

March 20, 1996

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

SUBJECT: FOLLOWON QUESTIONS RELATED TO AP600 PASSIVE CONTAINMENT COOLING SYSTEM (PCS)

Dear Mr. Liparulo:

To support the Containment System and Severe Accident Branch safety evaluation effort, the staff has developed the enclosed request for additional information concerning AP600 reports on PCS.

You have requested that portions of the information submitted for design certification be exempt from mandatory public disclosure. While the staff has not completed its review of your requests in accordance with 10 CFR 2.790, those portions of the submittals are being withheld from public disclosure pending the staff's final determination. The staff concludes that this request for additional information (RAI) does not contain 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 attachments be withheld from public disclosure in accordance with 10 CFR 2.790, this letter will be placed in the NRC Public Document Room.

You are requested to provide a response to these questions and comments within sixty days of receipt of this letter. This RAI affects nine or fewer respondents, and therefore this request is not subject to review by the Office of Management and Budget under P.L. 96-511. If you have any questions regarding this matter, you can contact me at (301) 415-8548.

Sincerely,
original signed by:
Diane T. Jackson, Project Manager
Standardization Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

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A PDR

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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Enclosure to be distributed to the following addressees after the result of the proprietary evaluation is received from Westinghouse:

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Request for Additional Information
AP600 Passive Containment Cooling System (PCS)

- 480.404 On page 3-61 in WCAP-14326, "Experimental Basis for the AP600 Containment Vessel Heat and Mass Transfer Correlation," it is stated that only tests with film coverage greater than 90 percent were included in the comparison because lower film coverage affected the circumferential averaging. This eliminated 17 of the 25 tests. In Table 3-3 in WCAP-14382, "WGOthic Code Description and Validation," the 13 tests selected for validation and verification all had a target coverage of 75 percent or less. In Table 7-1 of WCAP-14382, five of the tests (excluding the two dry tests) had actual coverage of less than 90 percent. Provide a description of the method used to obtain the circumferential average. Why is this method not valid if the coverage is less than 90 percent? Explain why it is acceptable to verify the water coverage model for tests with less than 90 percent coverage while it is not possible to use test data at less than 90 percent to verify the heat and mass transfer correlations.
- 480.405 On page 3-62 in WCAP-14326, "Experimental Basis for the AP600 Containment Vessel Heat and Mass Transfer Correlation," reference to Figure 3.9-1 says it is a plot of predicted-to-measured Nusselt numbers for the seven large-scale PCS tests. The actual figure on page 3-63 is a plot of predicted-to-measured Sherwood (Sh) numbers. Note that there is one data point near a predicted-to-measured Sherwood number of about 1.5, at the lowest heated length. Either provide a corrected figure that supports the discussion in Section 3.9 of WCAP-14326 or modify the discussion to be consistent with the figure.
- 480.406 In the attachment to letter NTD-NRC-95-4570, dated September 28, 1995, a plot of predicted-to-measured Sherwood number versus Reynolds number is used to show the bounding predicted-to-measured value for evaporation. For the condensation comparison, the predicted-to-measured Sherwood number versus P/P_{BM} ratio is used. There is no obvious reason as to why the independent variable should be different for this use. However in reviewing WCAP-14326, "Experimental Basis for the AP600 Containment Vessel Heat and Mass Transfer Correlation," it appears that in Figure 4.3-1 of that report (the Sherwood number versus Reynolds number comparison for condensation) the outlier (at $P/P_{BM} = 1.491$) is either missing or outside that plotted range. Provide a corrected Figure 4.3-1 for WCAP-14326 that includes this data point.

Enclosure

- 480.407 On page 2-3 in PCS-T2R-050, "Large-Scale Test Data Evaluation," reference is made to "radioactive" heat transfer. Is this really "radiation" (as in radiant) heat transfer? As written in the conclusion section it is radiation heat transfer. An addendum or errata should be provided to correct this error. Also, on page 4-1, reference 4 states the Docket No. as STN-S2-003. This should be STN-52-003.
- 480.408 Reference 3 in the attachment to NTD-NRC-95-4561, "Scaling Role in AP600 PCS DBA Analysis," dated September 19, 1995, indicates that R.W. Borchardt was the recipient of letter NTD-NRC-95-4545 from N.J. Liparulo. In actuality that letter was sent to T.R. Quay by B.A. McIntyre. Since the NRC document control system (DCS) can use recipient or author as a search parameter, this error should be corrected to facilitate location of letter NTD-NRC-95-4545 in the DCS.
- 480.409 In the first paragraph of Section 1.0 in WCAP-14382, the description of the PCS implies a single annular region. At the end of Section 1.1, the baffle, riser and downcomer are mentioned. The Introduction needs to be written to better describe the PCS air-annulus region (downcomer, baffle and riser).
- 480.410 On page 2-2 of WCAP-14382, it is stated that changes were made to the pre-processor program to assist in model development, and that these changes were verified by hand. Provide a description of these changes. Are these changes only related to the new features added by Westinghouse to model, for example, the "climes" regions? Were changes made to simplify the setting up of the distributed parameter nodal models when the model is not representing a true rectangular, orthogonal geometry? Discuss the hand verification performed. How complex are the changes?
- 480.411 On page 2-2 of WCAP-14382, the inclusion of the wall-to-wall radiant heat transfer is identified as the core modification to GOTHIC. This new conductor is referred to as the "clime." What other changes have been made to GOTHIC (excluding corrections of know coding errors)?
- 480.412 On page 2-2 of WCAP-14382, it is stated that two stacked sets of Climes are used in the PCS model. One is always considered to be dry and the other is called the "wet" stack. No other information is provided in this WCAP on how these stacks are modeled. Since this WCAP is a description of WGOTHIC, it should include a detailed description of how these stacks are modeled including a description of input needed and any other guidance for the user, such as the need to verify that modeling assumptions are consistent with the analyses. This should include the guidance on how to calculate the area for each region, what data are needed to perform this calculation and what is needed to verify that these assumptions are consistent with the completed WGOTHIC calculation.

- 480.413 In the attachment to letter NTD-NRC-95-4596, dated November 13, 1995, a sensitivity analysis is provided for the deck flow area. Which DBA was used, what was the size and location of the break? In the figure, the run is identified as both GOTHIC Version W-gothic 2.1.1.1 and as W-GOTHIC 1.2.1.1. Are these the same code? Identify the changes that are included in the version used for this analysis as compared with the 1.2 version of W-GOTHIC. This figure is marked preliminary. Why?
- 480.414 In the attachment to letter NTD-NRC-95-4595, dated November 13, 1995, a comparison analysis is provided of W-gothic s Ver 1.2 to W-gothic s Ver 1.2.2.1 for a cold leg break. How does this version compare with the deck area version identified as both GOTHIC Version W-gothic 2.1.1.1 and as W-GOTHIC 1.2.1.1. Are these the same code? Identify the changes that are included in the version used for this analysis as compared with the 1.2 and 1.2.1.1 versions of W-GOTHIC.
- 480.415 In the attachment to letter NTD-NRC-95-4595, dated November 13, 1995, in Table 1, it is inferred that the error in routine *condin.f* is negligible because AP600 analyses are done in English units. Verify that (1) the error only effects printed output from the code (eg, the conversion is not performed on an English value to be used in a model that is coded as a metric formulation), and that (2) no conclusions as to GOTHIC's or WGOTHIC's abilities were based on the wrong value (eg, comparison of a metric test data base to GOTHIC metric output).