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Your ref: Docket No. 52-006
Our ref: DCP_NRC_002609

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Subject: AP1000 Response to Request 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(s):

RAI-SRP 9.1.1-SRSB-06
RAI-SRP 9.1.2-SEB1-01 R1
RAI-SRP 9.2.1-SBPA-02 R1
RAI-SRP 9.2.2-SBPA-11 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,

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-SRP9.1.1-SRSB-06
Revision: 0

Question:

The validation of CASMO-4 outlined in Appendix B of APP-GW-GLR-029 Revision 1 covers a wide range of parameters. However, the following two parameters are not included:

1) Tungsten is not included in the list of burnable poisons or control materials.

2) The temperature ranges from 293 K to 1500 K, but the temperature range of interest in this application goes down to 277 K (4° C), presumably for both the fuel and coolant/moderator.

What is the effect of not including these variations in the CASMO-4 validation?

Westinghouse Response:

1) Tungsten was not specifically identified as a material in any of the benchmark experiments used in the validation of CASMO-4. This is not considered a major limitation considering the high level of conservatism incorporated into the selection of the combination of inserts during depletion as discussed in Section 7.2.1. Additionally, if further benchmark experiments could be identified that included Tungsten, they would have a negligible effect on the bias uncertainty of the CASMO-4 validation and an even smaller effect on the results of the criticality calculations, considering that the CASMO-4 bias uncertainty is combined statistically with other uncertainties, which are much larger and dominate the total uncertainty.

2) The extension of the area of applicability for the validation from 293 K (minimum temperature of the benchmark experiments) to 277 K is a very small extrapolation (~1%) compared to the range of temperatures used in the benchmark experiments (i.e., 1500K – 293K = 1207K). This extrapolation has a negligible effect on the bias/bias uncertainty calculated in Appendix B. Additionally, Section 2 in Appendix B provides justification for the validation approach used in the analysis.

Based on the discussion above, it is therefore concluded that the effect of not including these variations in the CASMO-4 validation is negligible.

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-SRP 9.1.2-SEB1-01
Revision: 1

Question:

Section I, "Introduction," was revised in TR 44 Rev. 1 to add: "Per DCD subsection 3.7.5.2, Combined License applicants will prepare site-specific procedures for activities following an earthquake. These procedures will be used to accurately determine both the response spectrum and cumulative absolute velocity of the recorded earthquake ground motion from the seismic instrumentation system. An activity will be to address measurement of the post-seismic event gaps between the new fuel rack and walls of the new fuel storage pit and to take appropriate corrective actions."

The staff notes that DCD Subsection 3.7.5.2 does not discuss the need for Combined License applicants to prepare site-specific procedures for checking the gaps between the new fuel rack and walls of the new fuel storage pit following an earthquake, and requests Westinghouse to explain how this requirement is conveyed to the Combined License applicants. Identify the COL Action Item, ITAAC, or other interface requirement that addresses this.

Westinghouse Response: (Revision 0)

Westinghouse agrees that the requirement for Combined License applicants to address post-seismic gaps for the new fuel rack is not currently included in the DCD. Westinghouse will add the following words to DCD Section 3.7.5.2 (which is a Combined License Information section):

"An activity of the procedures will be to address measurement of the post-seismic event gaps between the new fuel rack and walls of the new fuel storage pit and between the individual spent fuel racks and from the spent fuel racks to the spent fuel pool walls and to take appropriate corrective action if needed (such as repositioning the racks or analysis of the as-found condition)."

Westinghouse Response: (Revision 1)

Note: This RAI response also covers RAI-SRP9.1.2-SEB1-04, which applies to the spent fuel racks. The only change from Revision 0 to Revision 1 in this RAI response is the addition of the words ***"if needed (such as repositioning the racks or analysis of the as-found condition)."*** *to the markup of DCD Section 3.7.5.2 for clarification.*

Design Control Document (DCD) Revision:
See the following page.

