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OPPD
Omaha Public Power District

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April 3, 2009
LIC-09-0026

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

References:
1. Docket No. 50-285
2. EMF-2328(P)(A), Revision 0, "PWR Small Break LOCA Evaluation Model, S-RELAP5 Based," Framatome ANP, Inc., March 2001
3. EMF-2103(P)(A), Revision 0, "Realistic Large Break LOCA Methodology for Pressurized Water Reactors," Framatome ANP, Inc., April 2003

Subject: Annual Report for 2008 Loss of Coolant Accident (LOCA)/Emergency Core Cooling System (ECCS) Models Pursuant to 10 CFR 50.46

In accordance with 10 CFR 50(46)(a)(3)(ii), the Omaha Public Power District (OPPD) is submitting the annual 10 CFR 50.46 summary report for 2008. This summary report updates all identified changes or errors in the LOCA/ECCS codes, methods, and applications used by AREVA (formerly Framatome ANP) to model Fort Calhoun Station (FCS), Unit No. 1. The Small Break (SB) and Large Break (LB) LOCA analysis methodology used by AREVA for the FCS Analysis of Record is described in References 2 and 3 respectively.

OPPD has received the 2008 AREVA 10 CFR 50.46 Annual Notification Report for the SB and LB LOCA Analyses that are subject to the reporting requirements of 10 CFR 50.46.

For 2008, there were two SB LOCA Analysis Peak Clad Temperature (PCT) 10 CFR 50.46 Model Assessment errors of 0°F and -8°F. These errors are described in Attachment 1. Attachment 2 provides the 2008 SB LOCA Margin Summary Sheet for FCS. As a result of the -8°F total errors, the SB LOCA PCT changed from the baseline value (reported in the FCS Updated Final Safety Analysis Report) of 1537°F to 1529°F. The sum of the absolute values of the errors/changes in the SB LOCA analysis of record is 8°F.

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For 2008, there were three LB LOCA Analysis PCT 10 CFR 50.46 Model Assessment errors of +7°F, -20°F, and 0°F. These errors are described in Attachment 3. Attachment 4 provides the 2008 LB LOCA Margin Summary Sheet for FCS. Because of the -13°F total errors, the LB LOCA PCT changed from the baseline value (reported in the FCS Updated Final Safety Analysis Report) of 1636°F to 1623°F. The sum of the absolute value of the errors/changes in the LB LOCA analysis of record is 27°F.

In summary, the FCS PCT values for SB and LB LOCA remain less than the 10 CFR 50.46(b)(1) acceptance criteria of 2200°F.

If you should have any questions, please contact Mr. Bill R. Hansher at (402) 533-6894.

No commitments to the NRC are made in this letter.

Sincerely,

R. P. Clemens
Division Manager
Nuclear Engineering

Attachments:

1. 10 CFR 50.46 Small Break LOCA Model Assessments
2. Fort Calhoun Station Small Break LOCA Margin Summary Sheet
3. 10 CFR 50.46 Large Break LOCA Model Assessments
4. Fort Calhoun Station Large Break LOCA Margin Summary Sheet

c: E. E. Collins, NRC Regional Administrator, Region IV
A. B. Wang, NRC Project Manager
J. D. Hanna, NRC Senior Resident Inspector

10 CFR 50.46 Small Break LOCA Model Assessments

Inconsistencies in Application of the S-RELAP5 Mixture Level Model

It was discovered that there is a limitation in the S-RELAP5 mixture level model. The S-RELAP5 mixture level model detection logic determines the locations of mixture level by primarily looking at the void distributions in stacks of consecutive vertical volumes.

Under certain circumstances, the removal of extra mixture levels according to heat structure conditions may not be performed properly, resulting in random removal of mixture levels.

As a result, AREVA has performed code modifications to deal with this logic limitation in S-RELAP5 in order to eliminate potential level tracking problems.

After an evaluation, it was found that no safety impact results from this error. Scoping calculations were used to support the engineering judgment for the determination of the PCT impact. For the Fort Calhoun SB LOCA analysis, the PCT impact was estimated to be 0°F.

