AP1000DCDFileNPEm Resource

From: Loza, Paul G. [lozapg@westinghouse.com]
Sent: Thursday, July 09, 2009 12:18 PM
To: Buckberg, Perry
Cc: Butler, Rhonda
Subject: Acknowledgement of RAI-SRP 9.1.3-SBPA-06 through -15
Attachments: AP1000 DCD Rev17 RAIs SRP 9.1.3.doc

Perry,

I acknowledge receipt for Westinghouse of RAI-SRP9.1.3-SBPA-06 through -15. I will advise you if a phone discussion is required.

Thanks,

Paul

From: Buckberg, Perry [mailto:Perry.Buckberg@nrc.gov]
Sent: Thursday, July 09, 2009 11:30 AM
To: Loza, Paul G.
Cc: Altmayer, Scott A; Sisk, Robert B.; McKenna, Eileen; Jaffe, David
Subject: AP1000 DCD RAIs SRP 9.1.3

Paul,

The attached document includes RAI-SRP 9.1.3-SBPA-06 to 15 (continuing from RAI-SRP 9.1.3-SBPA-05 that was issued and responded to in 2008). Please let me know if a conference call will be needed.

This RAI attachment replaces the one I sent you at 1:15 yesterday (7/8/09) - the RAI numbering has changed.

Thanks,

Perry Buckberg
Senior Project Manager
Nuclear Regulatory Commission
Office of New Reactors
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perry.buckberg@nrc.gov

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Subject: Acknowledgement of RAI-SRP 9.1.3-SBPA-06 through -15
Sent Date: 7/9/2009 12:18:02 PM
Received Date: 7/9/2009 12:18:05 PM
From: Loza, Paul G.

Created By: lozapg@westinghouse.com

Recipients:
"Butler, Rhonda" <Rhonda.Butler@nrc.gov>
Tracking Status: None
"Buckberg, Perry" <Perry.Buckberg@nrc.gov>
Tracking Status: None

Post Office: SWEC9924.w-intra.net

Files	**Size**	**Date & Time**
MESSAGE	934	7/9/2009 12:18:05 PM
AP1000 DCD Rev17 RAIs SRP 9.1.3.doc	63040	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

RAI-SRP 9.1.~~32~~-SBPA-0~~61~~

In a Westinghouse letter dated May 28, 2008, the response to RAI-SRP9.1.3-SBPA-03 states that the spent fuel pool (SFP) water level is 12 inches below the operating deck and that this corresponds to a SFP water level of 134.25 feet. The response also states that "all effected analysis was included in TR121, and the analysis was performed assuming a SFP water level of 134.25 feet."

In AP1000 DCD, Revision17, the normal SFP water level was changed to 15 inches below the operating deck.

The decrease in normal pool water level corresponds to a SFP normal water volume decrease of approximately 1000 gallons.

The staff requests that the applicant: confirm that the analysis has been re-performed or validated using the revised SFP water inventory reported in Rev. 17 of the AP1000 DCD, , justify in the DCD that the proposed change in normal water level has not impacted the safety conclusion, discuss in the DCD all the assumptions that have changed in the design basis decay heat calculations.

RAI-SRP 9.1.~~32~~-SBPA-0~~27~~

AP1000 DCD, Revision 17, Table 9.1-2 includes changes in spent fuel pool (SFP) level and volume that have not been properly described and justified in the application. In AP1000 DCD, Revision 15 and 16, the minimum combined water volume of the SFP and fuel transfer canal above the top of active fuel to an elevation of 6 feet below the operating deck is stated as 46,700 gallons. In AP1000 DCD, Revision 17, the same water volume is stated as 129,500 gallons. Provide justification in the DCD for the increase in minimum combined water volume. State in the DCD whether the change is due to a change in actual pool geometry or is a correction of a previous documentation error. Clarify in the DCD whether this change in water volume, as stated in Table 9.1-2, has any effect on design basis decay heat calculations.

