ArevaEPRDCPEm Resource

From: DUNCAN Leslie E (AREVA NP INC) [Leslie.Duncan@areva.com]
Sent: Thursday, February 04, 2010 4:12 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); KOWALSKI David J (AREVA NP INC); ROMINE Judy (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 298, FSAR Ch. 9, Supplement 1
Attachments: RAI 298 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided a schedule on November 20, 2009 for responding to RAI No. 298. The attached file, "RAI 298 Supplement 1 Response US EPR DC.pdf" provides technically correct and complete responses to 4 of the 7 questions. The schedule for the remaining three questions has been revised.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 298 Questions 09.01.02-30, 09.01.02-31, and 09.01.02-32.

The following table indicates the respective pages in the response document, "RAI 298 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 298 — 09.01.02-29	2	2
RAI 298 — 09.01.02-30	3	3
RAI 298 — 09.01.02-31	4	4
RAI 298 — 09.01.02-32	5	5

The schedule for technically correct and complete responses to the remaining questions has been changed and is provided below:

Question #	Response Date
RAI 298 — 09.01.02-28	March 18, 2010
RAI 298 — 09.03.02-17	March 18, 2010
RAI 298 — 09.05.01-72	March 18, 2010

Sincerely,

Les Duncan
Licensing Engineer
AREVA NP Inc.
An AREVA and Siemens Company
Tel: (434) 832-2849
Leslie.Duncan@areva.com

From: Pederson Ronda M (AREVA NP INC)
Sent: Friday, November 20, 2009 4:55 PM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); KOWALSKI David J (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 298, FSAR Ch. 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 298 Response US EPR DC.pdf" provides a response date for each of the seven questions since technically correct and complete responses cannot be provided at this time.

The following table indicates the respective page in the response document, "RAI 298 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 298 — 09.01.02-28	2	2
RAI 298 — 09.01.02-29	3	3
RAI 298 — 09.01.02-30	4	4
RAI 298 — 09.01.02-31	5	5
RAI 298 — 09.01.02-32	6	6
RAI 298 — 09.03.02-17	7	7
RAI 298 — 09.05.01-72	8	8

The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 298 — 09.01.02-28	February 4, 2010
RAI 298 — 09.01.02-29	February 4, 2010
RAI 298 — 09.01.02-30	February 4, 2010
RAI 298 — 09.01.02-31	February 4, 2010
RAI 298 — 09.01.02-32	February 4, 2010
RAI 298 — 09.03.02-17	February 4, 2010
RAI 298 — 09.05.01-72	February 4, 2010

Sincerely,

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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, October 21, 2009 2:53 PM
To: ZZ-DL-A-USEPR-DL
Cc: Hernandez, Raul; Segala, John; Bernal, Sara; Frye, Timothy; McCann, Edward; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 298(3736,3708,3753), FSAR Ch. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on September 22, 2009, and discussed with your staff on October 8 and 21, 2009. Draft RAI Question 09.01.02-30 was modified as a result of those discussions. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 1132

Mail Envelope Properties (F322AA625A7A7443A9C390B0567503A1018DCD39)

Subject: Response to U.S. EPR Design Certification Application RAI No. 298, FSAR Ch. 9, Supplement 1
Sent Date: 2/4/2010 4:12:18 PM
Received Date: 2/4/2010 4:12:22 PM
From: DUNCAN Leslie E (AREVA NP INC)

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Files	**Size**	**Date & Time**
MESSAGE	4427	2/4/2010 4:12:22 PM
RAI 298 Supplement 1 Response US EPR DC.pdf	126950	

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

Response to

Request for Additional Information No. 298, Supplement 1

10/21/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.01.02 - New and Spent Fuel Storage
SRP Section: 09.03.02 - Process and Post-Accident Sampling Systems
SRP Section: 09.05.01 - Fire Protection Program

Application Section: FSAR Chapter 9

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)
QUESTIONS for Health Physics Branch (CHPB)
QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

Question 09.01.02-29:

Follow-up to RAI Questions 9.1.2-11 and 9.1.2-12

In RAI 9.1.2-11, the staff requested the applicant to include in the FSAR the elevation of the top of the spent fuel storage racks and to confirm that the spent fuel storage rack maximum height limitation is included in COL Information Item 9.1.4.