Markup of DCD Rev. 17 Section 3.7.5.2: (Revision 0 and 1)

3.7.5.2 Post-Earthquake Procedures

Combined License applicants referencing the AP1000 certified design will prepare site-specific procedures for activities following an earthquake. These procedures will be used to accurately determine both the response spectrum and the cumulative absolute velocity of the recorded earthquake ground motion from the seismic instrumentation system. The procedures and the data from the seismic instrumentation system will provide sufficient information to guide the operator on a timely basis to determine if the level of earthquake ground motion requiring shutdown has been exceeded. An activity of the procedures will be to address measurement of the post-seismic event gaps between the new fuel rack and walls of the new fuel storage pit and between the individual spent fuel racks and from the spent fuel racks to the spent fuel pool walls and to take appropriate corrective action if needed (such as repositioning the racks or analysis of the as-found condition). The procedures will follow the guidance of EPRI Reports NP-5930 (Reference 1), TR-100082 (Reference 17), and NP-6695 (Reference 18), as modified by the NRC staff (Reference 32).

PRA Revision:
None.

Technical Report (TR) Revision:
None.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP9.2.1-SBPA-02
Revision: 1

Question:

SWS pump capacity is being increased in order to provide sufficient flow for shutdown cooling when the heat load is the highest without exceeding the temperature limit for the cooling tower fill material. However, this design capability will not ensure that plant operators will adhere to this temperature limit or other design limitations that exist.

Identify and describe in the DCD those SWS design limitations that are important for assuring the long-term availability and reliability of the SWS. Explain how the adequacy of design is verified relative to the limitations that apply and whether the provisions specified by ITAAC Table 2.3.8-2 should be modified. Explain how adherence to these limitations is assured by COL applicants and whether additional provisions should be included in IPSAC 2.4.

Westinghouse Response:

The simple design of the SWS, which cools only the operating CCS heat exchangers, and the use of peak heat load conditions to define system design parameters such as pump flow rate and cooling tower heat duty, make it unlikely that operators will be able to adjust system operation in a manner that challenges the system's design limitations.

For example, the CCS heat exchangers are designed to withstand flow rates of up to 150% of the design SWS and CCS side flows. Flow rates of this magnitude cannot be achieved in the system with the design pump head and flow values. The system piping is designed and the pump design parameters selected to prevent runout of an operating SWS pump in any operating mode.

The SWS pumps, system piping, and cooling tower have all been sized to support operation with the peak cooldown heat load, which is substantially higher than the heat load anticipated during any other operating mode. Appropriate alarms and indications for key system parameters such as flow rate, pressure, fluid temperature, and basin level are provided to alert the operators to the potential for approaching a design or operating limit. The normal temperature limits imposed for avoidance of degradation in fill performance range between 120°F and 130°F (dependent upon fill type used). High temperature resistant fill can operate reliably with warm water return temperatures of up to 140°F. The limiting values of SWS warm water temperature for the AP1000 SWS approach the normal fill temperature limits only during high heat load operation of the SWS during plant cooldown. The duration of these peak temperatures is expected to be short and the tower fill material can be designed to accommodate intermittent, short-duration operation at these higher temperatures with an acceptable margin.

The SWS is not a safety system and is in continuous operation following initial plant startup. Operators monitor the performance of the system continually to detect any challenges to system design limits.

Additional Westinghouse Response based on NRC comments at 6/25/09 meeting:

RAI response and discussions have adequately addressed this question.

However, discussions have identified the need for SWS Cooling Tower Basin water level instrumentation to be included in ITAAC, since this parameter is needed to verify that SWS pumps will be supplied with adequate Net Positive Suction Head (NPSH). Testing to verify adequate NPSH is also discussed in Tier 2 Section 14.2.9.2.6, in the item (d) of the 'General Test Acceptance Criteria and Methods.'

See DCD Revision in Attachment A.