RAI-SRP 9.1.3-SBPA-8

AP1000 DCD, Revision 17, makes a change to the description of the location of the connection point between the SFP and the main suction line for the spent fuel pool (SFP) cooling system.. Where previously the description read, "main suction line connects to the SFP at an elevation 2 feet below the normal water level in the pool," the description was changed to read, "main suction line connects to the SFP at an elevation 6 feet below the operating deck."

The staff requests that the applicant:

a) Clarify in the DCD whether there has been a change in the elevation of the main suction line relative to the elevation of the operating deck. State in the DCD the elevation of both the operating deck and the elevation of the main suction line.

b) During the audit performed on June 25, 2009, Westinghouse clarified to the staff that the specified elevation of the main suction line described in the AP1000 DCD is the centerline elevation of the pipe. This elevation is used as initial water level in Revision 1

of APP-SFS-M3C-012, September 2007 "AP1000 Spent Fuel Pool Heatup, Boil off, and Emergency Makeup on Loss of Cooling." After a postulated seismic event, this section of piping is assumed to fail and drain the SFP. The staff considers it conservative to assume that the SFP will drain down to the bottom of the (10" diameter) main suction line for the SFP cooling system and not merely to the center line elevation of the pipe.

The staff requests that the applicant either re-evaluate the SFP thermal analysis (APP-SFS-M3C-012) assuming the SFP initial water level following a seismic event is the bottom of the main suction line for the SFP cooling system instead of the center line elevation of the pipe and update the DCD to reflect the results of the new evaluation or justify the use of this less conservative assumption.

RAI-SRP 9.1.2-SBPA-09

In describing spent fuel transfer operation, AP1000 DCD, Revision 16, states that waterways are of sufficient depth to maintain "a minimum of 9.5 feet of shielding above the active fuel height." AP1000 DCD, Revision 17, is changed to state that waterways are of sufficient depth to maintain "a minimum of 8.75 feet of shielding above the active fuel height." This corresponds to a decrease in minimum shielding of 9 inches.

AP1000 DCD, Revision 17, Tier 1 Table 2.1.1-1, line 5, indicates that the maximum elevation to which the bottom of a fuel bundle can be lifted has changed from 25 feet 3 inches below the operating deck to 24 feet 6 inches below the operating deck. This corresponds to an additional lift of 9 inches.

AP1000 DCD, Revision 17, Table 9.1-2, has changed the SFP normal water level from 12 inches below the operating deck to 15 inches below the operating deck. This corresponds to a decrease in normal water level of 3 inches.

Based on an increased fuel bundle lift of 9 inches and a decreased normal water level of 3 inches, the staff believes that the change in minimum shielding should be a decrease of 12 inches, not a decrease of 9 inches.

The staff requests that the applicant clarify in the DCD the proposed changes described above so that the decrease in minimum shielding can be accurately determined.

RAI-SRP 9.1.3-SBPA-10

In the AP1000 DCD, Revision 17, Figure 9.1-5, "Piping Diagram for Spent Fuel Pool Cooling (Normal Operation)," was changed. Changes include the following details:

a) There are no longer branch lines shown to and from the cask pit.
b) Connection to chemical and volume control system was changed from a separate penetration to the SFP to a connection shared with the SFPC pump suction.
c) The return line from SFPC discharge going to the in-containment refueling water storage tank has been deleted.
d) Some valve types have changed.

e) The chemical and volume control system is refered to as CVCS, but in Table 1.1-1 "AP1000 DCD Acronyms" (Sheet 1 of 4), this system is refer to as CVS.

During the audit performed on June 25, 2009, Westinghouse clarified to the staff that some of these changes were proposed in order to correct editorial errors in DCD Rev.16 of the DCD and others are editorial errors in Rev 17 that need to be corrected.
The staff requests that the applicant: provide the justification in the DCD for the changes listed above, discuss whether any of these changes impact the safety conclusions, update Figure 9.1-5 to represent the layout of the spent fuel pool cooling system.

