June 24, 1997

Mr. Nicholas J. Liparulo, Manager
Nuclear Safety and Regulatory Analysis
Nuclear and Advanced Technology Division
Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, PA 15230

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION (RAIs) ON THE AP600 STANDARD SAFETY ANALYSIS REPORT (SSAR) CHAPTER 15 ACCIDENT ANALYSES

Dear Mr. Liparulo:

The Nuclear Regulatory Commission (NRC) is reviewing the AP600 Chapter 15 Accident Analyses which has been substantially revised by Revisions 12 and 13 of the AP600 SSAR. The staff has determined that additional information will be needed to complete its review of Chapter 15. The staff's questions (RAIs) on the Chapter 15 analyses are provided as an enclosure to this letter.

If you have any questions regarding this matter, you may contact me at (301) 415-1141.

Sincerely,

original signed by:

William C. Huffman, P[illegible]ct Manager
Standardization Proje[illegible]irectorate
Division of Reactor Pro[illegible]m Management
Office of Nuclear Reactor Regulation

Docket No. 52-003

Enclosure: As stated

cc w/encl: See next page

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Docket No. 52-003
AP600

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NUCLEAR REGULATORY COMMISSION

REQUESTS FOR ADDITIONAL INFORMATION ON

WESTINGHOUSE AP600 SSAR CHAPTER 15 ACCIDENT ANALYSES

Anticipated Transients Without Scram (ATWS) Analysis

RAI 440.659

(a) Westinghouse has performed an ATWS analysis in response to RAI 440.26. Westinghouse used a complete loss of normal feedwater (LONF) event for the ATWS analysis because the LONF event was previously identified as the limiting case that produced the maximum RCS pressure for Westinghouse PWRs. Westinghouse has stated that the limiting ATWS case for the AP600 is the same as that performed for the Westinghouse traditional PWRs. Since the AP600 passive design is different from the traditional PWRs (for example, AP600 relies mainly on the PRHR system instead of the auxiliary feedwater system as required by the existing PWRs to remove the decay heat during an ATWS event), Westinghouse should demonstrate that the results of and the methodology used for the existing ATWS analyses are applicable to AP600 for analysis of the worst ATWS case.

(b) Westinghouse stated that the selection of the moderator temperature coefficient (MTC) in the ATWS analysis for AP600 is consistent with the method discussed in WCAP-11992. The staff review of this topical report is on-going. However, the staff's position on selection of the MTC for the ATWS analysis is as follows:

> The ATWS must show that the unfavorable exposure time (UET), given the cycle design (including MTC), will be less than 5 percent, or equivalently, that ATWS pressure limit will met for at least 95 percent of the cycle. The UET is the time during the cycle when reactivity feedback is insufficient to maintain pressure under 3200 psig for a given reactor state.

The position is applied to the Westinghouse PWRs and can be found in a letter dated July 27, 1995, from NRC to Mr. D. L. Farrar of the Commonwealth Edison company. Westinghouse should demonstrate that it's selection of the MTC in the ATWS analysis for AP600 complies with the staff's position stated above.

LOCA Methodology

RAI 440.660

SSAR 15.6.5 describes the results of the LOCA break spectrum study for AP600. The NOTRUMP code is used to perform small-break LOCA analyses for

the range of breaks from 0.5-inch to 10-inch diameter (about 0.55 ft^2 cross sectional area), while the WCOBRA/TRAC code is used to analyze large-break LOCAs for breaks ranging from a DECLG break to a break of 14-inch diameter (approximately 1.0 ft^2 cross sectional area). Westinghouse should justify the use of the NOTRUMP and WCOBRA/TRAC for LOCA analyses in the ranges of break sizes as proposed in SSAR 15.6.5. In addition, the LOCAs with breaks from 0.55 ft^2 to 1.0 ft^2 cross sectional area should be analyzed and the results should be provided for the staff to review. The analysis should use methods acceptable to the staff and identify the limiting LOCA case to satisfy the requirements of item (a)(1)(i) of 10 CFR 50.46.

LBLOCA - Determination of Peak Cladding Temperature

RAI 440.661

Table 15.6.5-9 lists the calculated peak cladding temperatures (PCTs) for large-break LOCAs. Provide example calculations to show how the PCTs are calculated for the guillotine breaks with and without superposition data. The submittal should include the calculation of the model bias and uncertainty and clarify whether they are the maximum values or determined on the case-by-case basis.

SBLOCA - Determination of the Limiting Single Failure

RAI 440.662

SSAR Section 15.6.5.4B.1.0 states that the failure of one ADS-4 valve to open is the limiting single failure (SF) during small-break (SB) LOCAs. The qualitative argument presented in the same SSAR section does not clearly demonstrate why the failure of one ADS-4 valve to open is more limiting than the failure of one ADS-1 valve to open for the double-ended DVI (DEDVI) line break. Provide a quantitative analysis to confirm that the limiting SF is the failure of one ADS-4 valve during SBLOCAs.

Long Term Cooling (LTC) - Boron Precipitation

RAI 440.663

SSAR Section 15.6.5.4C contains a general statement claiming that during the post-LOCA LTC transient period, the liquid through the core is sufficient to provide adequate flushing to prevent precipitation of boron. Westinghouse should provide a quantitative analysis to show boron concentrations as a function of the core boil-off rate, DVI injection rate and core flushing rate during LTC conditions and demonstrate that an adequate margin to avoid boron precipitation is available for the limiting post-LOCA LTC case.