March 1, 2004

MEMORANDUM TO: Laura A. Dudes, Section Chief
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Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

FROM: Amy Cubbage, Project Manager ***/RA/***
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SUBJECT: AUGUST 25, 2003, AP1000 TELEPHONE CONFERENCE CALL SUMMARY

On Monday, August 25, 2003, a telephone conference call was held with Westinghouse Electric Company (Westinghouse) representatives and Nuclear Regulatory Commission (NRC) staff to discuss thermal/hydraulics issues. The NRC staff specifically discussed the Westinghouse response to draft safety evaluation report (DSER) open item (OI)19.1.10.1-5. Westinghouse submitted a response to this open item on July 1, 2003 (ADAMS Accession No. ML031950553). A list of call participants is included in Attachment 1.

The following is a brief summary of the discussions regarding the identified topics:

OI 19.1.10.1-5:

This OI is related to Westinghouse's approach in categorizing success paths for the probabilistic risk assessment (PRA). This OI is composed of six items (a - f) which were discussed during the call and the staff discussed one additional item (g) (see comments in attachment 2). The following is a summary of the items and the discussions regarding the items:

(a) Additional justification is needed for long-term cooling analyses for which the initial and boundary conditions were obtained from analyses using MAAP4 for input into WCOBRA/TRAC (RAI 720.013):

The NRC staff stated that they have not formally approved MAAP4, except for its use in screening studies. The NRC staff stated that either MAAP4 should be benchmarked for AP1000 or Westinghouse should use a methodology the NRC staff has reviewed and approved. The staff asked why Westinghouse does not use its updated WCOBRA/TRAC long term cooling model. Westinghouse stated they would evaluate whether they will benchmark MAAP4 for AP1000 or use the WCOBRA/TRAC model using input conditions from WGOTHIC.

(b) Additional justification should be provided that a large break loss-of-coolant accident (LOCA) can be mitigated if one of the two core makeup tanks (CMT) fail (RAI 720.012-2):

Westinghouse stated that the AP1000 large break LOCA analysis, using WCOBRA/TRAC, includes a sensitivity study that determines the peak cladding temperature without credit for operation of the CMTs.

(c) Additional justification should be provided that adequate water can be maintained within the containment to provide for long term core cooling if containment isolation fails (RAIs 720.021 and 720.024):

The NRC staff stated that Westinghouse's July 1, 2003, response adequately addressed this issue.

(d) Additional justification should be provided that one of the two startup feedwater pumps can deliver adequate water to the two steam generators following an anticipated transient without scram (ATWS) event (RAI 720.024):

The NRC staff stated that Westinghouse's July 1, 2003, response adequately addressed this issue.

(e) Additional justification should be provided that evaluations made for the AP600 are appropriate to be used in the AP1000 probabilistic risk assessment (PRA) Table 6-1 and in the response to RAI 720.025 where Westinghouse assumes that 30 minutes of core cooling is available following a small break LOCA, steam generator tube rupture or transient with no accumulator injection (RAIs 720.024 and 720.025):

The staff asked Westinghouse how automatic CMT actuation injection could be a worse case than manual CMT actuation which has a longer delay time. The staff said that Westinghouse should run the manual CMT actuation case with NOTRUMP. Westinghouse said they could provide more justification.

(f) Additional justification should be provided that sequences which assume failure of one of the four ADS stage #4 valves and also assume failure of containment isolation, will end in successful core cooling (RAIs 720.012, 720.009 and 720.017):

Westinghouse stated that this is a success criteria case, and that the thermal-hydraulic uncertainty issue is different. Westinghouse said they ran all cases with MAAP, and when the results showed low margin and high risk they ran the cases with NOTRUMP. Westinghouse said they would look at this issue more, and that this is a different aspect than was asked in the original question.

(g) Additional Issue - Use of MAAP4 for MSGTR Calculation:

The staff raised an issue regarding the use of the MAAP4 computer code for performing multiple steam generator tube rupture (MSGTR) calculation. Since there appeared to be little margin, the staff requested that Westinghouse confirm that there is no core uncovery with a methodology reviewed by the staff. Upon further discussions, Westinghouse identified that the staff was unable to assess the large margin in the analysis results because the analysis results did not identify the top of the active fuel. Westinghouse agreed to revised their response to show the top of the active fuel in the analysis results.

