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ULNRC-3499

Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT
10CFR50.46 ANNUAL REPORT-
ECCS EVALUATION MODEL REVISIONS

References: 1) ULNRC-2141 dated 1-19-90
2) ULNRC-2373 dated 2-28-91
3) ULNRC-2439 dated 7-19-91
4) ULNRC-2664 dated 7-16-92
5) ULNRC-2822 dated 7-15-93
6) ULNRC-2892 dated 10-22-93
7) ULNRC-3087 dated 10-19-94
8) ULNRC-3101 dated 11-23-94
9) ULNRC-3295 dated 11-22-95

Attachment 1 to this letter describes changes to the Westinghouse ECCS Evaluation Models which have been implemented for Callaway for the time period from November 1995 to November 1996. In addition, a change involving reduced feedwater temperature is discussed. That change was evaluated per 10 CFR 50.59 and is included herein only for information to explain the Attachment 2 margin allocation. The feedwater temperature change is not reportable under 10 CFR 50.46 per Section 3.5 of WCAP-13451. Attachment 2 provides an ECCS Evaluation Model Margin Assessment which accounts for the peak cladding temperature (PCT) changes resulting from the resolution of the issues described in Attachment 1 as they apply to Callaway. References 1-9 above transmitted prior 10CFR50.46 reports.

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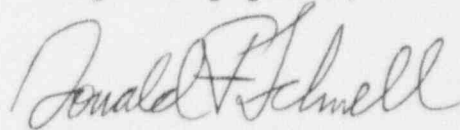
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Attachment 1 describes the resolution of those issues which have been implemented for Callaway. The margin allocations for Callaway to date are identified in Attachment 2. Since the PCT values determined in the large and small break LOCA analyses of record, when combined with all PCT margin allocations, remain well below the 2200°F regulatory limit, no reanalysis is planned by Union Electric.

Should you have any questions regarding this letter, please contact us.

Very truly yours,



Donald F. Schnell

GGY/sld

Attachments

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ATTACHMENT ONE

CHANGES TO THE WESTINGHOUSE

ECCS EVALUATION MODELS

ECCS EVALUATION MODEL CHANGES AND CORRECTIONS

1. Reduced Feedwater Temperature Evaluation *
2. NOTRUMP Specific Enthalpy Error *
3. SBLOCTA Fuel Rod Initialization *

* Results in PCT allocation in Attachment 2

1. REDUCED FEEDWATER TEMPERATURE EVALUATION

Background

Westinghouse performed a safety evaluation to determine the effect of an operating procedure change to throttle open the High Pressure Feedwater Heater Bypass Valve, AEHV0038, on the FSAR LOCA and non-LOCA accident analyses for Callaway. The effect of opening AEHV0038 will be a lower steam generator feedwater inlet temperature and reduced extraction steam flows from the main turbine to the high pressure feedwater heaters. Steam generator feedwater inlet temperature was evaluated for an analysis change from 446°F to 410°F. Steam generator pressure, T-ave, T-cold, and T-hot remain at their design values for 100% power. The effects on the LOCA PCT analyses are described below.

Large Break LOCA

The large break LOCA (LBLOCA) analysis which serves as the licensing basis for Callaway was performed using the NRC-approved 1981 Evaluation Model with BASH. This analysis was performed assuming a core power level of 102% of 3565 Mwt with a total peaking factor (F_Q) of 2.50, a hot channel enthalpy rise factor ($F_{\Delta H}$) of 1.65, a thermal design flow of 374,400 gpm, and an initial primary system pressure (including uncertainties) of 2280 psia. This analysis resulted in a peak cladding temperature (PCT) of 2014°F for the $C_D = 0.6$ limiting large break case. This analysis has been supplemented by margin allocations which have increased the resultant PCT to 2031°F.

