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Your ref: Docket No. 52-006
Our ref: DCP/NRC2362

January 28, 2009

Subject: AP1000 Responses to Requests for Additional Information (SRP 9)

Westinghouse is submitting a response to the NRC request for additional information (RAI) on SRP Section 9. 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:

RAI-SRP9.1.5-SBPB-10 R1

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,

D. A. Lindgren /FOR

Robert Sisk, Manager
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/Enclosure

1. Response to Request for Additional Information on SRP Section 9

D063
NRO

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ENCLOSURE 1

Response to Request for Additional Information on SRP Section 9

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP9.1.5-SBPB-10
Revision: 1

Question:

Section 9.1.5.1.2 "Codes and Standards" of the AP1000 DCD Revision 16 states that, "the polar crane and the cask handling crane are designed according to NUREG-0554 supplemented by ASME NOG-1 for a Type 1 single failure proof crane." Section 9.1.5.2 "System Description," of the AP1000 DCD Revision 16 states that, "the containment equipment hatch hoist and the containment maintenance hatch hoist incorporate single failure proof features based on NUREG-0612 guidelines." The AP1000 DCD/ Tier 1 Section 2.3.5 does not list "single failure proof" as certified design information with ITAAC for either the polar crane, the cask handling crane, the containment equipment hatch hoist or the containment maintenance hatch hoist. The staff believes that "single failure proof" design criteria for the above listed cranes and hoists should be listed in Tier 1 as described below.

One design criteria, among several design criteria for Tier 1 information, is that it should include features and functions which could have a significant effect on the safety of a nuclear plant or are important in preventing or mitigating severe accidents. A drop of the reactor vessel head or a spent fuel cask could affect plant safety. Therefore, design features that reduce the risk and/or analyses that provide assurance of safety after a dropped load are important to safety. The staff considers "single failure proof" design criteria for the polar crane and the cask handling crane as Tier 1 safety significant design criteria. As a minimum, the following analyses would have to be performed in order to not consider "single failure proof" design criteria as safety significant criteria for the polar crane and the cask handling crane:

- A heavy load analysis proving that a heavy load drop in safety related areas of the plant will not be the cause any of Items I through IV of section 5.1 of NUREG 0612, "Control of Heavy Loads at Nuclear Power Plants." [Section 9.1.5.3 of the AP1000 DCD clearly states that no heavy load analyses were performed for critical loads carried by the containment polar crane, the cask handling crane, the containment equipment hatch hoist and the containment maintenance hatch hoist.]

- SRP 9.1.5, "Overhead Heavy Load Handling Systems," Section III. 4, states that without "single failure proof" design criteria, analyses are required for a dropped load on the reactor vessel, among other analyses. The DCD does not describe results of this analysis.

- Regulatory Guide 1.13, Regulatory Position C.5 states that an alternative to an "single failure proof" crane is that the spent fuel cask loading area be designed to withstand a drop of the heaviest load at the maximum height. Whereas, AP1000 DCD Section 15.7.5 states a Spent Fuel Cask Drop Accident Analysis was not performed.

As a minimum, the following analysis would have to be performed in order to not consider "single failure proof" design criteria as safety significant criteria for the containment equipment hatch hoist and the containment maintenance hatch hoist:

- A heavy load analysis proving that a heavy load drop in safety related areas of the plant will not be the cause any of Items I through IV of section 5.1 of NUREG 0612, "Control of Heavy Loads at Nuclear Power Plants." [Section 9.1.5.3 of the AP1000 DCD clearly states that no heavy load analyses were performed for critical loads carried by the containment polar crane, the cask handling crane, the containment equipment hatch hoist and the containment maintenance hatch hoist.]

Without the analyses and design criteria stated above, the "single failure proof" design feature of the polar crane, cask handling crane, containment maintenance hatch crane and containment equipment hatch crane becomes safety significant design criteria.

The staff notes that the applicant prevents the cask handling crane from moving over the spent fuel pool because the crane rails do not extend over the pool. Mechanical stops prevent the cask handling crane from going beyond the end of the rails. However, Regulatory Guide 1.13, Regulatory Position C.5 specifies that the spent fuel cask loading area be designed to withstand, without significant leakage of the adjacent spent fuel storage, the impact of the heaviest load to be carried by the crane from the maximum height to which it can be lifted or the spent fuel storage facility should have cranes designed to single failure proof criteria. Since the DCD did not declare that the spent fuel cask loading area is designed to withstand the impact of the heaviest load to be carried from the maximum height to which it can be lifted, without significant leakage of the adjacent spent fuel storage, the single failure proof design criteria for the cask handling crane is safety significant design criteria.

