT + MARGIN ALLOCATIONS	1997°F
	ABSOLUTE MAGNITUDE OF MARGIN ALLOCATIONS SINCE LAST ANALYSIS OF RECORD OR LBLOCA 30-DAY REPORT	58°F

SMALL BREAK LOCA

A.	ANALYSIS OF RECORD (AOR)	PCT = 1043°F
B.	PRIOR ECCS MODEL ASSESSMENTS	+ 0°F
C.	CURRENT ECCS MODEL ASSESSMENTS - March 2018	+ 0°F

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