Westinghouse Electric Corporation Energy Systems

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DCP/NRC1164
NSD-NRC-97-5468
Docket No.: 52-003

December 3, 1997

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: T. R. QUAY

SUBJECT: RESPONSES TO STAFF REQUESTS REGARDING THE AP600 INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA (ITAAC) - PCS

Dear Mr. Quay:

Enclosed are three copies of Westinghouse's responses to RAIs 640.153 and 640.154 related to comments on the Passive Containment Cooling System (PCS) in Revision 3 of the AP600 Certified Design Material as requested in a letter from the staff dated October 9, 1997. Also included is our response to FSER Open Item 480.1084F, which is related to RAI 640.154, as requested in a letter from the staff dated November 17, 1997.

This submittal closes, from Westinghouse' perspective, open items 6053, 6054 and 6183. As a result, the Westinghouse status column will be changed to "Closed" in the Open Item Tracking System (OITS). The NRC should review this response and inform Westinghouse of the status of the open item to be designated in the "NRC Status" column of the OITS.

Please contact Mr. Eugene J. Piplica at (412) 374-5310 if you have any questions concerning this transmittal.

C L Haag for BAM

Brian A. McIntyre, Manager
Advanced Plant Safety and Licensing

jml

Enclosures

E004

cc: J. M. Sebrosky, NRC (w/Enclosure)
J. N. Wilson, NRC (w/Enclosure)
N. J. Liparulo, Westinghouse (w/o Enclosure)

FSER Open Item 480.1084F

As a result of the staff's continuing review of the AP600 design certification application, the Containment Systems and Severe Accident Branch (SCSB) has identified concerns regarding the Westinghouse position on water coverage testing for the AP600 PCS and the use of that information to support the WGOTHIC computer program for design certification.
This issue if further compounded because it spans a number of review areas: (1) the assumptions used in the water coverage model developed for use in WGOTHIC, (2) the initial test and acceptance criteria (ITAAC), (3) the initial test program (ITF), (4) the technical specifications (TS) and (5) the SSAR.

The limited experimental data available to support water coverage comes from the cold Water Distribution Test (WDT) facility, with some additional support from the Large-Scale Test (LST) facility. The water coverage area fractions used in the water coverage model, as a function of PCS flow rate, are based on the WDT. The vertical section of this test is 4 feet, as compared to about 90 feet in the AP600. The LST has a vertical height of about 12 feet. The PCS has three flow stages during the 72 hour draindown time for the passive containment cooling water storage tank (PCCWST): 442 gpm for the first 3 hours; then as the first standpipe uncovers the flow drops to 122 gpm for about 27 hours; followed by the uncovery of the second standpipe and a flow of 71.5 gpm to the 72 hour draindown time. Each PCS flow stage has its own unique water coverage area fraction, based on the WDT observations.

In SSAR Section 6.2.2.4.2, "Preoperational Testing," it is stated that "With a water level of 6.2±0.25 feet above the bottom standpipe the containment shell wetted coverage will exceed the amount predicted by the wetting coverage methodology used in the safety analysis." This is not consistent with ITAAC 2.2.2, "Passive Containment Cooling System," item 8.b), Certified Design Material (CDM) Revision 3, dated May 12, 1997, which requires "equal to or greater than" the amount predicted by the wetting coverage methodology used in the safety analysis.

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The Westinghouse position to verify the wetted coverage area for only the minimum PCS flow rate is unacceptable. Further it not known what is meant by "the amount predicted by the wetting coverage methodology used in the safety analysis," or "consistent with the accident analysis." These phrases are too ambiguous and are also unacceptable.

The staff position is that the wetting coverage area must be verified for each of the three PCS flow rates, in addition to the verification of the actual flow rates leaving the PCCWST. Verification is required during preoperational testing (ITP), and the acceptable values must be incorporated into the ITAAC. These values must then be verified at the first refueling outage and at subsequent 10 year intervals (TS). Further, the verification must confirm that the wetting coverage area is uniform along the vertical height as well as around the containment vessel circumference as observed near the upper annulus drain elevation. The performance of the PCS is based on the expectations arising from the WDT (and to a lesser extent, the LST). The acceptable values for the wetted coverage area are equal to or greater than the values observed in the WDT. These WDT values are an integral part of the wetting coverage methodology used by Westinghouse and are an integral part of the staff's overall understanding of the conservatism in the design certification review. Direct measurement of the expected performance of the water distribution system under conditions similar to the WDT is the only acceptable means for verifying the PCS water coverage.

The AP600 SSAR needs to be updated to reflect the required ITAAC and TS identified above. Also, the information provided must emphasize both the water flow rates and the wetted coverage area of the PCS.

Response:

The SSAR and the ITAAC have been revised to indicate the water coverage testing will be conducted by measuring the coverage percentages at each of the transition design basis flow rates. The coverage will be measured at the initial flow rate with a minimum initial amount of water in the PCCWST, subsequent to the highest standpipe being uncovered and finally subsequent to the second highest standpipe being uncovered. The coverage will be confirmed at the spring line for each of the three major flow rate periods. The acceptance criteria for each period will be that the water coverage will be equal to or greater than the coverage used as input to calculate the peak containment pressure in the safety analysis. With this acceptance criteria, the ITAAC testing will confirm system performance consistent with the input assumptions of the containment safety analysis.

