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Your ref: Project 711
Our ref: DCP/NRC1512

June 18, 2002

SUBJECT: Sensitivity Studies to Assess the Importance of Entrainment on AP1000 Safety Analysis Predictions

References:
1. Letter from Lyons to Cummins, "Applicability of AP600 Standard Plant Design Analysis Codes, Test Program and Exemptions to the AP1000 Standard Plant Design," dated March 25, 2002.
2. Westinghouse Letter DCP/NRC1505, "Transmittal of Westinghouse Documents "WCOBRA/TRAC AP1000 ADS-4/IRWST Phase Modeling," WCAP-15833, Rev. 0 (Proprietary) and WCAP-15834 (Non-Proprietary)," dated May 31, 2002.

In Reference 1, the staff concluded that with some exceptions, the experimental data produced by the AP600 separate-effects and integral-system test programs are appropriate for use in support of the AP1000 analysis. The staff also concluded that the analysis codes validated for the AP600 design could be extended to the analysis of the AP1000 design. The staff concluded that Westinghouse had not demonstrated that the existing AP600 integral tests provided data over the range of conditions necessary to validate entrainment models in the NOTRUMP and WCOBRA/TRAC codes that are used for small break LOCA analysis. In particular, the NOTRUMP code was cited for the lack of acceptable models for liquid entrainment in the upper plenum or from a horizontal stratified flow pattern in the hot legs during the ADS-4 / IRWST transition phase.

In WCAP-15833 transmitted in Reference 2, we provided supplemental WCOBRA/TRAC analysis of the ADS-4 / IRWST transition phase during the small-break LOCA events. This report was intended to address earlier issues raised by the staff during both the AP600 design certification review, and the AP1000 pre-certification review, with regards to the lack of a detailed momentum flux model in the NOTRUMP code. In this report, the performance of WCOBRA/TRAC was validated against an appropriate OSU integral systems test, and WCOBRA/TRAC plant calculations were compared to the NOTRUMP DCD analyses. The results indicate that the NOTRUMP code is an acceptable code to predict ECCS performance of the AP1000 small break LOCA accidents.

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To address the entrainment issue raised in Reference 1, we are preparing sensitivity analyses to investigate the effects of the entrainment phenomenon on the predictions of the SBLOCA events for the AP1000. These sensitivity studies will be added to WCAP-15833 as an appendix. Such an approach was discussed with the staff at our meeting in your offices on January 23, 2002. Our target submittal date for this report is July 31, 2002. We recognize that your review schedule is dependent upon receipt of this report by this date, so that the staff can provide all Requests for Additional Information to Westinghouse by September 30, 2002.

I will continue to keep you informed of the progress of this report.

Very truly yours,

M. M. Corletti
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