In response to RAI Question 9.1.2-11, the applicant stated that FSAR Tier 2, Section 9.1.2.2.2 will be revised to delete the normal water volume because it is dependent on the number of fuel assemblies stored in the pool and the volume of the racks. The applicant stated that the critical parameter is the height of water above the top of the stored fuel assemblies. The applicant will revise this value in FSAR Tier 2, Section 9.1.2.2 to reflect a nominal spent fuel pool (SFP) water depth of 45 feet 7 inches and approximately 29 feet of water above the top of the spent fuel assemblies seated in the storage racks. As long as at least 23 feet of water is provided above the top of the stored fuel assemblies, it is unnecessary to add the SFP rack maximum height limitation to the existing COL item.

The staff determined that this response is insufficient. In response to RAI 9.1.2-12, the applicant stated that the bottom of the loading pit gate is approximately 2 feet 6 inches above the top of the spent fuel assemblies in the storage racks. SRP 9.1.2, "New and Spent Fuel Storage," III.H, "Review Procedures" specifies that the bottoms of any gates should be above the top of the fuel assemblies. The staff considers that these two parameters (a minimum of 23 feet of water coverage above the top of the stored fuel assemblies and the top of the fuel assemblies remains below bottom of the loading pit gate) should be included in COL Information Item 9.1.4.

The staff requests the applicant to justify in the FSAR the absence of the need to include the spent fuel storage rack maximum height limitation in COL Information Item 9.1.4.

Response to Question 09.01.02-29:

AREVA Transnuclear Inc. Report TN-Rack.0101, "U.S. EPR New and Spent Fuel Storage Rack Technical Report," and corresponding U.S. EPR FSAR markups were submitted to the NRC Document Control Desk on December 8, 2009 (Letter NRC: 09:117). The U.S. EPR FSAR markups incorporated the AREVA Transnuclear rack design into the U.S. EPR FSAR and deleted COL Information Item 9.1.4 in U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items.

The elevation of the top of the stored fuel assemblies in the spent fuel storage racks is shown in U.S. EPR FSAR Tier 2, Figure 9.1.2-3—Spent Fuel Pool Elevation. U.S. EPR FSAR Tier 2, Section 9.1.2.2.2 states that the "gates and the weir, shown in Figure 3.8-52, are arranged so that the bottoms of the gates are higher than the top of the stored fuel assemblies." U.S. EPR FSAR Tier 2, Section 9.1.2.3 states that a minimum of 23 feet of water is provided above the tops of the stored fuel assemblies in the spent fuel pool. Both parameters requested to be in COL Information Item 9.1.4 have been included in the U.S. EPR FSAR.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 09.01.02-30:

Follow-up to RAI 9.1.2-12

In RAI 9.1.2-12, the staff requested the applicant to specify in the FSAR that the bottoms of the gates are above the top of the fuel assemblies and to include in the ITAAC for the SFSF verification that the elevation of the bottom of the loading pit gate is as shown in FSAR Tier 2, Figure 3.8-52.

The applicant responded to RAI 9.1.2-12 in Supplement 2 to RAI No. 84 by referring to RAI 84, Supplement 2 Question 09.01.02-11, which states the elevation of the top of the fuel assemblies seated in the spent fuel storage racks is at elevation 33 feet 2 inches. Therefore, the bottom of the loading pit gate is approximately 2 feet 6 inches above the top of the spent fuel assemblies in the storage racks. The applicant stated that the location of the bottoms of the loading pit gates is not a safety-significant design feature and is not included in FSAR Tier 1. The applicant stated that the FSAR should not be changed as a result of this question.