RAI-SRP 9.1.3-SBPA-11

In the AP1000 DCD, Revision 17, Section 9.1.3.7.D, the description of main control room alarms was changed. In DCD Revision 15 and 16, the description says that safety-related instrumentation is provided to give an alarm in the main control room when the water level in the spent fuel pool (SFP) reaches either the high level or low level setpoint. In DCD Revision 17, the description says that safety-related instrumentation is provided to give an alarm in the main control room when the water level in the spent fuel pool reaches the low-low-level setpoint.

The staff requests that the applicant:

a) Provide the basis in the DCD for the safety-related level instrumentation change.
b) Clarify in the DCD whether any main control room or local alarms are available to give an alarm on high level or on low level setpoints in the SFP, as previously described in AP1000 DCD, Revision 15.
c) Justify in the DCD how the change in SFP level alarms impacts any previously performed safety evaluations or operator response evaluations.

RAI-SRP 9.1.3-SBPA-12

Section 6.2.3.1.3. "Additional Requirements" of the "Containment Isolation System," states that:

> **[Requirement M]** *"Containment penetrations with leaktight barriers, both inboard and outboard, are designed to limit pressure excursion between the barriers due to heatup of fluid between the barriers. The penetration will either be fitted with relief or check valves to relieve internal pressure or one of the valves has been designed or oriented to limit pressures to an acceptable value".*

Table 6.2.3-1 "Containment Mechanical Penetrations and Isolation Valves" lists each containment penetration and provides a summary of the containment isolation characteristics. Table 6.2.3-1 Sheet 2 of 4 identifies the containment isolation valves related to the spent fuel pool. Valve SFS-PL-V067 is a pressure release valve located between SFS-PL-V034 and SFS-PL-V035. Tier 1 Table 2.2.1-1 also identifies the same pressure release valve. Figure 9.1-6 "Spent Fuel Pool Cooling System Piping and Instrumentation Diagram," Sheet 1 of 2 does not show valve SFS-PL-V067.

The staff requests that the applicant update Figure 9.1-6 Sheet 1 to include valve SFS-PL-V067.

RAI-SRP 9.1.3-SBPA-13

Table 9.1-4 "Station Blackout/Seismic Event Times," provides the times before boiling would occur in the spent fuel pool following station blackout for various scenarios. For the worst case scenario (seismic event occurs after an emergency full core off-load immediately following refueling) the spent fuel pool (SFP) will reach saturation state in 1.37 hrs after the start of the event.

The staff requests that the applicant update the DCD in order to address the impact of SFP time to boil on the required operator actions needed to cope with this scenario.

RAI-SRP 9.1.2 SBPA-14

In the AP1000 DCD, Rev. 17 (and 16), the applicant proposes to increase the spent fuel pool (SFP) storage rack density from high density to higher density racks. 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 61, "Fuel Storage and Handling and Radioactivity Control," requires in part that fuel storage systems be designed with a residual heat removal capability having reliability that reflects the importance to safety of decay heat removal. As indicated in NUREG-0800, "Standard Review Plan" Section 9.1.2, III.1, the NRC staff considers the design of high-density fuel storage systems to be acceptable in this regard if (among other things) low-density storage is used, at a minimum, for the most recently discharged fuel to enhance the capability to cool it. The design of the applicant's fuel storage system does not use low-density racks as specified by Standard Review Plan (SRP) Section 9.1.2.III.1, and this difference between the proposed design and the staff's acceptance criteria has not been explained and justified. Therefore, additional information is needed to address this difference and to explain how the proposed fuel storage system design is adequate for satisfying GDC 61 requirements commensurate with the staff's review criteria. Additionally, the AP1000 DCD needs to be revised to include this information.

