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NSD-NRC-96-4909
DCP/NRC0677
Docket No.: STN-52-003

December 10, 1996

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

ATTENTION: T. R. QUAY

SUBJECT: WESTINGHOUSE RESPONSES TO NRC REQUESTS FOR ADDITIONAL INFORMATION ON THE AP600

Dear Mr. Quay:

Enclosed are three copies of the Westinghouse responses to open items on the AP600 topics. Responses to open Items 1640 and 2414 on the WGOTHIC Computer Code are attached in this transmittal.

The NRC technical staff should review these responses as a part of their review of the AP600 design. These responses close the open items.

Please contact Brian A. McIntyre on (412) 374-4334 if you have any questions concerning this transmittal.

Brian A. McIntyre, Manager
Advanced Plant Safety and Licensing

/jml

Enclosures

cc: T. Kenyon, NRC (w/o enclosures)
C. Li, NRC
N. Liparulo, Westinghouse (w/o enclosures)

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E004

OI-1640

Question: DSER 21.5.9-3

The staff is also concerned that the supporting arms of the baffle wall of the PCCS, surface irregularities, and the possible effect of clogging of the weirs with foreign material are not modeled in the WGOTHIC analysis.

Response:

The AP600 water distribution system is described in Reference 3. Westinghouse has considered the effects of the baffle supporting arms, surface irregularities, and possible effects of weir clogging in development of the PCS DBA evaluation model as follows.

The baffle supporting arm standoffs are designed as fairings to minimize drag so that the liquid film flow is directed around the standoffs and recovery is promoted beneath the arms. The standoffs have no significant effect on water coverage since water flow was observed to recover with no dry patches even with the low flow rates of test LST 213. The LST testing included similar supporting arms so the effects have been implicitly included in the LST water coverage measurements and in the validation of WGOTHIC (Ref. 1, Section 8) and the water coverage model (Ref. 2, Section 7) with LST data.

Surface irregularities have been included in the cold full scale water distribution tests via maximum weld butt-up tolerances, both high and low, consistent with the ASME code. The water distribution tests have been combined with heated surface data, and that data is used to obtain PCS DBA water coverage. Results showed that water distribution on the dome is limited by manufacturing tolerances, rather than by film stability criteria. These results have been factored into the bounding minimum DBA water coverage used as a boundary condition in the WGOTHIC evaluation model (Ref. 2, Section 7). Therefore, surface irregularities have been addressed in the evaluation model.

Clogging at the inlet of the distribution box is not expected in AP600 due to periodic in-service inspections and cleaning, together with screened PCS inlets and outlets.

The weirs of the water distribution system have been designed to reduce the probability of debris affecting system performance. The feeder from the dam to the water distribution box is greater than 6 inches square so that debris which may be able to pass through the PCS screens will not block the feeder. Each of the "V" slots which feed distribution troughs and from which water egresses onto the shell is large enough to pass debris which could pass through the screens. In the case of postulated larger size debris, the weirs are self-correcting because the clogging of one "V" slot results in more water being fed to other "V" slots.

If localized clogging of "V" notches is postulated, more flow will be applied to adjacent "V" notches (since the delivered total PCS flow would be unaffected). In such a case, stripes formed by the adjacent "V" notches would be wider than assumed since the stripe film flow (lbm/sec-ft) would be increased. Therefore, it is not necessary to include a penalty for distribution system clogging in the evaluation model. It is concluded that the weir system performance is not likely to be adversely impacted by postulated debris scenarios.

References

1. NTD-NRC-95-4489, (WCAP-14382), "WGOTHIC Code Description and Validation", June 20, 1995.

2. NSD-NRC-96-4816, (WCAP-14407), "WGOTHIC Application to AP600", September 10, 1996.

3 WCAP-13960, "PCS Water Distribution Phase 3 Test Data Report", December 1993.

OI-2414

Question: Meeting open Item from: NRC Meeting on PCS (4/11/95)

Evaluate separately for the AP600 the effects of:
- heat sinks
- interior condensation model
- stratification

Response:

Information has been provided in WCAP-14407 (Peference 1):

- The effects of heat sinks are bounded by using a lower bound on the number of heat sinks (Table 14-1), assuming an upper bound concrete-steel gap (Table 14-2), maximum initial heat sink temperature (Table 14-2), and conservative material properties (Table 14-5). A sensitivity to the internal heat sinks air gap is provided in Section 5.9.

- Mass transfer rate to internal heat sinks is separately bounded by using the Uchida condensation correlations.

- A sensitivity to assumed interior condensation model is given in Section 10.2.

- The effects of stratification are given in Section 9.

Reference:

1. NSD-NRC-96-4816, (WCAP-14407), "WGOTHIC Application to AP600," September 10, 1996.