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Your ref: Docket No. 52-006
Our ref: DCP/NRC2497

May 26, 2009

Subject: AP1000 Response to Request for Additional Information (SRP 12)

Westinghouse is submitting a response to the NRC request for additional information (RAI) on SRP Section 12. 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-SRP12.3-CHPB-01

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 12

cc: D. Jaffe - U.S. NRC 1E
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ENCLOSURE 1

Response to Request for Additional Information on SRP Section 12

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP12.3-CHPB-01

Revision: 0

Question:

In its review of DCD Section 12.3, the staff identified areas in which additional information was necessary to complete its evaluation of the applicant's change. In Tier 2 DCD Subsection 12.3.1.1.1, the staff noted that the applicants' description now includes an integrated head package which combines the head lifting rig, control and gray rod drive mechanisms, lift columns, control rod drive mechanism cooling system and power and instrumentation cabling. Also the conventional top mounted instrumentation ports/conoseal thermocouple arrangement has been replaced with a combination thermocouple /incore detector system. The description of the change to include the integrated head package does not provide sufficient information to determine if the Containment area radiation zones are affected or the implementation results in an increase or decrease in the refueling dose estimates.

In Revision 17, Tier 2, Figure 12.3-1 (Sheet 8 of 16), Radiation Zones, Normal Operation / Shutdown Nuclear Island, EL 135'-3" indicates that the RV Head stand area may be a Plant Radiation Zone V (less than or equal to 1 Rem/hr) when the RV head is in the stand, which is defined by Figure 12.3-1 (Sheet 1 of 16). In Revision 16, the same drawing indicated that the area for the RV stand would be a Plant Radiation Zone II, (less than or equal to 2.5 mrem/hr) There are no supporting calculations to show that the Integrated Head Package will result in a dose rate of less than or equal to the original RV head configuration, or how this change is ALARA.

Table 12.4-12, Dose Estimate for Refueling Activities, has not changed as a result of the addition of the design change implementing the integrated head package.

AP1000 DCA, Revision 17, incorporated the Westinghouse Topical Report APP-GW-GLE-016, Revision 0, "Impact of In-core Instrumentation Grid, Quicklocs and Changes to Integrated Head Package" This report did not describe any changes to Section 12.4 and the dose assessment.

- a) Provide a complete description of the how the placement of integrated head package and the revised and associated equipment in the Containment building meets the acceptance criteria of SRP 12.3-4.
- b) Describe the effect on occupational exposures in and adjacent to the Containment building. Include this information in the DCD and provide a markup of the text and appropriate revised radiation zone maps and dose estimate tables in your response.

Westinghouse Response:

This response is based upon portions of the AP1000 still undergoing design finalization. DCD markups in response to b) above will be provided in December 2009.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

The previous AP1000 integrated head package (IHP) design, described in DCD Revision 16, included in-core instrument thimbles as part of the IHP. During normal operations, these thimbles became activated, and were then withdrawn into the IHP during refueling. The activated in-core instrument thimbles were the dominant gamma radiation source for the IHP, and had a significant impact on dose rates and personnel doses.

The current IHP design, reflected in Revision 17 of the DCD, is based upon technology in existing Combustion Engineering plants. This design does not allow in-core instrument thimbles to remain with the IHP during removal, eliminating the dominant gamma source from the IHP during refueling.

This IHP design allows the in-core instrument thimbles to stay with the reactor internals. During refueling, these components will remain underwater in the refueling cavity at all times. The water in the refueling cavity serves as a significant shield, reducing dose rates from activated in-core instrument thimbles.

As part of refueling operations, the IHP itself (without the in-core instrument thimbles) will be placed on a conventional stand inside of the containment vessel. The design of the stand includes shielding intended to minimize area radiation fields.

Responding to the NRC's questions:

- a) The changes to the IHP design can be shown to meet the SRP in three specific ways. The ability of the AP 1000 design to satisfy the SRP has not been otherwise affected by this change in the IHP design.

As stated in APP-GW-GLE-016, Revision 0, "the goal of this change is to enhance safety, facilitate reactor vessel head inspection and reduce ORE [occupational radiation exposure] during refueling outages." Thus, a primary concern addressed in the IHP design change was personnel dose during refueling. Specifically, the IHP design change to separate the in-core instrument thimbles from the IHP assembly during removal eliminates a major exposure source term on the operating floor during refueling operations. This design change meets SRP 12.3-4, Acceptance Criteria, Section 1. Facility Design Features, paragraph one by considering major exposure accumulating functions and incorporating radiation protection into the design to help maintain ORE ALARA.

Secondly, by separating the in-core instrument thimbles from the IHP, and allowing these components to be kept underwater during refueling, additional shielding of a source term is provided. This also meets SRP 12.3-4, Acceptance Criteria, Section 1. Facility Design Features, paragraph one, item (2) by providing the ability to shield the intensity of a source term.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Thirdly, as stated in APP-GW-GLE-016, Revision 0, the current IHP design "reduces both the radiation dose and number of personnel needed to service the IHP." By reducing the number of personnel servicing the IHP, SRP 12.3-4, Acceptance Criteria, Section 1. Facility Design Features, paragraph one, item (4) is satisfied.

The ability of other equipment associated with the IHP not mentioned above to meet the SRP has not been impacted by the change in the IHP design. For example, although specifics of the IHP stand may be altered to accommodate the current IHP, the stand design will continue to include shielding to reduce exposure rates on the operating floor during refueling.

- b) The changes to the IHP design are significant with respect to occupational exposures within the shield building, and result in an overall decrease in exposure. With this decrease, the exposure values shown in the current DCD are conservative. The majority of exposures affected by the IHP design change relate to refueling operations. As described above, with the dominant gamma source term placed underwater and ALARA considerations included in the design of the IHP, refueling exposures will decrease.

Exposures outside of the shield building are not significantly affected by the IHP design, due to the thickness of the shield building walls, the location of the reactor vessel, and the shielding on the IHP stand.

Details of the refueling exposure decrease and specific zone map changes are being finalized, and will be provided to AP1000 Combined License Applicants. The finalized DCD markups will be provided in December 2009. In addition, based on the April 7 phone call between Westinghouse and the NRC, a revised version of DCD Chapter 12, Figure 12.3-3 (Sheet 8 of 16) excluding the note will be provided.

Reference(s):

- 1) APP-GW-GLE-016, Revision 0
- 2) NUREG-800, Revision 3, March 2007

Design Control Document (DCD) Revision:

Forthcoming.

PRA Revision:

None.

Technical Report (TR) Revision:

None.