ArevaEPRDCPEm Resource

From: Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent: Friday, February 13, 2009 4:36 PM
To: Getachew Tesfaye
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); WILLIFORD Dennis C (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 84, Supplement 2
Attachments: RAI 84 Supplement 2 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 9 of the 22 questions of RAI No. 84 on November 26, 2008. AREVA NP submitted Supplement 1 to the response on January 21, 2009 to address 7 of the remaining 13 questions. The attached file, "RAI 84 Supplement 2 Response US EPR DC.pdf" provides technically correct and complete responses to 3 of the remaining 6 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 84 Questions 09.01.02-2 and 09.01.02-11.

The following table indicates the respective pages in the response document, "RAI 84 Supplement 2 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 84 — 09.01.02-1	2	2
RAI 84 — 09.01.02-2	3	3
RAI 84 — 09.01.02-3	4	4
RAI 84 — 09.01.02-11	5	5
RAI 84 — 09.01.02-12	6	7
RAI 84 — 09.01.02-17	8	8

AREVA NP is unable to respond to three of the questions at this time. The schedule for technically correct and complete responses to the remaining 3 questions has been revised and is provided below:

Question #	Response Date
RAI 84 — 09.01.02-1	June 25, 2009
RAI 84 — 09.01.02-3	June 25, 2009
RAI 84 — 09.01.02-17	June 25, 2009

Sincerely,

Ronda Pederson
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Licensing Manager, U.S. EPR Design Certification
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From: WELLS Russell D (AREVA NP INC)
Sent: Wednesday, January 21, 2009 2:47 PM
To: 'Getachew Tesfaye'
Cc: Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 84, FSAR Ch 9, Supplement 1

Getachew,

AREVA NP Inc. provided responses to 9 of the 22 questions of RAI No. 84 on November 26, 2008. The attached file, "RAI 84 Supplement 1 Response US EPR DC.pdf" provides technically correct and complete responses to 7 of the remaining 13 questions, as committed.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 84 Questions 09.01.02-7 and 09.01.02-16.

The following table indicates the respective pages in the response document, "RAI 84 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 84 — 09.01.02-6	2	2
RAI 84 — 09.01.02-7	3	3
RAI 84 — 09.01.02-9	4	4
RAI 84 — 09.01.02-16	5	5
RAI 84 — 09.01.02-18	6	6
RAI 84 — 09.03.01-4	7	7
RAI 84 — 09.03.01-5	8	8

The schedule for technically correct and complete responses to the remaining 6 questions is unchanged and provided below:

Question #	Response Date
RAI 84 — 09.01.02-1	February 13, 2009
RAI 84 — 09.01.02-2	February 13, 2009
RAI 84 — 09.01.02-3	February 13, 2009
RAI 84 — 09.01.02-11	February 13, 2009
RAI 84 — 09.01.02-12	February 13, 2009
RAI 84 — 09.01.02-17	February 13, 2009

Sincerely,

(Russ Wells on behalf of)
Ronda Pederson
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From: Pederson Ronda M (AREVA NP INC)
Sent: Wednesday, November 26, 2008 2:30 PM
To: 'Getachew Tesfaye'
Cc: WILLIFORD Dennis C (AREVA NP INC); DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 84 (966,980),FSAR Ch 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 84 Response US EPR DC.pdf" provides technically correct and complete responses to 9 of the 22 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 84 Questions 09.01.02-4, 09.01.02-8, 09.01.02-10, and 09.03.01-1.

The following table indicates the respective page(s) in the response document, "RAI 84 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 84 — 09.01.02-1	2	2
RAI 84 — 09.01.02-2	3	3
RAI 84 — 09.01.02-3	4	4
RAI 84 — 09.01.02-4	5	5
RAI 84 — 09.01.02-5	6	6
RAI 84 — 09.01.02-6	7	7
RAI 84 — 09.01.02-7	8	8
RAI 84 — 09.01.02-8	9	9
RAI 84 — 09.01.02-9	10	10
RAI 84 — 09.01.02-10	11	11
RAI 84 — 09.01.02-11	12	12
RAI 84 — 09.01.02-12	13	13
RAI 84 — 09.01.02-13	14	14
RAI 84 — 09.01.02-15	15	15
RAI 84 — 09.01.02-16	16	16
RAI 84 — 09.01.02-17	17	17
RAI 84 — 09.01.02-18	18	18
RAI 84 — 09.03.01-1	19	19
RAI 84 — 09.03.01-2	20	20
RAI 84 — 09.03.01-3	21	21
RAI 84 — 09.03.01-4	22	22
RAI 84 — 09.03.01-5	23	23

