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Your ref: Docket No. 52-006
Our ref: DCP_NRC_002698

November 23, 2009

Subject: AP1000 Response to Request for Additional Information (SRP 15)

Westinghouse is submitting a response to the NRC request for additional information (RAI) on SRP Section 15. This RAI response is submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in this response is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

Enclosure 1 provides the response for the following RAI(s):

RAI-SRP15.0-SRSB-06 R1
RAI-SRP15.0-SRSB-07

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

Robert Sisk, Manager
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/Enclosure

1. Response to Request for Additional Information on SRP Section 15

D063
NRO

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ENCLOSURE 1

Response to Request for Additional Information on SRP Section 15

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP15.0-SRSB-06
Revision: 1

Question: (Revision 0)

In the Westinghouse AP1000 – DCD Revision 17 Changes matrix, Westinghouse indicates many changes in the AP1000 DCD Revision 17 are enhancements or clarifications that have needed to change from earlier revisions of the DCD, and these changes were made based on engineering technical review of basis for current wording in the DCD. The following is a summary of changes.

Confirm that each of the following DCD Revision 17 changes to DCD Section 15, Revision 17, is merely for enhancement or clarification of the DCD documentation, is consistent with the assumptions credited in the existing Chapter 15 safety analyses, and does not represent new assumptions or results.

(1) Table 15.0-4a:

a. Change of the High-2 steam generator limiting setpoint from 100% to 95% of narrow range level span

b. Addition of an entry for the core makeup tank (CMT) actuation on pressurizer low-2 water level with a time delay of 2.0 seconds

(2) Table 15.0-6:

a. Addition of the main steam isolation valves, startup feedwater isolation, and accumulators credited for the analyses of the inadvertent opening of a steam generator safety valve and steam system pipe failure events, respectively,

b. Addition of the steam generator safety valves for the analysis of the inadvertent operation of CMT during power operation

c. Addition of the low steamline pressure ESF actuation functions for the analysis of the chemical and volume control system malfunction that increases reactor coolant inventory

d. Addition of the low pressurizer level ESF actuation function for the analysis of the steam generator tube rupture

(3) Table 15.0-7:

a. Revision of the single failure assumed for large-break LOCA from None to one CMT valve fails to open

(4) Table 15.0-8:

a. Addition of an entry to specify the nonsafety-related sample line isolation valves is credited for the failure of small lines carrying primary coolant outside containment

b. Revision of the footnote pertaining to the main steam isolation valve (MSIV) backup valves from the "moisture separator reheat steam supply control valve" to the "moisture separator reheater 2nd stage steam isolation valves"

(5) DCD Section 15.2.3.2.2:

a. Change of the statement pertaining to the turbine trip analysis results from the "minimum reactivity, without pressurizer spray, without offsite power" case to the "minimum reactivity, with pressurizer spray, without offsite power" case to be the most limiting case with respect to DNB margin of the loss of steam load case

b. Addition of the statements that the with and without offsite power cases have different assumptions regarding initial pressure, and that the initial pressure assumptions were based upon sensitivities that were run

(6) DCD Section 15.2.6.2.1:

a. Deletion of the statement that "conservative PRHR heat exchanger heat transfer coefficients (low) associated with the low flow rate caused by the reactor coolant pump trip are assumed."

(7) DCD Section 15.2.8.1:

a. Addition of high-3 pressurizer level as a reactor trip actuation function

Additional Question: (Revision 1)

In response to RAI-SRSB-06 regarding the change in Table 15.0-7 of the single failure assumption for the large-break LOCA analysis from "None" to "One CMT valve fails to open," Westinghouse states that this revision occurred in the update to the ASTRUM methodology report APP-GW-GLE-026, Revision 0. However, in the response to RAI 440.097 (Response Revision 1), dated March 17, 2003, Westinghouse stated that the single failure assumed in the AP1000 large break LOCA ECCS analysis presented in Chapter 15 of the DCD is the failure of a CMT delivery line isolation valve.

Please clarify whether the single failure of "one CMT valve fails to open" or "None" was assumed in the DCD Revision 15, large break LOCA analysis.

Westinghouse Response: (Revision 0)

The individual items above were each investigated to determine that the changes to DCD Section 15 were done for clarification of the DCD documentation, are consistent with the assumptions credited in the existing Chapter 15 safety analyses, and do not represent new assumptions or results. It is concluded that these items do not represent new assumptions or results and are consistent with the analysis results provided in Chapter 15 of the DCD. These clarifications were identified in the course of a detailed review during the Westinghouse DCD Revision 17 review process. Each item is discussed below.

