



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

May 14, 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: FOLLOWON QUESTIONS REGARDING THE WESTINGHOUSE AP600 INITIAL TEST PROGRAM (ITP)

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. Specifically, the enclosure to this letter contains requests for additional information concerning the AP600 ITP resulting from a review done by the Containment Systems and Severe Accident Branch.

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 Nuclear Regulatory Commission Public Document Room.

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Mr. Nicholas J. Liparulo

- 2 -

May 14, 1997

If you have any questions regarding this matter, you may contact me at (301) 415-1132.

Sincerely,

original signed by:

Joseph M. Sebrosky, 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:
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Docket No. 52-003
AP600

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Followon Questions on the AP600 Initial Test Program

Containment Systems and Severe Accident Branch Comments

Questions 260.118 through 260.130 apply to Section 14.2.9.1.4 Passive
Containment Cooling System (PCS) Testing

- 260.118 The following is a general comment on Section 14.2.9.1.4. The purpose of the testing in this section is stated in terms of the safety-related function "to transfer heat from inside containment to the environment."

Additional testing objectives need to be incorporated into the Initial Test Program (ITP) to validate the expected PCS wetting characteristics. Additional testing objectives need to be incorporated into the ITP to validate the overall heat transfer characteristics used in the design basis accident evaluation model which are dependent on the as-built structures. (RAIs 260.119 through 260.130 are specific examples of the above general comment).

- 260.119 The testing purpose needs to be expanded. It needs to be clear that there are distinct periods (three) of flow which need to be evaluated as well as the period of performance, 72 hours.

- 260.120 The passive containment cooling system water storage tank (PCCWST) is now also used as a safety-related makeup source for the spent fuel pool (see SSAR Section 6.2.2, Revision 11, February 28, 1997, page 6.2-21). This should be stated under Purpose, as is the fire protection function. Also, the description of the new, isolated fire protection tank within the PCCWST should be provided. Appropriate testing for the spent fuel pool makeup function needs to be developed and referenced in the Initial Test Program.

- 260.121 Under prerequisites, the quantity of water available in the PCCWST needs to reflect an amount sufficient to demonstrate that at the minimum level (volume) specified in the technical specifications, the PCS will provide at least 72 hours of continuous cooling water.

- 260.122 Under General Test Acceptance Criteria and Methods, the reference to Section 6.2 should be limited to Section 6.2.2, "Passive Containment Cooling System," only. This test does not cover the other sections.

Enclosure

- 260.123 Under **General Test Acceptance Criteria and Methods**, the reference to "appropriate design specifications" is unacceptable. SSAR Section 6.2.2, specifically Section 6.2.2.2.4, "System Operation," needs to identify the relevant design specifications which are directly verified by test. At a minimum these include, for each flow phase:
- a. The minimum acceptable flow rate for each flow phase, as measured just prior to the uncovering of each stand pipe.
 - b. The minimum acceptable water coverage area on the vessel side wall near the upper annulus drain elevation for each flow phase, and the uniformity of the coverage around the circumference of the vessel.
 - c. The time period for each flow phase, which considers the design objective of providing cooling water for a period of at least 72 hours in three flow phases to account for the reduction in the amount of heat to be removed during each phase.
- 260.124 Heat removal requires an adequate water film on the vessel exterior surface (sufficiently thick to assure stability based on the design basis accident evaluation model), as noted in SSAR Section 6.2.2.2.4. A non-invasive method for approximating the film thickness during each flow phase needs to be included in the Initial Test Program. Based on the known water delivery flow rate and the water coverage area, near the upper annulus drains, a method which measures the time for "a water particle" to travel from the vessel spring line to the upper annulus drain can be used to estimate the average film thickness over the covered vessel side wall.
- 260.125 Under **General Test Acceptance Criteria and Methods**, c), references to item a. and c. under RAI 260.123 need to be incorporated.
- 260.126 Under **General Test Acceptance Criteria and Methods**, c), the text refers to the PCCWST "drain" flowpath. SSAR Section 6.2.2 refers to the PCCWST "outlet" piping or "discharge" piping. In other descriptions, for example the technical specifications, references are made to the PCCWST "delivery" flowpath [piping]. There needs to be one term which is consistently used to identify the PCS piping which provides the cooling water to the distribution bucket.
- 260.127 Under **General Test Acceptance Criteria and Methods**, d), reference to item b. under RAI 260.123 needs to be incorporated.

