1901 Chouteau Avenue
Post Office Box 149
St. Louis, Missouri 63166
314-554-2650

UNION ELECTRIC

Donald F. Schnell
Senior Vice President
Nuclear

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U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

Gentlemen: ULNRC-3101

DOCKET NUMBER 50-483
CALLAWAY PLANT
10CFR50.46 THIRTY DAY 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

Attachment 1 to this letter describes changes to the Westinghouse SBLOCA ECCS Evaluation Model which have been implemented for Callaway since the last report (Reference 7). 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 1-7 above transmitted prior 10CFR50.46 reports; Reference 7 noted that this 30-day report would follow.

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. The large break LOCA table included in Attachment 2 remains unchanged from that submitted in Reference 7 and is enclosed here for completeness only. However, based on the criteria and reporting requirements of 10CFR50.46(a)(3)(ii), as clarified in Section 5.1 of WCAP-13451, the cumulative changes since the last 30-day report, Reference 6, are significant for small break LOCA and require a 30-day report. Since the limiting Callaway small break LOCA

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(4-inch break) clad heatup transient has been reanalyzed with the revised SBLOCTA code and methodology, in conjunction with the NOTRUMP thermal-hydraulics analysis of record, no further reanalysis is planned by Union Electric. This position on reanalysis is also supported by the large margin to the 2200°F regulatory limit.

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

Very truly yours,

Donald F. Schnell

GGY/jdg

Attachments

cc: T. A. Baxter, Esq.
Shaw, Pittman, Potts & Trowbridge
2300 N. Street, N.W.
Washington, D.C. 20037

M. H. Fletcher
Professional Nuclear Consulting, Inc.
18225-A Flower Hill Way
Gaithersburg, MD 20879-5334

L. Robert Greger
Chief, Reactor Project Branch 1
U.S. Nuclear Regulatory Commission
Region III
801 Warrenville Road
Lisle, IL 60532-4351

Bruce Bartlett
Callaway Resident Office
U.S. Regulatory Commission
RR#1
Steedman, MO 65077

L. R. Wharton (2)
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
1 White Flint, North, Mail Stop 13E21
11555 Rockville Pike
Rockville, MD 20852

Manager, Electric Department
Missouri Public Service Commission
P.O. Box 360
Jefferson City, MO 65102

ATTACHMENT ONE

CHANGES TO THE WESTINGHOUSE

ECCS EVALUATION MODELS

BACKGROUND

10CFR50.46, Appendix K prescribes the acceptable features and required documentation for ECCS Evaluation Models. More specifically, Section II.3 requires that documentation be in place to verify that sensitivity studies have demonstrated the adequacy of nodalization schemes used in the analysis models. A study was recently undertaken with the Westinghouse small break LOCA Evaluation Model to examine the sensitivity of predicted results to the nodalization used for the hot rod model. The results of that study raised concerns regarding the adequacy of the standard axial nodalization prescribed for use in the SBLOCTA code for licensing basis analyses. As a result of this concern, Westinghouse investigated this as a Potential Issue per 10 CFR 21.

ISSUE DESCRIPTION

The standard rod model (developed in the 1970's) used in performing SBLOCTA calculations has 19 axial nodes with a finer distribution in the top elevations. However, sensitivity studies to justify the number and distribution of these nodes cannot be documented. A series of calculations was performed using increasingly finer axial nodalizations than prescribed for the 19 node model and indicated that the standard SBLOCTA 19 node model was not conservative. Nearly all cases demonstrated a significantly non-conservative behavior with respect to PCT. The penalty is attributed to a net increase in single-phase steam enthalpy rise as these nodes uncover sooner and heat up more than coarser nodes partially covered by the mixture level. Thus, it was concluded that a revised model that included a much finer axial nodalization could potentially lead to less favorable results than those predicted in the current analyses, possibly challenging the 10 CFR 50.46 acceptance criteria.

As a result of further investigation into the SBLOCTA code, several additional related issues associated with nodalization and the overall solution of the fluid conservation equations were subsequently identified and corrected. As a separate, but related, issue Westinghouse has implemented a revised model for calculating transient fuel rod internal pressure in the SBLOCTA code. Fuel rod pressure is a governing factor in defining the clad creep, burst, and blockage behavior for small break LOCA transients. The NRC was informed of this modeling change per Westinghouse letter NTD-NRC-94-4253, "Revision to the Rod Internal Pressure Model in the Westinghouse SBLOCTA Code (Proprietary)". The letter also informed the NRC that Westinghouse has validated and instituted the model as a methodology improvement to the small break LOCA model for standard implementation on a forward-fit basis in accordance with WCAP-13451, "Westinghouse Methodology for Implementation of 10 CFR 50.46 Reporting," October, 1992.

TECHNICAL EVALUATION

At this time Westinghouse has completed the generic technical evaluation of the fuel rod axial nodalization methodology. A revised standard for rod nodalization has been established which insures an adequate solution to the hot channel calculation by specifying a fine nodalization of 0.25 ft nodes for all elevations that are predicted to uncover during the transient.