The location of the bottoms of the loading pit gates related to the top of the stored fuel is a key design parameter that ensures that there are no openings or drains in the spent fuel pool below the stored fuel. The spent fuel pool and the SFP liner are seismic category 1 structures that are credited to maintain stored fuel covered with water under all accident scenarios. In Tier 1 Table 2.1.1-11, “Fuel Building ITAAC,” Commitment 2.3, the applicant proposes to verify the minimum depth of the spent fuel pool. The staff considers that the key design features (no gates, openings, pipes or drainages are located below the active fuel) are important to safety and need to be verified through ITAAC.

Response to Question 09.01.02-30:

ITAAC will be added to U.S. EPR FSAR Tier 1, Section 2.1.1.3 and Table 2.1.1-11—Fuel Building ITAAC to verify the absence of gates, openings, or drains below the top of stored fuel assemblies.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.1.1.3 and Table 2.1.1-11 will be revised as described in the response and indicated on the enclosed markup.

Question 09.01.02-31:

Follow-up to RAI Question 9.1.2-15

In RAI 9.1.2-15, the staff requested the applicant to justify in the FSAR the absence of an anti-siphon device and Seismic Category 1 criteria for the demineralized water distribution system (GHC) piping.

In response to RAI 9.1.2-15, the applicant stated that siphoning is not a concern based on the elevation of the demineralized water distribution system pipe to "just below the spent fuel pool water surface".

The staff considers that any piping that reaches below the minimum water level should contain an anti-siphon device. It is not clear to the staff that the GHC piping does not extend below the minimum water level. One of the bases of the thermal analysis report of the spent fuel pool is that no pipe is capable of draining the spent fuel pool below the minimum inventory level, and to assure this, some pipes are adapted with anti-siphon devices. The staff also identified that the applicant has not proposed an ITAAC to verify that all pipes that extend below the minimum water level have a working anti-siphon device.

The staff requests the applicant to:

a. clarify that the GHC piping does not extend below the minimum water level and

b. justify the absence of an ITAAC to verify that no pipe extends below the minimum water level without a working anti-siphon device.

Response to Question 09.01.02-31:

a. The demineralized water distribution system pipe will extend less than three feet below the normal spent fuel pool water surface, which is well above an elevation corresponding to10 feet above the active fuel stored in the pool. U.S. EPR FSAR Tier 2, Section 9.1.2.3 will be revised to reflect this information.

b. ITAAC will be added to U.S. EPR FSAR Tier 1, Section 2.1.1.3 and Table 2.1.1-11—Fuel Building ITAAC to verify the absence of piping that extends below an elevation 10 feet above the top of stored fuel assemblies.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.1.1.3 and Table 2.1.1-11 and U.S. EPR FSAR Tier 2, Section 9.1.2.3 will be revised as described in the response and indicated on the enclosed markup.

Question 09.01.02-32:

Follow-up to RAI Questions 9.1.2-16 and 9.1.2-20

In RAI 9.1.2-16, the staff requested the applicant to include in the FSAR a description of the initial testing and liner leakage monitoring. In response to RAI 9.1.2-16, the applicant stated that this question is very similar to RAI #86, Question 9.1.2-20. In response to RAI 9.1.2-20, the applicant stated that the proper fabrication and construction of the leak chase system (LCS) reduces the chance of formation of blockages. The staff could not find an ITAAC or an Initial Plant Test that will verify that the LCS has been properly constructed or that it is free of obstructions.

The staff requests the applicant to justify in the FSAR the absence of an ITAAC or an Initial Plant Test that will verify that the LCS has been properly constructed or that it is free of obstructions.

Response to Question 09.01.02-32:

ITAAC is not necessary because the leak chase system is classified as non-safety-related. This system is tested as part of the Initial Plant Test Program of the fuel pool cooling and purification system (refer to U.S. EPR FSAR Tier 2, Section 14.2.12.1.1, Test #001, Step 3.8).