RAI SRP 9.1.5-SBPB-10

Section 9.1.5.3, "Safety Evaluation" of the AP1000 DCD in the first bulleted item, states that "Postulated load drops are evaluated in the heavy load analysis." The last sentence of that section states, "The heavy load analysis is to confirm that a postulated load drop analysis does not cause unacceptable damage to reactor fuel elements, or loss of safe shutdown or decay heat removal capability." Please describe what heavy load drop analyses were performed and the results of the analyses.

Westinghouse Response:

The Polar Crane, Cask Handling Crane, Equipment Hatch Hoist, and Maintenance Hatch Hoist are single failure proof which satisfies the requirements for moving heavy loads. No analysis needs to be performed. The Criteria has been added to the ITAAC (See RAI-SRP9.1.5-SBPB-09).

The Main Steam Isolation Valve (MSIV) Monorail Hoists A and B are used to perform maintenance on the MSIV. The hoists will not be used during plant operation. Failure of the hoists will not prevent the plant from shutting down safely because the plant will already be shut down.

References:

1. NUREG-0612 section 5.1.2 (Spent Fuel Area - PWR) and section 5.1.3 (Containment Building - PWR)
2. RAI-SRP9.1.5-SBPB-09

Additional Question:

For the MSIV monorail hoists A and B, please address the effect of a load drop on equipment needed for decay heat removal.

Additional Westinghouse Response:

[From DCD Rev 17, Technical Specification 3.7.1 Basis, APPLICABILITY]

In MODE 1, 2, 3, or 4 (without the normal residual heat removal system in service), six MSSVs per steam generator are required to be OPERABLE. In MODES 4 (with the normal residual heat removal system in service) and 5, there are no credible transients requiring the MSSVs. The steam generators are not normally used for heat removal in MODES 5 and 6, and thus cannot be overpressurized. There is no requirement for the MSSVs to be OPERABLE in these MODES.

[From DCD Rev 17, Technical Specification 3.7.2 Basis, APPLICABILITY]

The MSIVs, turbine stop or associated turbine control valves, turbine bypass valves, and moisture separator reheater 2nd stage steam isolation valves must be OPERABLE in MODE 1 and MODES 2, 3, and 4, except when steam flow is isolated when there is significant mass and energy in the RCS and steam generators. Therefore, these valves must be OPERABLE or closed. When these valves are closed, they are already performing their required function. In MODE 5 or 6, the steam generators do not contain much energy because their temperature is below the boiling point of water; therefore, the MSIVs and alternate downstream valves are not required for isolation of potential high energy secondary system pipe breaks in these MODES.

Response:

In the AP1000, safety related decay heat removal is accomplished by natural circulation of reactor coolant through the Passive Residual Heat Removal (PRHR) heat exchanger in the containment. Based on the original Westinghouse response, the use of a single-failure proof polar crane results in the exclusion of possible impacts from a load drop on the safety-related decay heat removal equipment. Additionally, since the PRHR heat exchanger is located in containment, there is no impact potential from a failure of the MSIV monorail hoists on the safety-related decay heat removal mode.

Non-safety decay heat removal is accomplished by boiling in the steam generators and steam flow to the condenser or atmospheric steam dumps. Both of these flow paths will require the function of the MSIVs and the MSSVs (Main Steam Safety Valves) in either the OPERABLE or CLOSED position based on the plant operating configuration.

Because the MSIVs and MSSVs have to be OPERABLE or CLOSED during MODES 1, 2, 3, and 4, the MSIV monorail hoists shall not be used to service the MSIVs or MSSVs during MODES 1, 2, 3, or 4.

During MODES 5 and 6 the reactor coolant and the steam generator shells are below the boiling point of water. Therefore, in these operating modes, the steam generators are not utilized for non-safety related decay heat removal. A load drop by the MSIV monorail hoists during MODES 5 or 6 will not affect decay heat removal capability of the AP1000.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None