ArevaEPRDCPEm Resource

From: Miernicki, Michael
Sent: Monday, February 04, 2013 3:54 PM
To: Honcharik, John
Cc: Terao, David; Snyder, Amy
Subject: FW: Response to U.S. EPR Design Certification Application RAI No. 109, Supplement 3
Attachments: RAI 109 Supplement 3 Response US EPR DC.pdf

Please see attached final RAI response.

Mike

Michael J. Miernicki
Sr. Project Manager
NRC/NRO/DNRL/LB1
301-415-2304

From: WILLIFORD Dennis (AREVA) [mailto:Dennis.Williford@areva.com]
Sent: Thursday, January 31, 2013 4:37 PM
To: Snyder, Amy
Cc: DELANO Karen (AREVA); LEIGHLITER John (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); WILLS Tiffany (AREVA); Miernicki, Michael; KOWALSKI David (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 109, Supplement 3

Amy,

AREVA NP Inc. provided responses to 4 of the 7 questions of RAI No. 109 on December 15, 2008. AREVA NP submitted Supplement 1 to the response on February 13, 2009 to address 2 of the remaining 3 questions. Supplement 2 response was sent on February 19, 2009 to provide a technically correct and complete response to the remaining Question 03.05.01.03-2.

The attached file, "RAI 109 Supplement 3 Response US EPR DC.pdf" provides a technically correct and complete revised final response to Question 03.05.01.03-2, which supersedes in its entirety the prior response to this question provided in Supplement 2.

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 109, Question 03.05.01.03-2.

The following table indicates the respective pages in the response document, "RAI 109 Supplement 3 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 109 — 03.05.01.03-2	2	4

This concludes the formal AREVA NP response to RAI 109 and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager

AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
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Email: Dennis.Williford@areva.com

From: PEDERSON Ronda (FE/FL)
Sent: Thursday, February 19, 2009 6:46 PM
To: 'Getachew Tesfaye'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 109, Supplement 2

Getachew,

AREVA NP Inc. provided responses to 4 of the 7 questions of RAI No. 109 on December 15, 2008. AREVA NP submitted Supplement 1 to the response on February 13, 2009 to address 2 of the remaining 3 questions. The attached file, "RAI 109 Supplement 2 Response US EPR DC.pdf," provides technically correct and complete responses to the remaining question.

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 109 Supplement 2, Question 03.05.01.03-2.

The following table indicates the respective pages in the response document, "RAI 109 Supplement 2 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 109 — 03.05.01.03-2	2	4

This concludes the formal AREVA NP response to RAI 109 and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
AREVA NP Inc.
An AREVA and Siemens company
3315 Old Forest Road
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Phone: 434-832-3694
Cell: 434-841-8788

From: Pederson Ronda M (AREVA NP INC)
Sent: Friday, February 13, 2009 5:30 PM
To: 'Getachew Tesfaye'
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 109, Supplement 1

Getachew,

AREVA NP Inc. provided responses to 4 of the 7 questions of RAI No. 109 on December 15, 2008. The attached file, "RAI 109 Supplement 1 Response US EPR DC.pdf," provides technically correct and complete responses to 2 of the remaining 3 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 109 Supplement 1 Question 03.05.01.01-1, and 03.05.01.02-1.

The following table indicates the respective pages in the response document, "RAI 109 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 109 — 03.05.01.01-1	2	6
RAI 109 — 03.05.01.02-1	7	8

A complete answer is not provided for 1 of the 7 questions. The schedule for a technically correct and complete response to the remaining question is unchanged and provided below:

Question #	Response Date
RAI 109 — 03.05.01.03-2	February 20, 2009

Sincerely,

Ronda Pederson
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From: WELLS Russell D (AREVA US)
Sent: Monday, December 15, 2008 7:30 PM
To: 'Getachew Tesfaye'
Cc: 'John Rycyna'; Pederson Ronda M (AREVA US); BENNETT Kathy A (OFR) (AREVA US); DELANO Karen V (AREVA US)
Subject: Response to U.S. EPR Design Certification Application RAI No. 109, FSAR Ch 3

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 109 Response US EPR DC.pdf" provides technically correct and complete responses to 4 of the 7 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 109 Questions 03.04.01-1, 03.04.01-2, 03.04.01-3, 03.05.01.01-1, and 03.05.01.02-1.