Flushing the leak chase piping is a construction activity that is verified prior to performing the preoperational test of the spent fuel pool. U.S. EPR FSAR Tier 2, Section 14.2.12.1.1, Test #001 will be revised to verify that each leak chase pipe has been back filled and flushed prior to performing the preoperational test.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12.1.1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

2.1.1.3 Fuel Building

1.0 Description

The FB is a reinforced concrete, Seismic Category I, safety-related structure. It extends approximately 58 feet out from the RSB wall and is approximately 160 feet long by 140 feet high. The FB is located adjacent to the RSB at 180 degrees as shown on Figure 2.1.1-2. As shown on Figure 2.1.1-11 and Figure 2.1.1-12 the FB is decoupled from the external hazards barrier by a gap between the FB external wall and its uppermost ceiling. The FB and the RSB share the reinforced concrete cylindrical shell from the basemat to elevation 0 feet 0 inches; above this elevation the structures are physically separated by a seismic gap. The primary function of the FB is to house new and spent fuel and to provide radiation protection during normal operation by shielding areas of higher radiation from areas of lower radiation. The FB supports the vent stack, a steel structure approximately 12 feet, 6 inches in diameter by 100 feet high located on top of the stair tower between the FB and SB 4. Stair towers are provided between the different SBs and the FB. These stair towers provide personnel access among the various elevations of the NI and tie together the buildings around the periphery of the RSB.

2.0 Key Design Features

2.1 The FB structures are Seismic Category I and are designed and constructed to withstand design basis loads, as specified below, without loss of structural integrity and safety-related functions.

- Normal plant operation (including dead loads, live loads, lateral earth pressure loads, equipment loads, hydrostatic, hydrodynamic, and temperature loads).
- Internal events (including internal flood loads, accident pressure loads, accident thermal loads, accident pipe reactions, and pipe break loads, including reaction loads, jet impingement loads, and missile impact loads).
- External events (including rain, snow, flood, tornado, tornado-generated missiles and earthquake).

2.2 The ~~as-installed~~ basic configuration of the NI structures provides internal separation between independent divisions within the FB and separates the FB from other NI structures by an internal hazards separation barrier so that the impact of internal hazards, including fire, flood, high line energy break and missile impact, is contained within the FB division of hazard origination. Figure 2.1.1-20 and Figure 2.1.1-38 through Figure 2.1.1-44 identify the internal hazards separation barrier.

2.3 To provide adequate radiological protection, the Spent Fuel Storage Pool (SFSP) has a minimum depth from the bottom of the SFSP to the spent pool operating floor that is confirmed after construction.

2.4 The SFSP includes no gates, openings, or drains below an elevation corresponding to the top of stored fuel assemblies.

2.5 The SFSP includes no piping that extends below an elevation of 10 feet above the top of the stored fuel assemblies.

09.01.02-30 & 09.01.02-31

Table 2.1.1-11—Fuel Building ITAAC (3 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
		f. An internal flooding analysis for the FB will be performed. g. A walkdown of the FB features identified in the internal flooding analysis that maintain the impact of the internal flooding to the FB of origin will be performed.	f. Completion of the internal flooding analysis for the FB indicates that the impact of internal flooding is contained within the FB division of origin. g. The FB flood protection features that maintain the impact of internal flooding to the FB division of origin are installed and agree with the associated construction drawings.
2.3	To provide adequate radiological protection, the SFSP has a minimum depth from the bottom of the SFSP to the spent pool operating floor that is confirmed after construction.	An inspection of the SFSP will be performed.	The ~~as-installed~~ SFSP has a minimum depth of 47 feet, 2 inches as measured from the bottom of the SFSP to the spent fuel pool operating floor.
2.4	The SFSP includes no gates, openings, or drains below an elevation corresponding to the top of stored fuel assemblies.	An inspection of the SFSP will be performed.	The SFSP includes no gates, openings, or drains below 16 feet, 6-11/16 inches as measured from the bottom of the SFSP.
2.5	The SFSP includes no piping that extends below an elevation of 10 feet above the top of the stored fuel assemblies.	An inspection of the SFSP will be performed.	The SFSP includes no piping that extends below 26 feet, 6-11/16 inches as measured from the bottom of the SFSP.

09.01.02-30 &
09.01.02-31

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7. The design and density storage arrangement of the spent fuel racks provide adequate natural coolant circulation to remove the residual heat from spent fuel stored in the spent fuel rack, in combination with the FPCPS. The FPCPS maintains the spent fuel pool water temperature and water level within prescribed limits by removing decay heat generated by the stored spent fuel assemblies (see Section 9.1.3).

