B 05/22/78

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)
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REC: STOLZ J F
NRC

ORG: CRANE P A
PACIFIC GAS & ELEC

DOCDATE: 05/16/78
DATE RCVD: 05/22/78

DOCTYPE: LETTER NOTARIZED: NO

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SUBJECT:
FURNISHING INFO RE NOTIFICATION BY WESTINGHOUSE CORP THAT A LOGIC INCONSISTENCY EXISTS IN TWO OF THE COMPUTER CODES USED IN THEIR LOCA ECCS EVALUATION MODEL, AFFECTING APPLICANT"S ANALYSIS ON RECORD...TWO CODES ARE SATAN-VI (1) AND LOCTA-IV(2).

PLANT NAME: DIABLO CANYON - UNIT 1
DIABLO CANYON - UNIT 2

REVIEWER INITIAL: XJM
DISTRIBUTER INITIAL: ML

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May 16, 1978

Mr. John F. Stolz, Chief
Light Water Reactors Branch No. 1
Division of Project Management
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Docket No. 50-275-OL
Docket No. 50-323-OL
Diablo Canyon Units 1 and 2

Dear Mr. Stolz:

We have been informed by Westinghouse Electric Corporation that a logic inconsistency exists in two of the computer codes used in their LOCA ECCS Evaluation Model. The computer codes are SATAN-VI(1) and LOCTA-IV(2). All versions of the Westinghouse Appendix K, 10 CFR 50.46 evaluation model are affected(3,4,5,6). Therefore, our analysis on record is also affected.

This logic inconsistency involves the interface between the zirconium-water reaction heat generation calculation and the heat conduction equation. Both the zirconium-water reaction equation (Baker-Just) and the heat conduction equation are solved correctly. However, the heat conduction equation uses a volumetric heat flux from the zirconium-water reaction calculation. The output of the zirconium-water reaction calculation is a surface heat flux. This surface heat flux is modified by dividing it by the thickness of the radial mesh size between the surface temperature node and the first node inside the clad to obtain a volumetric heat flux. It is this calculation which was performed incorrectly. The inconsistency underestimates the volumetric heat flux due to zirconium-water reaction by a factor of 2.

The presence of this logic inconsistency has been verified by visual inspection of the computer codes and by performing energy balances on some sample calculations. Correction of this error will result in higher calculated peak clad temperatures.

Westinghouse Electric Corporation has studied the effect of correcting this error on calculated peak clad temperature. In addition to correcting this error, some beneficial model changes were also studied. The result of their studies indicate a net increase in peaking factor.

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Some details of these calculations follow.

Westinghouse Electric Corporation has proposed the use of the following improvements to the October 1975 version of their evaluation model:

1. Change the transition boiling correlation used during blowdown from the W Transition Boiling Correlation to the Dougall-Rohsenow. Both correlations have been documented by Westinghouse[3] and both are termed "acceptable" in Appendix K of 10 CFR 50.46 and in the NRC SER for the Westinghouse evaluation model.

2. Use of an emissivity in the refill radiation heat transfer model of 0.9[7].

3. Multiply the volumetric heat flux from the zirconium-water reaction calculation by a factor of 2 to correct the logic inconsistency.

4. Use of maxi-convolution to improve the peaking factors being calculated[8].

All of the modifications were discussed with the Staff on March 29, 1978. We understand that it will take the Staff 3 months to review all of these model changes. We will work with Westinghouse until then to arrive at a new approved LOCA ECCS Evaluation Model. At that time we will submit to the Nuclear Regulatory Commission a schedule for reanalysis of the present limiting break size with the new model. Until then no further analysis is planned.

Very truly yours,

Philip A. Crane, Jr.

Attachment
CC w/attachment: Service List

References

1. Bordelon, F. M., et al., "SATAN-VI Program: Comprehensive Space-Time Dependent Analysis of Loss-of-Coolant," WCAP-8306, June 1974.

2. Bordelon, F. M., et al., "LOCTA-IV Program" Loss-of-Coolant Transient Analysis," WCAP-8305, June 1974.

3. "Westinghouse ECCS Evaluation Model - Summary" WCAP-8339 Bordelon, F. M., Massie, H. W., and Zordan, T. A., July 1974.

4. Bordelon, F. M., et al., "Westinghouse ECCS Evaluation Model - Supplementary Information, WCAP-8471, April, 1975, (Proprietary) and WCAP-8472, April, 1975 (Non-Proprietary).

5. "Westinghouse ECCS Evaluation Model October 1975 Version," WCAP-8622, November 1975, (Proprietary), and WCAP-8623, November 1975, (Non-Proprietary).

6. Letter from C. Eicheldinger of Westinghouse Electric Corporation to D. B. Vassallo of the Nuclear Regulatory Commission, Letter NS-CE-924, 1/23/76.

7. "High Temperature Properties of Zircalloy - Oxygen Alloys", EPRI Report NP-524, March, 1977.

8. Little, C. C., et al., "Consideration of Uncertainties in the Specification of Core Hot Channel Factor Limits", WCAP-9180, September 1977.