A complete answer is not provided for 13 of the 22 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 84 — 09.01.02-1	February 13, 2009
RAI 84 — 09.01.02-2	February 13, 2009
RAI 84 — 09.01.02-3	February 13, 2009
RAI 84 — 09.01.02-6	January 21, 2009
RAI 84 — 09.01.02-7	January 21, 2009
RAI 84 — 09.01.02-9	January 21, 2009
RAI 84 — 09.01.02-11	February 13, 2009
RAI 84 — 09.01.02-12	February 13, 2009
RAI 84 — 09.01.02-16	January 21, 2009
RAI 84 — 09.01.02-17	February 13, 2009
RAI 84 — 09.01.02-18	January 21, 2009
RAI 84 — 09.03.01-4	January 21, 2009
RAI 84 — 09.03.01-5	January 21, 2009

Sincerely,

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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Monday, October 27, 2008 7:25 PM
To: ZZ-DL-A-USEPR-DL
Cc: Raul Hernandez; John Segala; Stephen Campbell; Peter Hearn; Joseph Colaccino; John Rycyna
Subject: U.S. EPR Design Certification Application RAI No. 84 (966,980),FSAR Ch 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on September 16, 2008, and discussed with your staff on October 7, 2008. Draft RAI Question 09.01.02-14 was deleted and Draft RAI Questions 09.01.02-10 and 09.01.02-12 were modified as a result of that discussion. 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: 215

Mail Envelope Properties (5CEC4184E98FFE49A383961FAD402D31A9FED2)

Subject: Response to U.S. EPR Design Certification Application RAI No. 84, Supplement 2
Sent Date: 2/13/2009 4:35:58 PM
Received Date: 2/13/2009 4:36:02 PM
From: Pederson Ronda M (AREVA NP INC)

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Priority: Standard
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Sensitivity: Normal
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Recipients Received:

Response to

Request for Additional Information No. 84, Supplement 2

10/27/2008

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: 09.03.01 - Compressed Air System
Application Section: Ch 9
SBPA Branch

Question 09.01.02-1:

The applicant has not identified the maximum capacity or provided details of the design of the new fuel storage facility. The new fuel storage facility (NFSF) needs to provide storage for new fuel assemblies in accordance with the design basis. The staff requests the applicant to provide and include in the FSAR the design basis for the new fuel storage facility and identify the maximum number of new fuel assemblies that can be stored.

Response to Question 09.01.02-1:

A response to this question will be provided by June 25, 2009.

Question 09.01.02-2:

The applicant stated that the spent fuel storage facility (SFSF) provides storage for a minimum of 1020 spent fuel assemblies stored in the spent fuel pool (SFP). In accordance with SRP Section 9.1.2, the applicant is requested to include in the FSAR the design basis of the spent fuel storage facility, including the number of fuel assemblies to be offload into the SFP from the core during a typical refueling outage and the number of refueling cycles the SFP is designed to accommodate.

Response to Question 09.01.02-2:

U.S. EPR FSAR Tier 2, Section 9.1.2.2.2 will be revised to state that the SFP provides storage for a minimum of 10 years worth of used fuel plus a full core offload.

Based on 18-month operating cycles, the first refueling cycle batch size is estimated to be 120 fuel assemblies, with a subsequent and equilibrium refueling batch size of 96 assemblies. The number of fuel assemblies (96) to be offloaded from the core during a typical (based on an18-month fuel cycle) refueling outage will be added to U.S. EPR FSAR Tier 2, Section 9.1.2. A total of seven fuel cycles (10.5 years of operation neglecting refueling outage length and assuming 100 percent availability) provides a conservative estimate for the amount of irradiated fuel to be discharged during 10-year calendar years of operation. The minimum required spent fuel storage for seven cycles of operation with 18-month fuel cycles equates to 120 + 6 x (96) = 696 fuel assemblies. Because a full core offload is 241 fuel assemblies, storage for a minimum of 696 + 241 = 937 fuel assemblies is required based on 18-month operating cycles.