8. ~~As described in Section 9.1.4.5 for the fuel handling system (FHS), instrumentation, and electrical and mechanical interlocks are provided to prevent movement of loads over the spent fuel.~~

8. Instrumentation is provided to monitor the pool water level and water temperature (see Section 9.1.3) to provide indication of the loss of decay heat removal and to warn personnel of potentially unsafe conditions. In addition, area radiation monitors are provided near the SFP which will provide a distinct audible and visual alarm to alert personnel in the vicinity of the need to take appropriate action. Refer to Section 12.3.4 for further details on the area radiation monitors.

9. ~~Stresses in the fully loaded new fuel and spent fuel racks must not exceed stresses specified by ASME Code, Section III, Division I, Part NF, as well as guidance given in RG 1.124. The racks will be designed to withstand the maximum uplift force of the auxiliary crane~~The new and spent fuel racks are Seismic Category I structures and are designed to withstand normal and postulated dead loads, live loads, loads resulting from thermal effects, and loads caused by an SSE event. See Section 9.1.2.2.3 for information on structural and stress analyses for new and spent fuel racks.

10. The spent fuel is stored within a stainless steel lined concrete pool which has no penetrations that can result in an unacceptable loss of water. As described in Section 9.1.3, the FPCPS provides makeup water for the SFP. The concrete structures for the SFP and fuel transfer canal are designed to maintain leak-tight integrity to prevent the loss of cooling water from the pool. All piping penetrations into the pool are designed to preclude draining the pool down to an unacceptable limit, as described in Section 9.1.3.

09.01.02-30 & 09.01.02-31

11. ~~The rack will be designed so that it is impossible to insert or jam a fuel assembly between two adjacent storage positions~~The design of the new and spent fuel racks confirms that only one fuel assembly can be inserted into a single storage cell.

12. The spent fuel pool and cooling systems are designed so that in the event of failure of inlets, outlets, piping, or drains, the pool level will not be inadvertently drained below a level approximately 3 meters (10 feet) above the top of the active fuel. The spent fuel pool does not include piping that extends below this elevation.

9.1.2.4 Inspection and Testing Requirements

Refer to Section 14.2 (test abstract #038) for initial plant startup test program related to the proper operation of the fuel handling equipment, including the spent fuel storage rack positions.

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In these abstracts:

- References to design or design requirements generally mean functional design or functional design requirements. For example, SSC may have higher design capacity than what is functionally required.
- Acceptance criteria are based on system design parameters that are used in the safety analysis and on programmatic requirements. For example, programmatic testing requirements for the pump and valve testing are described in Section 3.9.6.

Detailed U.S. EPR preoperational test procedures:

- Accomplish the testing described in the test abstracts via multiple test procedures that may be executed at different times.
- Establishes the prerequisite conditions per individual test requirements. For example, heating, ventilation, air conditioning (HVAC) testing will be done at current environmental conditions, not extremes of design-assumed temperatures.
- Include data requirements for individual tests in more detail (as necessary for verifying test objectives).

14.2.12.1 NSSS Support Systems

14.2.12.1.1 Fuel Pool Cooling and Purification System (Test #001)

1.0 OBJECTIVE

1.1 To demonstrate proper operation of the fuel pool cooling and purification system (FPCPS).

1.2 To identify any spent fuel pool leakage.

1.3 To demonstrate electrical independence and redundancy of power supplies.

2.0 PREREQUISITES

2.1 Construction activities on the FPCPS have been completed.

09.01.02-32

2.1.1 Verify that construction has back filled each leak chase channel from a low pressure source and verified that each leak chase drains the back filled water through an unobstructed leak chase pipe and valve.

2.2 FPCPS system instrumentation has been calibrated and is functional for performance of the following test.

2.3 Test instrumentation available and calibrated per site procedures.

2.4 Component cooling water system (CCWS) water is available to the fuel pool cooling heat exchanger.