



LIC-99-0099
October 29, 1999

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

- References:
1. Docket 50-285
 2. WCAP-13027-P, "Westinghouse ECCS Evaluation Model for Analysis of CE-NSSS," dated July 1991
 3. Letter from OPPD (W.G. Gates) to NRC (Document Control Desk), dated October 13, 1993 (LIC-93-0249)
 4. Letter from OPPD (R.L. Phelps) to NRC (Document Control Desk), dated April 28, 1999 (LIC-99-0036)

Subject: Report of Significant Change/Error in the Large Break Loss of Coolant Accident (LOCA) /Emergency Core Cooling System (ECCS) Models and Evaluations

In accordance with 10 CFR 50.46(a)(3)(i), the Omaha Public Power District (OPPD) is submitting a report of a significant change/error in the LOCA/ECCS models and evaluations. 10 CFR 50.46(a)(3)(i) states that a significant change or error is one that results in a calculated peak fuel cladding temperature different by more than 50°F from the temperature calculated for the limiting transient using the last acceptable model. This report identifies the cumulative effects associated with a 10 CFR 50.59 evaluated change in the fuel spacer grids for Cycle 19, two LOCBART errors, and quantification of peak clad temperature (PCT) conservatisms previously identified but not credited in the Westinghouse Electric Company (W) large break LOCA/ECCS analysis for Fort Calhoun Station (FCS) Unit No. 1. Reference 2 describes the methodology utilized by W to model Combustion Engineering plants, such as FCS.

The fuel assembly design was revised for Cycle 19 to use Inconel spacer grids in order to minimize the susceptibility to grid-to-rod fretting. This configuration change (evaluated per 10 CFR 50.59) resulted in a 68°F increase in PCT (see Attachment 1). Two 10 CFR 50.46 model assessments (i.e., permanent assessments of PCT margin), were also identified (see Attachment 2) and quantified. Conservatisms previously identified but not credited were quantified to obtain these benefits (see Attachment 3).

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Attachment 4 provides a summary of the large break LOCA PCT status, incorporating the results of Attachments 1 through 3, consistent with Reference 4 (Annual Report for 1998 LOCA/ECCS Models pursuant to 10 CFR 50.46). These results show that the large break LOCA PCT is 2094°F, thus remaining less than the 10 CFR 50.46(b)(i) limit of 2200°F. In Reference 4, PCT was reported as 2036°F. These changes will also be reflected in the 1999 10 CFR 50.46 Annual Report (to be submitted approximately March 2000).

Because the sum of the absolute magnitude of the above changes and errors exceeds 50°F, the change is classified as significant and this report is being submitted pursuant to the requirements of 10 CFR 50.46(a)(3)(i). Since these results represent a quantification requiring no further analysis and the PCT remains less than 2200°F, no further analytical or operational mitigating strategies are required.

Please contact me if you have any questions.



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Division Manager
Nuclear Operations

Attachments

- c: E.W. Merschoff, NRC Regional Administrator, Region IV
- L. R. Wharton, NRC Project Manager
- W.C. Walker, NRC Senior Resident Inspector
- Winston & Strawn

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Attachment 1**

10 CFR 50.59 Evaluation of Changes

Reanalysis Sensitivity Study for Inconel Grids

For Cycle 19 Fort Calhoun Station is implementing the use of Inconel grids, rather than Zirlo or Zircaloy grids in place at the time of the analysis of record. The effect of the grids on PCT was quantified as +61°F through a reanalysis of the limiting LOCBART case. However, the code version used for this assessment contains the LOCBART zirc-water oxidation error (described in Attachment 2). As a result, an additional PCT change of +7°F due to correction of this error (quantified using a correlation as described above) for the Inconel grid fuel only has been included, which results in a +68°F PCT effect.

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Attachment 2**

10 CFR 50.46 Model Assessments

LOCBART Spacer Grid Single-Phase Heat Transfer Error

As discussed in WCAP-10484-P-A ("Spacer Grid Heat Transfer Effects During Reflood", M.Y. Young, et al., March 1991), the Yao-Hochreiter-Leech correlation is used in the LOCBART code to compute the single-phase heat transfer enhancement for axial elevations located downstream of spacer grids. The Safety Evaluation Report to WCAP-10484-P-A requires that a length-averaged value be used to specify the heat transfer coefficient for a given fluid cell, since use of a local value corresponding to the forward edge or the rear edge of the cell could be non-conservative. It was determined that the length-averaging in LOCBART was not being done correctly in all cases. This error correction was determined to be a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

The effect of this error on the existing results for Fort Calhoun Station was determined to be +15°F.

LOCBART Zirc-Water Oxidation Error

As discussed in NSD-NRC-99-5845 ("Closure of Westinghouse Interim Report No. 98-029", H.A. Sepp, August 27, 1999), a logic error in the LOCBART code caused the Baker-Just metal-water reaction calculations to be performed three times per timestep. Correcting the error was found to reduce the total cladding oxidation while increasing the heat deposition in the cladding. The error correction was determined to be a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451.

The effect of this error on the existing results for Fort Calhoun Station was determined to be +29°F.

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Other

Quantification of Conservatism in Prior 0°F Assessments

In Reference 3, OPPD reported to the NRC that an error associated with the spacer grid heat transfer in BART had been identified, but since the error was conservative and adequate margin to the 10 CFR 50.46 PCT limit of 2200°F existed, a 0°F assessment was applied. This effect was recently quantified for Fort Calhoun Station as -66°F through reanalysis of the limiting LOCBART case using a code version corrected for this error. Subsequently, a reanalysis of the limiting LOCBART case on the HP-UNIX computer platform, rather than the Cray computer platform, introduced an additional -8°F effect. Reanalysis for 100 psig backfill pressure for IFBA fuel with Zirlo cladding further introduced a +20°F effect. Each of these effects remained bounded by the previously reported PCT of 2036°F. However, as the change to Inconel grids causes the new PCT value to exceed the previously reported value, a quantification of these effects (-54°F) was necessary to establish the new limiting PCT limit.

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Attachment 4

Fort Calhoun Station Large Break LOCA
Peak Clad Temperature Margin Utilization Summary

LICENSING BASIS	Clad Temp (°F)
Analysis-Of-Record	2066
MARGIN ALLOCATIONS (ΔPCT)	
A. Prior Permanent ECCS Model Assessments	
1. Total	-30
B. 10 CFR 50.59 Safety Evaluations	
1. Reanalysis Sensitivity Study for Inconel Grids	+68
C. 1999 10 CFR 50.46 Model Assessments (Permanent Assessments of PCT Margin)	
1. LOCBART Spacer Grid Single-Phase Heat Transfer	+15
2. LOCBART Zirc-Water Oxidation Error	+29
D. Temporary ECCS Model Issues	
1. None	0
E. Other	
1. Quantification of Prior 0°F Assessments	-54
LICENSING BASIS + MARGIN ALLOCATIONS	2094