Based on a 24-month operating cycles, the first refueling cycle batch size is estimated to be 144 fuel assemblies, with a subsequent and equilibrium refueling batch size of 140 assemblies. A total of five fuel cycles (10 years of operation neglecting refueling outage length and assuming 100 percent availability) provides a conservative estimate for the amount of irradiated fuel to be discharged during 10 years of operation. The minimum required spent fuel storage for five cycles of operation with 24-month fuel cycles equates to 144 + 4 x (140) = 704 fuel assemblies. Because a full core offload is 241 fuel assemblies, storage for a minimum of 704 + 241 = 945 fuel assemblies is required based on 24-month operating cycles.

An additional margin of 75 fuel assemblies has been added to the largest value comparing the 18-month and 24-month fuel cycles to provide an overall minimum storage capacity for the spent fuel pool of 1020 assemblies. This is the value provided in U.S. EPR FSAR Tier 2, Section 9.1.2.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.1.2 and Section 9.1.2.2.2 will be revised as described in the response and indicated on the enclosed markup.

Question 09.01.02-3:

SRP Section 9.1.2 recommends that low-density storage should be used, at a minimum, for the most recently discharged fuel to enhance the capability to cool it. If low-density storage is not used, the use high-density storage racks needs to be evaluated on a case by case basis. The staff determined that the applicant has not specified in the FSAR what are the density requirements for fuel racks. The applicant is requested to identify and include in the FSAR the density requirements for spent fuel storage and, if applicable, to provide justification.

Response to Question 09.01.02-3:

A response to this question will be provided by June 25, 2009.

Question 09.01.02-11:

The staff reviewed the applicant's submittal and determined that the applicant has not specified the elevation of the top of the stored spent fuel. The applicant is requested to provide the elevation of the top of the stored spent fuel and to confirm that the spent fuel storage rack maximum height limitation is included in the FSAR in COL Information Item 9.1.4.

Response to Question 09.01.02-11:

As specified in the Response to RAI 87, Question 09.01.03-8, the top of the active fuel is at elevation 31 feet 8 inches. The additional length of the fuel assembly above this height, which does not contain fuel, is 1 feet 5.5 inches. Therefore, the top of the fuel assemblies seated in the spent fuel storage racks will be at elevation 33 feet 2 inches. The nominal water level in the pool is at elevation 62 feet 4 inches. This elevation corresponds to a nominal water depth of 45 feet 7 inches, and a nominal height of water above the spent fuel assemblies seated in the storage racks of approximately 29 feet. This is well above the minimum height of 23 feet required for radiological analysis reflected in U.S. EPR FSAR Tier 2, Table 14.3-2 and in the ITAAC for the fuel pool cooling and purification system in U.S. EPR FSAR Tier 1, Table 2.2.5-3, Item 7.6.

U.S. EPR 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 critical parameter is the height of water above the top of the stored fuel assemblies. This value in U.S. EPR FSAR Tier 2, Section 9.1.2.2 has been revised 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.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.1.2.2.2 will be revised as described in the response and indicated on the enclosed markup.

Question 09.01.02-12:

The applicant has stated that the bottom of the loading pit gate is at elevation 10.9 meters (35'-9"). SRP Section 9.1.2 (iii).2.H.(i) states that the bottoms of any gates should be above the top of the fuel assemblies. The applicant has not provided the elevation of the stored spent fuel; therefore, the staff can not determine that the design of the gates are in accordance with SRP Section 9.1.2.

The staff requests 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 ITACC for the SFSF verification that the elevation of the bottom of the loading pit gate are as shown in FSAR Tier 2, Figure 3.8-52.

Response to Question 09.01.02-12:

As stated in the Response to RAI 84, Question 09.01.02-11, 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.

Safety-significant design features are identified for the U.S. EPR based on guidance from Standard Review Plan (SRP) 14.3.