The Technical Specifications have been revised to indicate flow and coverage testing will be performed after the first fuel cycle and at a subsequent frequency of every 10 years. The coverage measurement has been revised to assure continued conformance with the containment analysis. During the Initial Test Program, the containment coverage will be measured for the full flow case at the base of the upper annulus in addition to the coverage at the spring line. This benchmark value will be used to develop acceptance criteria for the Technical Specifications at the full flow condition. This condition is selected since it is the most important flow rate from the standpoint of calculation peak containment pressure.

SSAR Revision:

Revise Note 1 to Table 3.9-17 as follows:

1. The flow capability of each PCS water drain line is demonstrated by conducting a test where water is drained from the PCS water storage tank onto the containment shell by opening one isolation valve. During this flow test the water coverage is also demonstrated. The test is terminated when the flow measurement is obtained and the water coverage is observed. The minimum allowable flow rate is 442 gpm with the passive containment cooling water storage tank level 23.75 ± 0.25 feet above the lowest standpipe. Water coverage is demonstrated by a report that concludes that the amount of the containment shell covered is equal or greater than the coverage used to calculate peak containment pressure ~~at lesat equal to that predicted by the wetting coverage methodology used~~ in the safety analysis.

Revise Table 6.2.2-1 to include wetted containment shell coverage at specific PCCWST elevations as follows:

PCCWST maximum temperature (°F) 120
~~Containment wetting coverage~~ . . . . . ~~Note 3~~
Upper annulus drain rate (per drain) - Minimum . . . . . 450 gpm

Containment Wetting Coverage

PCCWST Elevation (Note 3) (feet)	Minimum Flow (gpm)	Wetted Coverage (Note 3) (percentage of circumference)
23.75	442	90
20.65	122	51
13.55	71.5	30

Revise Note 3 in Table 6.2.2-1

3. ~~PCS water coverage of the containment shell exceeds the amount predicted by the wetting coverage methodology used in the safety analysis.~~ PCCWST Elevation is measured as feet above the lowest tank standpipe entrance. Wetted coverage is measured as the linear percentage of the containment shell circumference wetted measured at the upper spring line.

In subsection 14.2.9.1.4 revise item d) under **General Test Acceptance Criteria and Methods** as follows:

d) The proper operation of the passive containment cooling water distribution bucket and weirs is verified and proper wetting of the containment is observed and recorded during draindown testing in Item c, above. Water delivery and coverage is verified at the initial minimum water level and as each of the first two standpipes is uncovered.

Revise to the Frequency for Surveilance Requirement 3.6.6.6 in Technical Specification Section 3.6.6 as follows:

SR 3.6.6.6	Verify passive containment cooling system flow and water coverage performance in accordance with the System Level Operability Testing Program.	10 Years and after the first fuel cycle

ITAAC Revision:

In ITAAC Section 2.2.2 Table 2.2.2-3

Revise Acceptance Criteria ii) for Design Commitment 8.a) as follows:

8.b)	ii)	i) A report exists that concludes ~~concluding~~ that with water in the ~~a~~ PCCWST ~~water~~ at the following levels, ~~level of 6.2 ft ± 0.25 ft above the bottom of the tank,~~ water delivery to the containment shell provides a coverage measured at the spring line that is equal to or greater than the corresponding coverage used to calculate peak containment pressure ~~amount predicted by the wetting coverage methodology used~~ in the safety analysis. ~~The wetted coverage will be verified with each of the two parallel paths tested separately.~~ - 23.75 ± 0.25 ft above the lowest standpipe - 20.65 ± 0.25 ft above the lowest standpipe - 13.55 ± 0.25 ft above the lowest standpipe

Question 640.153 (OITS # 6053)

2.2.2 - Passive Containment Cooling System

Your response to RAI 640.57(a) requires clarification. The acceptance criteria for ITAAC 8. a) ii) specifies a water level without units or relative location.

Response:

The acceptance criteria has been changed to be consistent with the other elevations as a height above the lowest standpipe.

SSAR Revision: NONE

ITAAC Revision:

Revise Acceptance Criteria ii) for Design Commitment 8.a) as follows:

8 -	ii)	ii) When tested and/or analyzed with both flow paths delivering and an initial water level at 24.25 - 0.25, -0.00 ft ~~300.75 ± 0.25~~, the water inventory provides greater than or equal to 72 hours of flow with a flow rate greater or equal to 62 gpm.

Question 640.154 (OITS #6054)

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Your response to RAI 640.57(b) is unacceptable. Provide an ITAAC that verifies that the water coverage fractions, at the upper annulus drain elevation, for each of the three phases of PCS flow are consistent with the design basis assumptions that are used to determine the evaporated flow as described in section 7A of WCAP-14407 (Rev 1). These values need to be consistent with the observations from the cold Water Distribution Tests. In addition to the coverage fraction (percent of the circumference), the uniformity of the PCS flow around the circumference at the upper annulus drain elevation must be verified.

Response:

See Response to FSER Open Item 480.1084F

SSAR Revision:

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ITAAC Revision:

See Response to FSER Open Item 480.1084F