(1) Table 15.0-4a

a. The change of the High-2 steam generator limiting setpoint from 100% to 95% of narrow range level span is consistent with the steam generator tube rupture analysis (SGTR) provided in section 15.6.3 of the DCD. Other events used 100% of the narrow range level span but the limiting setpoint is provided in the SGTR analysis.

b. The addition of the core makeup tank (CMT) actuation on pressurizer Low-2 water level with a time delay of 2.0 seconds is also consistent with SGTR analysis presented in Section 15.6.3 of the DCD, which credits this signal.

(2) Table 15.0-6

a. The addition of the main steam isolation valves, startup feedwater isolation valves, and accumulators credited for the analyses of the inadvertent opening of a steam generator safety valve and steam system pipe failure events are consistent with the analyses and description presented in Section 15.1.5 of the DCD.

b. The addition of the steam generator safety valves for the inadvertent operation of the CMT analysis is consistent with the event provided in Section 15.5 of the DCD.

c. The addition of the low steamline pressure ESF actuation functions for the CVS malfunction accident is consistent with the current analysis provided in DCD section 15.5.

d. The addition of the low pressurizer level ESF actuation function is consistent with the SGTR event presented in Section 15.6.3 of the DCD.

(3) Table 15.0-7

a. The revision of the single failure assumed from the large-break LOCA (from "None" to "one" CMT valves fails to open) occurred in the update to the ASTRUM methodology report, APP-GW-GLE-026, Revision 0, "Application of ASTRUM Methodology for Best-Estimate Large-Break Loss-of-Coolant Accident Analysis for AP1000."

(4) Table 15.0-8

a. The addition of an entry to specify the nonsafety-related sample line isolation valves is consistent with the analysis presented in Section 15.6.2 of the DCD for the small line break outside containment.

b. The revision to the footnote pertaining to the main steam isolation valve (MSIV) backup valves from the "moisture separator reheat steam supply control valve" to the "moisture separator reheater 2nd stage steam isolation valves" was done as part of a design change. For the Chapter 15 analysis this design change did not increase the valve closure time for the steamline isolation and reduced the unisolatable steam line volume slightly. The volume reduction would be a slight benefit to the analysis but the results would remain the same and the analysis in Section 15.1.5 of the DCD has not changed.

(5) DCD Section 15.2.3.2.2

a. In the statement of the turbine trip analysis results, with respect to the DNB margin of the loss of steam load case, designating "minimum reactivity, with pressurizer spray, without offsite power" rather than "minimum reactivity, without pressurizer spray, without offsite power" to be the most limiting case was a correction. The prior wording in the DCD was in error. The revised wording is now correct and consistent with the analysis.

b. The statements that the "with offsite power" and "without offsite power" cases have different assumptions about initial pressure, and that those assumptions were based on sensitivity cases that were run, were added to be consistent with the current analysis as it is documented in DCD Section 15.2.3.

(6) DCD Section 15.2.6.2.1

a. The deletion of the statement that "conservative PRHR heat exchanger heat transfer coefficients (low) associated with the low flow rate caused by the reactor coolant pump trip are assumed" is consistent with the "loss of AC power" analysis provided in Section 15.2.6 of the DCD.

(7) DCD Section 15.2.8.1

a. The addition of the High-3 pressurizer level as a reactor trip actuation function makes this statement consistent with page 15.2-19 on the PMS signals.

Westinghouse Additional Response: (Revision 1)

The response to RAI 440.097 incorrectly stated that a single failure was assumed in the AP1000 large break LOCA analysis presented in the DCD Revision 15. Inspection of the documentation associated with the AP1000 DCD Revision 15 large break LOCA analysis shows that no single failure of a CMT discharge valve to open was assumed.

In the AP1000 DCD Revision 17 large break LOCA analysis with the ASTRUM methodology the single failure of one CMT discharge valve to open was assumed.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP15.0-SRSB-07
Revision: 0

Question:

In DCD Rev. 15, Subsection 15.0.3.3, it was stated that "the axial power shape used in the DNB calculation is the 1.55 chopped cosine, as discussed in subsection 4.4, for transients analyzed at full power ...." Subsection 4.4.4.3.2 states that the reference axial shape used in establishing core DNB limits is a chopped cosine with a peak-to-average value of 1.61. In DCD Revision 17, subsection 15.0.3.3 is revised by deleting the "1.55" axial power shape peak value, and therefore eliminate the discrepancy with the 1.61 value discussed in subsection 4.4.4.3.2.

Please confirm that the existing DCD Chapter 15 safety analyses of all DNB transients were performed with the axial peaking factor of 1.61. If the existing analyses were performed with the axial peaking factor of 1.55, provide justification on the validity of these safety analyses.

Westinghouse Response:

The existing DCD Chapter 15 safety analyses of all DNB transients were performed with the chopped cosine shape having an axial peaking factor of 1.61 or a more limiting axial shape. In accordance with existing methodology, accident specific power distributions and radial peaking factors were used for hot zero power events (streamline break and rod withdrawal from sub- critical).

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None