~~**RAI-SRP 9.1.3-SBPA-06**~~

~~AP1000 DCD, Revision 17, makes a change to the description of the location of the connection point between the SFP and the main suction line for the spent fuel pool (SFP) cooling system.. Where previously the description read, "main suction line connects to the SFP at an elevation 2 feet below the normal water level in the pool," the description was changed to read, "main suction line connects to the SFP at an elevation 6 feet below the operating deck."~~

~~The staff requests that the applicant:~~

~~a) Clarify in the DCD whether there has been a change in the elevation of the main suction line relative to the elevation of the operating deck. State in the DCD the elevation of both the operating deck and the elevation of the main suction line.~~

~~b) During the audit performed on June 25, 2009, Westinghouse clarified to the staff that the specified elevation of the main suction line described in the AP1000 DCD is the centerline elevation of the pipe. This elevation is used as initial water level in Revision 1~~

of APP-SFS-M3C-012, September 2007 "AP1000 Spent Fuel Pool Heatup, Boil off, and Emergency Makeup on Loss of Cooling." After a postulated seismic event, this section of piping is assumed to fail and drain the SFP. The staff considers it conservative to assume that the SFP will drain down to the bottom of the (10" diameter) main suction line for the SFP cooling system and not merely to the center line elevation of the pipe.

The staff requests that the applicant either re-evaluate the SFP thermal analysis (APP-SFS-M3C-012) assuming the SFP initial water level following a seismic event is the bottom of the main suction line for the SFP cooling system instead of the center line elevation of the pipe and update the DCD to reflect the results of the new evaluation or justify the use of this less conservative assumption.

RAI-SRP 9.1.2-SBPA-03

In describing spent fuel transfer operation, AP1000 DCD, Revision 16, states that waterways are of sufficient depth to maintain "a minimum of 9.5 feet of shielding above the active fuel height." AP1000 DCD, Revision 17, is changed to state that waterways are of sufficient depth to maintain "a minimum of 8.75 feet of shielding above the active fuel height." This corresponds to a decrease in minimum shielding of 9 inches.

AP1000 DCD, Revision 17, Table 2.1.1-1, line 5, indicates that the maximum elevation to which the bottom of a fuel bundle can be lifted has changed from 25 feet 3 inches below the operating deck to 24 feet 6 inches below the operating deck. This corresponds to an additional lift of 9 inches.

AP1000 DCD, Revision 17, Table 9.1-2, has changed the SFP normal water level from 12 inches below the operating deck to 15 inches below the operating deck. This corresponds to a decrease in normal water level of 3 inches.

Based on an increased fuel bundle lift of 9 inches and a decreased normal water level of 3 inches, the staff believes that the change in minimum shielding should be a decrease of 12 inches, not a decrease of 9 inches.

The staff requests that the applicant clarify in the DCD the proposed changes described above so that the decrease in minimum shielding can be accurately determined.

RAI-SRP 9.1.3-SBPA-07

In the AP1000 DCD, Revision 17, Figure 9.1-5, "Piping Diagram for Spent Fuel Pool Cooling (Normal Operation)," was changed. Changes include the following details:

a) There are no longer branch lines shown to and from the cask pit.
b) Connection to chemical and volume control system was changed from a separate penetration to the SFP to a connection shared with the SFPC pump suction.
c) The return line from SFPC discharge going to the in-containment refueling water storage tank has been deleted.
d) Some valve types have changed.

e) The chemical and volume control system is refered to as CVCS, but in Table 1.1-1 "AP1000 DCD Acronyms" (Sheet 1 of 4), this system is refer to as CVS.

During the audit performed on June 25, 2009, Westinghouse clarified to the staff that some of these changes were proposed in order to correct editorial errors in DCD Rev.16 of the DCD and others are editorial errors in Rev 17 that need to be corrected.
The staff requests that the applicant: provide the justification in the DCD for the changes listed above, discuss whether any of these changes impact the safety conclusions, update Figure 9.1-5 to represent the layout of the spent fuel pool cooling system.

RAI-SRP 9.1.3-SBPA-08

In the AP1000 DCD, Revision 17, Section 9.1.3.7.D, the description of main control room alarms was changed. In DCD Revision 15 and 16, the description says that safety-related instrumentation is provided to give an alarm in the main control room when the water level in the spent fuel pool (SFP) reaches either the high level or low level setpoint. In DCD Revision 17, the description says that safety-related instrumentation is provided to give an alarm in the main control room when the water level in the spent fuel pool reaches the low-low-level setpoint.