- 260.128 Under **General Test Acceptance Criteria and Methods**, d), in addition to verifying the uniformity of the wetted surface (proper operation of the water distribution bucket and weirs), an estimation of the water film thickness needs to be incorporated, as discussed in RAI 260.124.
- 260.129 Under **General Test Acceptance Criteria and Methods**, b), reference is made to features and equipment not identified in Section 6.2.2 of the SSAR. These features need to be included in the SSAR description:
- a. Diverse actuation signals, those in addition to the Hi-2 containment pressure signal, need to be included in SSAR Section 6.2.2.1. Alternatively, the Initial Test Program description would have to specifically address SSAR Section 7.3 to identify the appropriate features of the PCS actuation system that are covered by the testing.
 - b. The shield plate which protects the distribution bucket.
- 260.130 An additional test objective needs to be developed that will provide an estimate of the overall heat transfer process during the testing of the PCS. Consideration should be given to performing the test with a sufficient temperature difference between the PCC&ST water temperature and the internal containment temperature to observe and measure containment cooldown. With no steam inside containment, this test will validate the overall thermal resistance of the vessel wall and its inorganic zinc coatings used in the design basis accident evaluation model. These data should, if practical, be obtained in conjunction with **General Test Acceptance Criteria and Methods**, f) which provides information on the exterior boundary of the PCS (air flow rates and temperatures).

Questions 260.131 through 260.135 apply to section 14.2.9.1.10 Containment Isolation and Leak Rate Testing

- 260.131 Is the preoperational test separate and distinct from the ASME Containment Structural Acceptance Test? Is it performed after the ASME Containment Structural Acceptance Test? If this is the case, it should be clarified in Section 14.2.9.1.10.
- 260.132 A requirement to verify that isolation valve divisional assignments for instrumentation and actuation circuits are correct should be included. Also, instrumentation logic and remote manual operation capability should be verified.
- 260.133 Fail-open and fail-close valve motions should be verified.
- 260.134 Stroke-times should be verified.

- 260.135 Plants have used their Type C test procedures for preoperational testing. The test abstract references ANS-56.8-1994 for leakage testing methodology. The 1994 standard is permitted for Option B leakage testing programs to meet the requirements of Appendix J. Option A plants that want to use their Appendix J procedures and methods for preoperational testing have to use the 1972 standard.

Questions 260.136 through 260.139 apply to section 14.2.9.1.11 Containment Hydrogen Control System Testing

- 260.136 The **Purpose** and the **General Test Acceptance Criteria and Methods** sections do not address the nonsafety-related functions described in Section 6.2.4. Specifically, those aspects of the system that have been incorporated to meet the requirements of 10 CFR 50.34(f)(2)(ix) need to be verified by testing. Therefore, this test abstract needs to be modified to include testing that verifies the operability of (1) all sixteen hydrogen sensors in their role of supporting proper actuation and operation of the hydrogen igniter-s, and (2) the alternative power supplies to the hydrogen igniter-s.
- 260.137 The SSAR does not appear to describe when the hydrogen igniter-s are to be actuated and how they are to be operated. This information is needed to support test c) under **General Test Acceptance Criteria and Methods**.
- 260.138 All the recombiner plates should be tested under test b) of the **General Test Acceptance Criteria and Methods** unless it can be established that they are from the same batch or manufacturing lot. Westinghouse also needs to specify how many plates will be tested once traceability to the same batch or manufacturing lot has been established.
- 260.139 Section 6.2.4 of the SSAR does not support the determination of a specified plate temperature as described in test b) under **General Test Acceptance Criteria and Methods**. Temperatures within the PAR cartridge can vary greatly and are dependent on a number of factors such as location and mounting of the thermocouple, and the proximity of the thermocouple to the hydrogen source. This information is needed because during a test the temperature within a plate may be below or above the specified acceptance temperature depending on the location of the thermocouple.