The size of break modeled in the LBLOCA analysis makes the break the major energy release path for the system following accident initiation. The secondary side effects are insignificant and, as such, are not modeled. Therefore, the Callaway LBLOCA analysis results are not affected by the lowered steam generator feedwater inlet temperature and the regulatory limits of 10 CFR 50.46 continue to be met.

Small Break LOCA

The small break LOCA (SBLOCA) licensing basis analysis for Callaway was performed using the NRC-approved 1985 Evaluation Model using the NOTRUMP code. This analysis was performed assuming a core power level of 102% of 3565 Mwt with an F_Q of 2.50, an $F_{\Delta H}$ of 1.65, a thermal design flow of 374,400 gpm, and an initial primary system pressure (including uncertainties) of 2280 psia. This analysis resulted in a PCT of 1528°F for the limiting 4-inch break case and has been supplemented by margin allocations which have decreased the resultant PCT to 1466°F (prior to this report).

The impact of lowered steam generator feedwater inlet temperature on small break LOCA PCT was assessed based on an existing PCT sensitivity to feedwater temperature. Accordingly, a PCT penalty of +10°F was assessed for small break LOCA. The small break LOCA PCT remains below the limit of 2200°F, so that the regulatory limits of 10 CFR 50.46 continue to be met.

2. NOTRUMP SPECIFIC ENTHALPY ERROR

A typographical error was found in a line of coding in the NOTRUMP code. This line of coding was intending to model the calculation found in Equation L-127 of WCAP-10079-P-A. Although the equation in the topical report is correct, the coding represented the last term as a partial derivative with respect to the fluid node mixture region total energy instead of the mixture region total mass. This correction is a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451. Representative plant calculations have led to an estimated SBLOCA PCT penalty of +20°F for this error correction.

3. SBLOCTA FUEL ROD INITIALIZATION

An error was discovered in the SBLOCTA code related to adjustments which are made as part of the fuel rod initialization process which is used to obtain agreement between the SBLOCTA model and the fuel data supplied from the fuel thermal-hydraulic design calculations at full power, steady-state conditions. Specifically, an adjustment to the power, which is made to compensate for adjustments to the assumed pellet diameter, was incorrect. Additionally, updates were made to the fuel rod clad creep and strain model to correct logic errors that could occur in certain transient conditions. These model revisions had a small effect on the fuel rod initialization process, and could produce small effects during the transient. Due to the small magnitude of effects, and the interaction between the two items, they are being evaluated as a single, closely related effect. This correction is a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451. Representative plant calculations with the corrected model demonstrated that these revisions result in a predicted SBLOCA peak clad temperature penalty on the order of +10°F.

ATTACHMENT TWO

ECCS EVALUATION MODEL

MARGIN ASSESSMENT FOR CALLAWAY

LARGE BREAK LOCA

A.	ANALYSIS OF RECORD	PCT = 2014°F
B.	1989 LOCA MODEL ASSESSMENTS (refer to ULNRC-2141 dated 1-19-90)	+ 10°F
C.	1990 LOCA MODEL ASSESSMENTS (refer to ULNRC-2373 dated 2-28-91)	+ 0°F
D.	1991 LOCA MODEL ASSESSMENTS (refer to ULNRC-2439 dated 7-19-91)	+ 10°F
E.	1992 LOCA MODEL ASSESSMENTS, MARGIN ALLOCATIONS, AND SAFETY EVALUATIONS (refer to ULNRC-2664 dated 7-16-92 and ULNRC-2892 dated 10-22-93)	+ 29°F
F.	1993 LOCA MODEL ASSESSMENTS (refer to ULNRC-2822 dated 7-15-93 and ULNRC-2892 dated 10-22-93)	- 65°F
G.	1994 LOCA MODEL ASSESSMENTS (refer to ULNRC-3087 dated 10-19-94 and ULNRC-3101 dated 11-23-94)	- 6°F
H.	1995 LOCA MODEL ASSESSMENTS (refer to ULNRC-3295 dated 11-22-95)	+ 39°F
I.	CURRENT LOCA MODEL ASSESSMENTS - NOVEMBER 1966	+ 0°F