Legacy Fortran Programming Issue with Point Kinetics in RELAP5 Based Computer Codes

A legacy FORTRAN programming issue with point kinetics solution of the RELAP5 based computer code was discovered. The limitation consists of incorrect indexing in the four summations that compute terms for the delayed neutron fractions from each group that contributes to the total power.

After an evaluation, it was found that no safety impact resulted from this condition. For the Fort Calhoun SB LOCA analysis, the PCT impact was estimated to be -8°F.

Small Break LOCA Margin Summary Sheet – Annual Report

Plant Name: **Fort Calhoun Station**
Utility Name: **Omaha Public Power District**

Evaluation Model: Small Break LOCA

		Net PCT Effect		Absolute PCT Effect
A.	Prior 10 CFR 50.46 Changes or Error Corrections-Previous Years	ΔPCT =	0˚F	0˚F
B.	Prior 10 CFR 50.46 Changes or Error Corrections-This year	ΔPCT =	- 8˚F	8˚F
	Absolute Sum of 10 CFR 50.46 Changes	ΔPCT =		8˚F

The sum of the PCT from the most recent analysis using an acceptable evaluation model and the estimates of the PCT impact for changes and errors identified since this analysis is less than 2200°F.

10 CFR 50.46 Large Break LOCA Model Assessments

Inconsistencies in Application of the S-RELAP5 Mixture Level Model

It was discovered that there is a limitation in the S-RELAP5 mixture level model. The S-RELAP5 mixture level model detection logic determines the locations of mixture level by primarily looking at the void distributions in stacks of consecutive vertical volumes. Under certain circumstances, the removal of extra mixture levels according to heat structure conditions may not be performed properly, resulting in random removal of mixture levels.

As a result, AREVA has performed code modifications to deal with this logic limitation in S-RELAP5 in order to eliminate potential level tracking problems.

After an evaluation, it was found that no safety impact results from this error. Scoping calculations were used to support the engineering judgment for the determination of the PCT impact. For the Fort Calhoun LB LOCA analysis, the PCT impact was estimated to be +7°F.

Legacy Fortran Programming Issue with Point Kinetics in RELAP5 Based Computer Codes

A legacy FORTRAN programming issue with point kinetics solution of the RELAP5 based computer code was discovered. The limitation consists of incorrect indexing in the four summations that compute terms for the delayed neutron fractions from each group that contributes to the total power.

After an evaluation, it was found that no safety impact resulted from this condition. For the Fort Calhoun LB LOCA analysis, the PCT impact was estimated to be -20°F.

Cold Leg Condensation in RLBLOCA Methodology

An issue with Realistic Large Break LOCA (RLBLOCA) was discovered. AREVA determined that, for analyses assuming a single train of pumped injection due to a single failure assumption, the S-RELAP5 modeling significantly underpredicts the condensation in the cold legs and the downcomer during the reflood phase after the accumulators empty. Because of this, the ECCS water entering the downcomer is suffiently subcooled to absorb the downcomer wall heat release without significant boiling. If the condensation were properly modeled, it is expected that the ECCS water would enter the downcomer in a saturated or only slightly subcooled state and that heat release from the downcomer would lead to boiling and reduction of reflood driving head.

An evaluation was performed for Fort Calhoun and there is a 0°F impact to PCT.

Large Break LOCA Margin Summary Sheet – Annual Report

Plant Name: **Fort Calhoun Station**
Utility Name: **Omaha Public Power District**

Evaluation Model: Large Break LOCA

		Net PCT Effect		Absolute PCT Effect
A.	Prior 10 CFR 50.46 Changes or Error Corrections- Previous Years	ΔPCT =	0°F	0°F
B.	Prior 10 CFR 50.46 Changes or Error Corrections- This year	ΔPCT =	-13°F	27°F
	Absolute Sum of 10CFR 50.46 Changes	ΔPCT =		27°F

The sum of the PCT from the most recent analysis using an acceptable evaluation model and the estimates of the PCT impact for changes and errors identified since this analysis is less than 2200°F.