The following table indicates the respective pages in the response document, "RAI 109 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 109 — 03.04.01-1	2	2
RAI 109 — 03.04.01-2	3	3
RAI 109 — 03.04.01-3	4	5
RAI 109 — 03.05.01.01-1	6	9
RAI 109 — 03.05.01.02-1	10	11
RAI 109 — 03.05.01.03-2	12	12
RAI 109 — 03.05.01.03-3	13	14

A complete answer is not provided for 3 of the 7 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 109 — 03.05.01.01-1.a	February 13, 2009
RAI 109 — 03.05.01.01-1.c	February 13, 2009
RAI 109 — 03.05.01.01-1.e	February 13, 2009
RAI 109 — 03.05.01.01-1.g	February 13, 2009
RAI 109 — 03.05.01.02-1.b	February 13, 2009
RAI 109 — 03.05.01.03-2.a	February 20, 2009
RAI 109 — 03.05.01.03-2.b	February 20, 2009
RAI 109 — 03.05.01.03-2.c	February 20, 2009
RAI 109 — 03.05.01.03-2.d	February 20, 2009

Sincerely,

(Russ Wells on behalf of)
Ronda Pederson
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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Friday, November 14, 2008 10:31 AM
To: ZZ-DL-A-USEPR-DL
Cc: Chang Li; Stephen Campbell; David Shum; John Segala; John Honcharik; David Terao; Michael Miernicki; Joseph Colaccino; John Rycyna; Tarun Roy
Subject: U.S. EPR Design Certification Application RAI No. 109 (1523, 1524,1525, 1128, 1129, 1419), FSAR Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on October 20, 2008, and discussed with your staff on November 4, 2008. No change was made to the draft RAI 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: 4183

Mail Envelope Properties (9C2386A0C0BC584684916F7A0482B6CADC63F196EF)

Subject: FW: Response to U.S. EPR Design Certification Application RAI No. 109, Supplement 3
Sent Date: 2/4/2013 3:54:23 PM
Received Date: 2/4/2013 3:54:25 PM
From: Miernicki, Michael

Created By: Michael.Miernicki@nrc.gov

Recipients:
"Terao, David" <David.Terao@nrc.gov>
Tracking Status: None
"Snyder, Amy" <Amy.Snyder@nrc.gov>
Tracking Status: None
"Honcharik, John" <John.Honcharik@nrc.gov>
Tracking Status: None

Post Office: HQCLSTR02.nrc.gov

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MESSAGE	8831	2/4/2013 3:54:25 PM
RAI 109 Supplement 3 Response US EPR DC.pdf	156066	

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

Response to

Request for Additional Information No. 109. Supplement 3

11/14/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.04.01 - Internal Flood Protection for Onsite Equipment Failures
SRP Section: 03.05.01.01 - Internally Generated Missiles (Outside Containment)
SRP Section: 03.05.01.02 - Internally Generated Missiles (Inside Containment)
SRP Section: 03.05.01.03 - Turbine Missiles
Application Section: FSAR Ch. 3

QUESTIONS for Balance of Plant Branch 2 (ESBWR/ABWR) (SBPB)
QUESTIONS for Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects) (CIB1)

Question 03.05.01.03-2:

The U.S. EPR FSAR, Tier 2 Section 3.5.1.3 states that all safety-related structures, except for two of the four essential service water buildings (ESWBs) and a portion of one of the four emergency power Generating buildings (EPGBs) are located outside of the low-trajectory missile strike zone, as defined in RG 1.115. Therefore, the U.S. EPR FSAR considers the turbine generator is favorably positioned, because most of the safety-related SSCs are located outside the low-trajectory missile strike zone. In addition, the supporting turbine missile analysis evaluates that the probability of a turbine missile being ejected will be less than 1 $x10^{-4}$. Based on this information, provide the following to ensure that safety-related structures, systems and components are protected against missiles in accordance with GDC 4 of 10 CFR Part 50, Appendix A:

a. Discuss in detail how the turbine generator is favorably positioned when the ESWBs and the EPGBs are considered safety-related structures and systems (which are used to safely shutdown and maintain the reactor in a safe shutdown condition) and are located in the low-trajectory missile strike zone. Otherwise, the turbine generator should be considered in an unfavorable position in accordance with RG 1.115, and the probability of turbine failure resulting in ejection of turbine rotor fragments (P1) should be less than 1 x 10^{-5} in lieu of 1 $x10^{-4}$.

b. It appears from Figure 2.1.2-1 in Tier 1 of the U.S. EPR FSAR that more than one EPGB may be within the low-trajectory missile strike zone. Which EPGB is located in the low-trajectory missile strike zone, and discuss why the other EPGBs are not considered in the low-trajectory missile strike zone.

c. Since ESWBs 3 and 4 are in the low-trajectory missile strike zone, discuss whether the reactor can be shutdown and maintained in a safe condition with ESWBs 1 and 2 only?

d. Since the switch-gear building (SWGB) is adjacent to the turbine building and in the low-trajectory missile strike zone, discuss how a turbine missile strike in the SWGB would affect safety-related components and systems (e.g., offsite power buses, etc.) that could prevent the reactor from being safely shutdown and maintained in a safe condition.