LICENSING BASIS PCT + MARGIN ALLOCATIONS = 2031°F

ABSOLUTE MAGNITUDE OF MARGIN ALLOCATIONS = 45°F
SINCE LAST 30-DAY REPORT (ULNRC-2892)

SMALL BREAK LOCA

A.	ANALYSIS OF RECORD	PCT = 1528°F
B.	1989 LOCA MODEL ASSESSMENTS (refer to ULNRC -2141 dated 1-19-90)	+ 229°F
C.	1990 LOCA MODEL ASSESSMENTS (refer to ULNRC-2373 dated 2-28-91)	+ 0°F
D.	1991 LOCA MODEL ASSESSMENTS (refer to ULNRC-2439 dated 7-19-91)	+ 0°F ¹
E.	1991 LOCA MODEL ASSESSMENTS AND SAFETY EVALUATIONS (refer to ULNRC-2664 dated 7-16-92)	+ 0°F
F.	1993 LOCA MODEL ASSESSMENTS (refer to ULNRC-2892 dated 10-22-93)	- 13°F ²
G.	1993 SAFETY EVALUATIONS (refer to ULNRC-2822 dated 7-15-93)	+ 4°F ³
H.	BURST AND BLOCKAGE/TIME IN LIFE (This PCT assessment is tracked separately since it will change depending on future margin allocations.)	+ 0°F ¹
I.	1994 LOCA MODEL ASSESSMENTS (refer to ULNRC-3087 dated 10-19-94 and ULNRC-3101 dated 11-23-94)	- 282°F ⁴
J.	1995 LOCA MODEL ASSESSMENTS (refer to ULNRC-3295 dated 11-22-95)	+ 0°F

SMALL BREAK LOCA (cont.)

K. CURRENT LOCA MODEL ASSESSMENTS - NOVEMBER 1996

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|----|--------------------------------------------------------------------------|---------|
| 1. | REDUCED FEEDWATER TEMPERATURE
EVALUATION (See Item 1 of Attachment 1) | + 10°F* |
| 2. | NOTRUMP SPECIFIC ENTHALPY ERROR
(See Item 2 of Attachment 1) | + 20°F |
| 3. | SBLOCTA FUEL ROD INITIALIZATION
(See Item 3 of Attachment 1) | + 10°F |

LICENSING BASIS PCT + MARGIN ALLOCATIONS	= 1506°F
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ABSOLUTE MAGNITUDE OF MARGIN ALLOCATIONS SINCE LAST 30-DAY REPORT (ULNRC-3101)	= 30°F*
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* Per Section 3.5 of WCAP-13451, intentional changes to plant input parameters evaluated per 10 CFR50.59 are not tracked against the 10 CFR50.46 reporting requirements related to a significant change (i.e., > 50°F).

NOTES:

1. See Attachment 1 to ULNRC-3101. The 1991 assessments have been eliminated as a result of the new SBLOCTA calculation. The Small Break Burst and Blockage penalty is a function of the base PCT plus margin allocations and has been reduced to 0°F since the total PCT has been reduced to a value below that at which burst would occur.
2. Addendum 2 to WCAP-10054 has been submitted to NRC. It references the improved condensation model (COSI) described in WCAP-11767 and provides justification for application of this model to small break LOCA calculations. Union Electric tracks the Peak Cladding Temperature (PCT) change reported in ULNRC-2892 (+150°F/-150°F) as a permanent change to Callaway's calculated PCT. See WCAP-10054, Addendum 2, "Addendum to the Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code: Safety Injection into the Broken Loop and COSI Condensation Model," August 1994.
3. +4.0°F Cycle 6 CRUD Deposition penalty will be carried until such time as it is determined to no longer apply.
4. Based on the limiting case clad heatup reanalysis with axial offset reduced from 30% to 20%, as discussed in ULNRC-3101.