52-003

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 31, 1995

Mr. Nicholas J. Liparulo
Nuclear Safety and Regulatory Activities
Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, Pennsylvania 15230

SUBJECT: FOLLOWON QUESTIONS CONCERNING THE AP600 LOFTRAN AND LOFTTR-2 FINAL VERIFICATION AND VALIDATION REPORT

Dear Mr. Liparulo:

As a result of its review of the June 1992 application for design certification of the AP600, the staff has determined that it needs additional information in order to complete its review. Specifically, the enclosed questions and comments have resulted from the a comprehensive review by the staff and its contractor, INEL, of the LOFTRAN and LOFTTR-2 final verification and validation report (WCAP-14307 submitted June 27 1995).

You have requested that portions of the information submitted in the June 1992 application for design certification be exempt from mandatory public disclosure. While the staff has not completed its review of your request in accordance with the requirements of 10 CFR 2.790, that portion of the submitted information is being withheld from public disclosure pending the staff's final determination. The staff concludes that these followon questions do not contain those portions of the information for which exemption is sought. However, the staff will withhold this letter from public disclosure for 30 calendar days from the date of this letter to allow Westinghouse the opportunity to verify the staff's conclusions. If, after that time, you do not request that all or portions of the information in the enclosures be withheld from public disclosure in accordance with 10 CFR 2.790, this letter will be placed in the NRC Public Document Room.

These followon questions affect nine or fewer respondents, and therefore is not subject to review by the Office of Management and Budget under P.L. 96 511.

IFOB 1/1

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

Sincerely,

original signed by:

William C. Huffman, Project Manager
Standardization Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 52-003

Enclosure:
As stated

cc w/enclosure:
See next page

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Mr. Nicholas J. Liparulo
Westinghouse Electric Corporation

Docket No. 52-003
AP600

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REQUEST FOR ADDITIONAL INFORMATION

AP600 LOFTRAN-AP AND LOFTTR2-AP
FINAL VERIFICATION AND VALIDATION REPORT

WCAP-14307 DATED JUNE 1995

440.

447 Please expand upon the PIRT shown on pages 1-5 and 1-6 of WCAP-14307. Specifically, provide justification for the rankings.

448 On page 3-3, it is stated that the AP600 plant system design is shown in Figure 1-1. This figure is missing from the document.

449 On page 3-3, it is stated that "Moderate void generation can occur for some transients when the RCS pressure drops very low, leading to a decrease in the water subcooling at the top of the CMT (e.g., steam line break, steam generator tube rupture). The LOFTRAN homogeneous-equilibrium slug flow model is capable of handling such situations."

Please define numerically what "Moderate void generation" is. What controls does LOFTRAN have to limit itself when not in the "moderate void" region? Does the code alert the user when this occurs? Normally, homogeneous-equilibrium means a code can handle subcooled liquid, two-phase mixture and superheated steam transitions in a control volume. Is this the case with LOFTRAN?

450 How much void was present after 3,000 seconds in the SPES-2 Test 10? Why was LOFTRAN compared with data after this time, when Figures 5.5.2-7 and 5.5.2-9 clearly indicate LOFTRAN is experiencing instabilities? Was Test 10 a valid test? LOFTRAN exhibited problems with the voided conditions present in the SPES-2 test.

451 It appears that LOFTRAN uses a friction factor based on pressure drop measurements in the SPES-2 facility as input for the code. How is the friction factor determined for AP600 calculations? Is it possible to calculate the friction as a function of Reynolds number and quality? Will the friction factor for SPES-2 scale up to AP600?

452 Has Westinghouse compared the heat transfer coefficients calculated by LOFTRAN for the metal slabs to published heat transfer correlations? If so, please provide the comparisons.

453 How many cycles of refill did the CMT tests encompass? Are there longer term data and comparisons? If so, please provide such for review.

454 Page 5-2, Steamline Break Section: It is stated that the break flow is saturated steam. Won't the steam become superheated when the steam generator tubes uncover? Does the break flow model incorporate the form loss from the flow limiting venturi and sudden expansion when the break flow unchokes?

Enclosure

455 Page 5-2, Steamline Break Section: A blowdown quality profile is used for the break flow. Is it possible for LOFTRAN to calculate the quality from first principles? Does prescribing the blowdown quality overconstrain the solution? Can LOFTRAN model separation effects in a steam generator for steamline breaks?

456 Were any "true" double-ended steam line break tests performed at the SPES-2 facility? Was LOFTRAN compared to such tests if they were performed? Were tests run with sufficient break size that liquid was entrained out the break?

457 Page 5-7: "Theoretical pressure drops were calculated and compared to experimental values." Please provide these comparisons and the methods for normalizing the pressure drops to match pump heads.

458 Section 5.3.4.1: Please address scaling for the heat transfer coefficients determined from test H-01. Will these heat transfer coefficients be used for AP600 calculations?

459 It appears that there is a lot of tuning of the code to data from the experiments, such as the break flow quality, metal heat transfer, etc., and then comparisons made between the code and the same facility and data. Since so much of this has been done with the SPES-2 facility, is Westinghouse planning to compare the code to any other data?

460 (a) CMT Flow, page 5-29: States "There were no significant differences in the flow rates of the CMT's." Examination of Figure 5.5.2-12 shows very small flow rates, around 0.1 lb_m/sec for the CMT's. There is a difference in the flow rates out to about 3,000 seconds into the transient. How does this difference scale to AP600? The difference is about 0.015 lb_m/sec for the average, or about 12-13%. Please show that the difference will not increase for AP600 to justify modeling the two CMTs as one.

(b) Page 5-180: CMT Flow: It is stated that the CMT flow is shown in Figure 5.5.4-50. Please provide this figure.

(c) There is CMT flow shown in Figure 5.5.4-42. Asymmetric behavior is shown for Test 11, Run 2. Please explain this apparent contradiction to the argument that two CMTs can be modeled as one. Also, please provide larger scale plots of the comparisons to the experimental data.

461 Please explain the differences between the calculated and experimental pressurizer and hot leg conditions that occur at 1,000 seconds for the steam generator tube rupture comparisons of Test 10.

462 For the SPES-2 SLB Test 12 Run 1: Figures 5.6-6 and 5.6-10 show large differences between the calculated and experimental flows and pressures. Figure 5.6-13 shows significant difference in the calculated temperature compared to experimental data. Please explain these discrepancies and discuss their impact on the AP600 calculations.