Docket No. 52-006

Attachments: As stated

cc: See next page

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AUGUST 25, 2003
TELEPHONE CONFERENCE CALLS SUMMARY
LIST OF PARTICIPANTS

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Westinghouse

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J. Scobel
B. Kemper
E. Cummins
T. Schultz

Attachment 1

NUCLEAR REGULATORY COMMISSION STAFF
COMMENTS THAT WERE SENT TO WESTINGHOUSE TO
FACILITATE DISCUSSION OF OPEN ITEM 19.1.10.1-5
FOR CONFERENCE CALL HELD ON AUGUST 25, 2003

Staff comments on items related to Open Issue 19.1.10.1-5

(a) Additional justification is needed for long-term cooling analyses for which the initial and boundary conditions were obtained from analyses using MAAP4 for input into WCOBRA/TRAC (RAI 720.013):

This issue remains open. In the revised response to RAI 720.013, Westinghouse performed long term cooling analyses for bounding conditions in the PRA. (Case F DEDVI, 1 CMT, 1 recirc line, 3/4 ADS4 and CI) and (Case G DEDVI, 1 CMT, 1 recirc line, 4/4 ADS4 and CI failure). The WCOBRA/TRAC code was used for LTC calculations with input conditions derived from MAAP4 analyses. As discussed in the DSER the staff has not reviewed MAAP4 except for its use in screening studies. These are analyses using minimum equipment sets as discussed in the DSER. The staff believes that only a methodology the staff has reviewed should be utilized. In addition, as a result of staff and ACRS questions, the WCOBRA/TRAC long term cooling model has been changed. The staff believes that the revised model should be used in these bounding calculations.

(b) Additional justification should be provided that a large break LOCA can be mitigated if one of the two CMTs fail (RAI 720.012-2):

This issue remains open. In the revised response to RAI 720.012, Figure 2-1, Westinghouse listed large break LOCA sequences as success sequences (OK7 sequences). Westinghouse should verify these conclusions by using a methodology that the staff has reviewed.

(c) Additional justification should be provided that adequate water can be maintained within the containment to provide for long term core cooling if containment isolation fails (RAIs 720.021 and 720.024):

This response is acceptable based on Westinghouse arguments on the relative elevations between the postulated RCS break and the postulated failed containment penetration and the tortuous path that would be involved.

(d) Additional justification should be provided that one of the two startup feedwater pumps can deliver adequate water to the two steam generators following an ATWS event (RAI 720.024):

This response is acceptable based on new analyses to be added to Appendix A of the PRA.

(e) Additional justification should be provided that evaluations made for AP600 are appropriate to be used in the AP1000 PRA Table 6-1 and in the response to RAI 720.025 where Westinghouse assumes that 30 minutes of core cooling is available following a small break LOCA, steam generator tube rupture or transient with no accumulator injection (RAIs 720.024 and 720.025):

References to AP600 have been removed and acceptable arguments applying to AP1000 have been added. This response is acceptable.

An analysis using MAAP4 was performed to demonstrate that a 30 minute delay in CMT injection is acceptable following a SBLOCA and multiple failures. The consequences were determined to be bounded by a MAAP4 analysis with automatic actuation. Westinghouse asserted that since this is not a limiting case a NOTRUMP analysis is not required. For the manual CMT case there is no ECCS for 2000 seconds after the break. For the automatic actuation case, CMT injection occurs about 200 seconds after the break. How can the automatic CMT actuation injection case be worse than the manual CMT actuation case which has a longer delay time?

(f) Additional justification should be provided that sequences which assume failure of one of the four ADS stage #4 valves and also assume failure of containment isolation, will end in successful core cooling (RAIs 720.012, 720.009 and 720.017):

This issue is unresolved. In the revised response to RAI 720.09, Westinghouse presented the results of an analysis using WCOBRA/TRAC with inputs determined from a MAAP4 analysis. The staff has the same issue with this analysis as is stated under Item a. In the revised response to RAI 720.17, Westinghouse argued that this case is not risk significant and therefore it is not necessary to perform a T&H uncertainty analysis. This argument is not valid since OK6 (See Figure 2-4 of RAI 720.012), OK2 and OK4 sequences (on Figure 2-5 of RAI 720.012) fall in this category. Are these OK sequences considered to be low risk?

(g) Additional Issue - Use of MAAP4 for MSGTR Calculation:

In its response to the staff RAI 440.043 regarding the AP1000 design features that mitigate or prevent steam generator safety valves challenges during an event of rupture of multiple steam generator tubes (MSGTR), Westinghouse provided a beyond-design-basis analysis of MSGTR using MAAP4. Two cases were analyzed: a passive system mitigation case with PRHR heat exchanger operation; and a minimum PRHR heat removal case with the assumption of steam generator safety valve (SGSV) failed open. Based on the MAAP4 analysis, Westinghouse concluded that for the MSGTR, the core remains covered and cooled, and thus no significant fission product release occurs. In DSER Section 5.4.2.3.2, the staff stated that the staff's evaluation of the use of MAAP4 for the AP1000 PRA evaluation is discussed in Chapter 19 of DSER. In DSER Chapter 19 the staff gave conditions for the use of MAAP4 as described in the above excerpt.

In light of Open Item 19.1.10.1-5 and the concern described in the DSER that MAAP4 does not provide a rigorous solution of reactor system conditions during transients and accidents, the staff requests that Westinghouse confirm the beyond-design-basis MSGTR results of no core uncovery described in response to RAI 440.043 with a methodology reviewed by the staff.

AP 1000

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