The staff requests that the applicant:

a) Provide the basis in the DCD for the safety-related level instrumentation change.
b) Clarify in the DCD whether any main control room or local alarms are available to give an alarm on high level or on low level setpoints in the SFP, as previously described in AP1000 DCD, Revision 15.
c) Justify in the DCD how the change in SFP level alarms impacts any previously performed safety evaluations or operator response evaluations.

RAI-SRP 9.1.3-SBPA-09

Section 6.2.3.1.3. "Additional Requirements" of the "Containment Isolation System," states that:

> **[Requirement M]** *"Containment penetrations with leaktight barriers, both inboard and outboard, are designed to limit pressure excursion between the barriers due to heatup of fluid between the barriers. The penetration will either be fitted with relief or check valves to relieve internal pressure or one of the valves has been designed or oriented to limit pressures to an acceptable value".*

Table 6.2.3-1 "Containment Mechanical Penetrations and Isolation Valves" lists each containment penetration and provides a summary of the containment isolation characteristics. Table 6.2.3-1 Sheet 2 of 4 identifies the containment isolation valves related to the spent fuel pool. Valve SFS-PL-V067 is a pressure release valve located between SFS-PL-V034 and SFS-PL-V035. Tier 1 Table 2.2.1-1 also identifies the same pressure release valve. Figure 9.1-6 "Spent Fuel Pool Cooling System Piping and Instrumentation Diagram," Sheet 1 of 2 does not show valve SFS-PL-V067.

The staff requests that the applicant update Figure 9.1-6 Sheet 1 to include valve SFS-PL-V067.

~~**RAI-SRP 9.1.2-SBPA-04**~~

~~Table 9.1-4 "Station Blackout/Seismic Event Times," provides the times before boiling would occur in the spent fuel pool following station blackout for various scenarios. For the worst case scenario (seismic event occurs after an emergency full core off-load immediately following refueling) the spent fuel pool (SFP) will reach saturation state in 1.37 hrs after the start of the event.~~

~~The staff requests that the applicant update the DCD in order to address the impact of SFP time to boil on the required operator actions needed to cope with this scenario.~~

~~**RAI-SRP 9.1.2 SBPA-5**~~

~~In the AP1000 DCD, Rev. 17 (and 16), the applicant proposes to increase the spent fuel pool (SFP) storage rack density from high density to higher density racks. 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 61, "Fuel Storage and Handling and Radioactivity Control," requires in part that fuel storage systems be designed with a residual heat removal capability having reliability that reflects the importance to safety of decay heat removal. As indicated in NUREG-0800, "Standard Review Plan" Section 9.1.2, III.1, the NRC staff considers the design of high-density fuel storage systems to be acceptable in this regard if (among other things) low-density storage is used, at a minimum, for the most recently discharged fuel to enhance the capability to cool it. The design of the applicant's fuel storage system does not use low-density racks as specified by Standard Review Plan (SRP) Section 9.1.2.III.1, and this difference between the proposed design and the staff's acceptance criteria has not been explained and justified. Therefore, additional information is needed to address this difference and to explain how the proposed fuel storage system design is adequate for satisfying GDC 61 requirements commensurate with the staff's review criteria. Additionally, the AP1000 DCD needs to be revised to include this information.~~

RAI-SRP 9.1.3-~~5~~-SBPA-~~10~~15

The AP1000 DCD, Revision 17, made a change to Figure 9.1-4, "Spent Fuel Storage Pool Layout (889 Storage Locations)," to indicate that Rack C1 is 12x10 (-2) assemblies; whereas Revision 16 showed this same arrangement of assemblies but the label stated that Rack C1 contains an arrangement of 12x10 (-7) assemblies. Additional information is needed in the DCD to explain this apparent inconsistency.