U.S. EPR FSAR Tier 2 material is screened to determine if it meets the "safety-significant" requirements described in U.S EPR FSAR Tier 2, Section 14.3.2. This screening process involves two approaches using criteria developed from Standard Review Plan (SRP) 14.3, Appendices A and C. The first screening approach uses discipline checklists that include ITAAC criteria based on guidance in SRP 14.3. For example, the discipline checklist for systems provides guidance to create ITAAC for the following features:

- Major safety-related features.
- Equipment that is seismic, EQ, or 1E.
- Safety-related equipment.
- Design features provided for severe accident (SA) mitigation, station blackout (SBO), and anticipated transient without scram (ATWS).
- Significant system features identified in the applicable SRPs for the system.
- Significant safety-related (and non-safety-related) functions derived from those listed in system design requirements documents.

The second screening approach involves an expert review panel that identifies safety-significant features based on assumptions and insights from key safety and integrated plant safety analyses in U.S. EPR FSAR Tier 2, where plant performance is dependent on contributions from multiple systems. This second screening approach is based on guidance in SRP 14.3, page 14.3-21. Results of the expert review panel meetings are provided in U.S. EPR FSAR Tier 2, Table 14.3-1 through Table 14.3-7. For the SFP, a water level of at least 23 feet above the spent fuel is a safety-significant design feature for the U.S. EPR as listed in U.S. EPR FSAR Tier 2, Table 14.3-2, Item 2-4. Descriptions of maintaining a SFP water level of at least 23 feet above the spent fuel are contained in U.S. EPR FSAR Tier 2:

- Section 9.1.2.2.2.
- Section 9.1.2.3, Item 5.
- Section 15.0.3.10.2 and Table 15.0-46.

The requirement, including ITAAC, of maintaining a SFP water level of at least 23 feet above the spent fuel is provided in the following locations in the U.S. EPR FSAR:

- Tier 1, Section 2.2.5, Item 7.6 and Table 2.2.5-3, ITAAC 7.6.
- Tier 2, Table 14.3-2, Item 2-4.
- Tier 2, Section 3.7, Surveillance Requirement 3.7.14.1.

Using the criteria established, an ITAAC for a SFP water level of at least 23 feet above the spent fuel is provided in U.S. EPR FSAR Tier 1. The location of the bottoms of the loading pit gates, however, is not a safety-significant design feature and is not included in U.S. EPR FSAR Tier 1. As described in the Response to RAI 84, Question 09.01.02-13, even the failure of the double gates between the SFP and cask loading pit and the gates between the SFP and the transfer compartment results in an equilibrium water level of about 24 feet above the active fuel stored in the SFP, which is above the minimum 23 feet required by U.S. EPR FSAR Tier 1, Section 2.2.5, Item 7.6 and Table 2.2.5-3, ITAAC 7.6.

FSAR Impact:

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

Question 09.01.02-17:

The applicant has stated in FSAR Tier 2, Section 3.1.6.3, that in compliance with GDC 62, preventing criticality in the new and spent fuel storage areas is accomplished by physical separation of fuel assemblies, the use of borated water and borated neutron absorber panels in the fuel storage pool. However, the applicant has also stated in FSAR Tier 2, Section 9.1.2.2.2, that borated demineralized reactor makeup water is used to fill and to supplement water inventory in the SFP but boration is not essential for maintaining the subcriticality of the stored fuel assemblies. Clarify in the FSAR the U.S EPR design requirements for borated water in the SFP.

Response to Question 09.01.02-17:

A response to this question will be provided by June 25, 2009.

U.S. EPR Final Safety Analysis Report Markups

9.1.2 New and Spent Fuel Storage

Since the design of the new and spent fuel storage racks is the responsibility of the COL applicant (see COL items identified in Section 9.1.2.2.1 and Section 9.1.2.2.2), the description of these items in this section is typical or representative. The NFSF and SFSF are both located within the reinforced concrete structure of the Fuel Building (see Section 3.8.4). The NFSF provides onsite dry storage for new fuel assemblies required for refueling the reactor. The SFSF provides onsite underwater storage for spent fuel assemblies and optional underwater storage of some of the new fuel assemblies. The SFSF provides storage locations for a minimum of 1020 spent fuel assemblies in a single fuel storage pool, which is constructed of reinforced concrete with a stainless steel lining. For a typical (based on an 18-month fuel cycle) refueling outage, approximately 96 fuel assemblies are offloaded into the spent fuel pool (SFP).