Since the improved axial nodalization methodology and revised fuel rod internal pressure model can have significant synergistic effects on the predicted peak clad temperature, the SBLOCTA calculation from the limiting small break LOCA transient has been rerun with the revised code and methodology in order to obtain an accurate estimation of the net effect of these changes on the analysis of record. Several recent code revisions and error corrections of lesser magnitude have also been incorporated in the code version used to conduct this calculation. Those items have been discussed in prior 10CFR50.46 reports. As a consequence of using the revised code to obtain results for this reanalysis, those items have been addressed in the results provided (as discussed in Attachment 2). Since this portion of the ECCS Small Break Evaluation Model has already been reanalyzed, Westinghouse believes that no additional reanalysis is necessary to satisfy 10CFR50.46 for those plants that have a significant PCT change as a result of this issue.

Since all of the issues relate to portions of the SBLOCTA code and/or its associated input methodology, they may be reported as a single, closely-related group of changes. Attachment 2 presents a revised small break LOCA ECCS Evaluation Model Margin Assessment which contains a compilation of the net effects on PCT.

POWER MARGIN UTILIZATION

During the process of reviewing the analysis of record for Callaway as part of addressing the above issues, conservatism was noted in the core power axial offset limit assumed in the analysis. The current licensing basis analyses restrict the axial offset to a maximum positive skew of 13% at full power. Additional conservatism had been incorporated into the small break LOCA analysis to provide margin above and beyond the present core design limits (a positive skew of 30% was used in the analysis). Following consultation with cognizant core design and utility personnel, it was concluded that this margin is not being utilized and could be made available to offset the penalty associated with resolution of the present issues. The revised calculation was therefore performed with an axial offset limit of 20% which supports the same RSAC core design limits as previously supported by the analysis of record, and therefore there are no changes to plant Technical Specifications from incorporating this revision.

POWER MARGIN REVISION

During the process of reviewing the analysis of record for Callaway as part of addressing the above issues, conservatism was noted in the core power methodology used for the analysis. The current analysis of record was performed with an older methodology which was replaced in 1990. Excessive conservatism is known to exist in the old methodology and, as part of the recalculation, the core power input was updated to correspond to current standards. The revised calculation conforms to the same RSAC core design limits as previously supported by the analysis of record, and therefore there are no changes to the plant Technical Specifications from incorporating this revision.

RESULTS

As a result of the SBLOCTA axial nodalization error, the limiting Callaway small break LOCA clad heatup transient calculation was performed. The NOTRUMP thermal-hydraulics analysis from the current analysis of record was used. In addition, the overly conservative axial offset of +30% typically assumed for older analyses was reduced to +20%. This assumption remains conservative and increases PCT margin. The renodalization coupled with revised modeling in SBLOCTA resulted in a 278°F benefit.

Because the SBLOCTA calculation was performed, it was possible to remove prior penalties previously reported in Reference 3. These were 37°F for "Fuel Rod Initial Conditions Inconsistencies" and 20°F for "SBLOCA Rod Internal Pressure Assumption". As such, the 1991 LOCA Model Assessments have been reduced from 57° to 0°F.

Finally, the 15°F "Burst and Blockage/Time in Life" penalty reported in Reference 7 does not currently apply since the SBLOCTA reanalysis has reduced the PCT to a value below the 1700°F threshold for burst.

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)	-	6°F
H.	POWER SHAPE SENSITIVITY MODEL (PSSM) (refer to Item 5 of Attachment 1 to ULNRC-2822 dated 7-15-93)	+	0°F

LICENSING BASIS PCT + MARGIN ALLOCATIONS	=	1992°F
ABSOLUTE MAGNITUDE OF MARGIN ALLOCATIONS SINCE LAST 30-DAY REPORT (ULNRC-2892)	=	6°F

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.	1992 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)	- 4°F
J.	CURRENT LOCA MODEL ASSESSMENTS - NOVEMBER 1994	
	1. AXIAL NODALIZATION, RIP MODEL REVISION, SBLOCTA ERROR CORRECTIONS ANALYSIS (see Attachment 1)	- 278°F[4]
	LICENSING BASIS PCT + MARGIN ALLOCATIONS	= 1466°F

NOTES:

1. See Attachment 1. 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. At the January 12, 1994 meeting between Westinghouse and the NRC, Westinghouse agreed to provide to the NRC an addendum to WCAP-10054-P-A describing the SI model used in NOTRUMP including SI to the broken loop. 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. In the interim, Union Electric will track the Peak Cladding Temperature (PCT) change reported in ULNRC-2892 (+150°F/-150°F) as a permanent change to Callaway's calculated PCT.

3. The +4.0°F Cycle 6 CRUD Deposition penalty will be carried until such time as it is evaluated to no longer apply.

4. Based on the limiting case clad heatup transient reanalysis with axial offset reduced from 30% to 20%.