Design Control Document (DCD) Revision:
~~None~~ See Attachment A

PRA Revision:
None

Technical Report (TR) Revision:
None

Attachment A: DCD Markup Tier 1 Table 2.3.8-2 (Page 2.3.8-2)

Table 2.3.8-1			
Equipment Name	**Tag No.**	**Display**	**Control Function**
Service Water Pump A (Motor)	SWS-MP-01A	Yes (Run Status)	Start
Service Water Pump B (Motor)	SWS-MP-01B	Yes (Run Status)	Start
Service Water Cooling Tower Fan A (Motor)	SWS-MA-01A	Yes (Run Status)	Start
Service Water Cooling Tower Fan B (Motor)	SWS-MA-01A	Yes (Run Status)	Start
Service Water Pump 1A Flow Sensor	SWS-004A	Yes	-
Service Water Pump 1B Flow Sensor	SWS-004B	Yes	-
Service Water Pump A Discharge Valve	SWS-PL-V002A	Yes (Valve Position)	Open
Service Water Pump B Discharge Valve	SWS-PL-V002B	Yes (Valve Position)	Open
Service Water Pump A Discharge Temperature Sensor	SWS-005A	Yes	-
Service Water Pump B Discharge Temperature Sensor	SWS-005B	Yes	-
Service Water Cooling Tower Basin Level	SWS-009	Yes	-

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP9.2.2-SBPA-11
Revision: 1

Question:

Tier 2 of the DCD, Section 9.2.2.3.5, "Piping Requirements," proposes to allow COL applicants the option of using black polyethylene piping (High Density Polyethylene or HDPE) for SWS applications in accordance with the ASME B31.1 Power Piping Code and as deemed appropriate by evaluation. Since the SWS function is considered to be risk important during shutdown conditions when the reactor is open, the impact of using HDPE on SWS reliability and availability assumptions must be considered and addressed, especially during seismic events. Also, the review criteria specified by SRP Section 3.6.1 relative to pipe failure evaluations is based on the use of metal pipe. Unless otherwise justified, the potential consequences of pipe failure (including flooding) should be evaluated assuming the complete failure of all HDPE piping during seismic events coincident with metallic pipe failures that are postulated and other considerations that are specified by the SRP. Finally, the specific criteria for allowing the use of HDPE should be reflected in the DCD to ensure clarity of the plant design basis. Additional information is needed to address these considerations, including the incorporation of design requirements in ITAAC Table 2.3.1-2 as appropriate.

Westinghouse Response: (Revision 0)

The basis for the use of HDPE piping in the AP1000 design is described in detail in Westinghouse's response to RAI-TR103-EMB2-02. This RAI response was submitted to USNRC on February 22, 2008 under letter DCP/NRC2008.

HDPE is not used in the AP1000 CCS design nor does Westinghouse have current plans to use HDPE in this system. If HDPE were to be used for some portions of CCS piping, its use would necessarily be required to adhere to the limitations described in the Westinghouse response cited above.

Reference:

1. Response to RAI-TR103-EMB-02, letter DCP/NRC2088, February 22, 2008

Additional Westinghouse Response based on NRC comments at 6/25/09 meeting: (Revision 1)

Discussions have identified the need to remove the provision for the use of nonmetallic piping from DCD Tier 2 Section 9.2.2. The operating pressure and temperature exceeds the limits for HDPE piping imposed by ANSI/ASME B31.1 and applicable code cases, prohibiting its use in

this application. Additionally, the response to RAI-TR103-EMB2-02 only permits the use of HDPE piping in buried, underground applications; the CCS has no underground piping sections.

Design Control Document (DCD) Revision:
~~None~~ Tier 2 Section 9.2.2.3.5 (Page 9.2-12)

9.2.2.3.5 Piping Requirements

Component cooling water system piping is made of carbon steel. Piping joints and connections are welded, except where flanged connections are required as indicated on the component cooling water system piping and instrumentation diagram (Figure 9.2.2-2). ~~Nonmetallic piping constructed to the requirements of ANSI B31.1, Appendix III also may be used outside containment.~~

PRA Revision:
None

Technical Report (TR) Revision:
None