09.01.02-2

9.1.2.1 Design Bases

The functions of the NFSF and SFSF are to maintain new and spent fuel in a safe and subcritical array during all anticipated operating and accident conditions and to limit offsite exposures in the event of release of radioactive materials from the fuel. The spent fuel facility will also keep spent fuel assemblies adequately cooled during all anticipated operating and accident conditions. The safety-related functions and requirements related to the general design criteria (GDC) are as follows:

1. The NFSF and SFSF are protected from the effects of natural phenomena, including earthquakes, tornadoes, hurricanes, floods, and external missiles (GDC 2). The facility components meet the guidance presented in RG 1.13, positions C.1 and C.2, RG 1.29, RG 1.117, Reference 2, and Reference 1.

2. The NFSF and SFSF will remain functional after an SSE and will perform their intended function following postulated hazards such as fires, internal missiles, or pipe break (GDC 4). The facility components meet the guidance presented in RG 1.13, positions C.2 and C.3, RG 1.115, and RG 1.117.

3. Structures, systems, and components of the NFSF and SFSF that are important to safety are not shared with other units (GDC 5).

4. The NFSF and SFSF are designed with the capability to permit periodic inspections (GDC 61). The NFSF meets the applicable design requirements of Reference 1. The SFSF meets the applicable design guidance of RG 1.13 and the design requirements of Reference 2.

5. The depth of shielding water over the spent fuel will be sufficient to limit the radiation dose to acceptable levels (GDC 61). Details of the dose assessment are provided in Section 12.3.5.

- Gaseous radioactivity above the ~~spent fuel pool (~~SFP~~)~~ is maintained below the limits as defined in 10 CFR 20, Appendix B, table 1, column 1.

- A leak chase and collection system is provided for the detection of leaks in the spent fuel pool liner plate ~~(see Section 9.3.3 for details)~~.

9.1.2.2 Facilities Description

9.1.2.2.1 New Fuel Storage

The NFSF is enclosed by the reinforced concrete structure of the Fuel Building. New fuel storage racks are located in the new fuel dry storage area inside the Fuel Building. These racks are designed to provide vertical storage of new fuel assemblies, either with or without rod cluster control assemblies. The design of the new fuel storage racks are the responsibility of the COL applicant. A COL applicant that references the U.S. EPR design certification will describe the new fuel storage racks, including a description of confirmatory structural dynamic and stress analyses. The racks must be shown to meet Seismic Category I requirements.

The new fuel storage rack location is shown in Figure 9.1.2-1—New Fuel and Spent Fuel Storage Rack Representative Layout. These representative new fuel storage racks provide support for the fuel assemblies and incorporate guide funnels at the top to facilitate insertion of the new fuel assemblies. Figure 9.1.2-2—Typical New and Spent Fuel Storage Rack Cross-Sections, provides a typical sketch of the new and spent fuel storage racks. Fuel assemblies are handled using the auxiliary crane equipped with the new fuel handling tool, as detailed further in Section 9.1.4.

~~A drainage system is~~Building features such as door thresholds, curbs, and floor openings are provided to prevent ~~accumulation~~entry of water or other moderation media into the NFSF.

Refer to Section 3.2 for the seismic and system quality group classification of the new fuel racks. Non-safety-related equipment or structures not designed to Seismic Category I criteria that are located in the vicinity of the NFSF are evaluated to confirm that their failure could not cause an increase in the k_{eff} value beyond the maximum allowable.

9.1.2.2.2 Spent Fuel Storage

09.01.02-2

The spent fuel pool provides storage space for a minimum of 10 years worth of irradiated fuel assemblies, ~~including~~plus the capability for a full core offload from the reactor. The pool is a reinforced concrete structure (refer to Section 3.8.4) with a stainless steel liner having a ~~normal water volume of approximately 375,000 gallons and a~~nominal depth of ~~40~~45 feet, 7 inches (29~~3~~ feet above the tops of the stored fuel assemblies). Borated water is used in the spent fuel pool and is maintained at 1700 ppm. The concentration required for sub-criticality for spent fuel is approximately

09.01.02-11