Response to Question 03.05.01.03-2:

This response supersedes in its entirety the response provided to RAI 109, Supplement 2, Question 03.05.01.03-2.

a. SRP Section 3.5.1.3 Acceptance Criteria 1 states “that favorably oriented turbine generators are located such that the containment and all, or almost all, safety-related SSC outside containment are excluded from the low-trajectory hazard zone described in RG 1.115.”

   Regulatory Guide 1.115, states “that plants designed with no essential SSC within the low-trajectory hazard zone are considered to have a favorable turbine orientation.”

   U.S. EPR FSAR, Tier 2, Section 3.5.1.3 states that almost all of the U.S. EPR safety-related SSC are located outside the low-trajectory zone. In addition, the U.S. EPR has four redundant ESW divisions, two of which are capable of bringing the reactor to safe shutdown and maintaining it in safe shutdown condition, as stated in U.S. EPR FSAR, Tier 2, Section 9.2.5.5. Thus, having a turbine orientation with two ESWBs within the turbine low-trajectory strike zone is acceptable.

To meet the NRC guidance in both SRP 3.5.1.3 and RG 1.115, the turbine orientation will be considered unfavorable, which is the worst case situation, with a P_1 of less than 1×10^{-5}.

U.S. EPR FSAR, Tier 2, Section 3.5.1.3 will be revised to read:

> "The turbine layout, as shown in Figure 1.2-37 in Section 1.2, is a longitudinal arrangement for the turbine generators. The axis of the turbine rotor shafts is positioned such that safety-related structures, except for two of the four ESWBs are located outside the turbine low-trajectory hazard zone, as defined by RG 1.115. Redundant safety systems are physically separated into four divisions (one in each ESWB). Only two of the ESWBs are considered "essential systems" requiring protection from turbine missiles (as defined by RG 1.115) to perform the necessary functions to safely shut down the plant. Therefore, the turbine generator is considered unfavorably positioned, as defined by RG 1.115, because all essential SSC are not located outside the low-trajectory hazard zone.
>
> Section 10.2 describes the design of the turbine generator. The probability of turbine failure resulting in ejection of the turbine rotor (or internal structure) fragments through the turbine casing, P_1, will be less than 1×10^{-5}. In accordance with guidance provided by Reference 10, SRP Section 3.5.1.3, Table 3.5.1.3-1, an overall turbine missile safety objective for the probability of unacceptable damage resulting from turbine missiles, P_4, of less than 1×10^{-7} is satisfied with P_1 less than 1×10^{-5} for unfavorably oriented turbine generators. Therefore, given the redundancy and the low probability of a turbine missile being generated, the impact of turbine generated missiles on safety-related SSC is not safety significant. A COL applicant that references the U.S. EPR design certification will confirm the evaluation of the probability of turbine missile generation for the selected turbine generator, P_1, is less than 1×10^{-5} for turbine generators unfavorably oriented."

U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items will be revised to reflect the revision of COL Information Item 3.5-2 to state the following:

> "A COL applicant that references the U.S. EPR design certification will confirm the evaluation of the probability of turbine missile generation for the selected turbine generator, P_1, is less than 1×10^{-5} for turbine generators unfavorably oriented."

U.S. EPR FSAR, Tier 2, Section 10.2.4 will be revised to read:

> "The orientation of the U.S. EPR TG is considered to be unfavorably oriented as defined by RG 1.115 because not all essential SSC are located outside the low-trajectory hazard zone as defined by RG 1.115. Turbine missiles are addressed in Section 3.5.1.3."

Refer to the response to RAI 439, Supplement 11, Question 14.03.07-36, for a description of related changes that will be made to U.S. EPR FSAR, Tier 1, Section 2.8.1.

b. Refer to the response to RAI 439, Supplement 11, Question 14.03.07-36, Item 5.

U.S. EPR FSAR, Tier 2, Figure 3B-1—Dimensional Arrangement Reference Plant Building Location and Figure 1.2-37—[[Turbine Building General Arrangement Plan View Elevation +65'-0" with Equipment]] will be revised to show a minimum distance between the reactor

building and the blades of the first LP rotor such that the EPGBs are not located in the turbine low-trajectory hazard zone as defined by RG 1.115.

See Figure 14.03.07-36-2—Turbine Location and Relationship to Site Buildings and Structures, included in the response to RAI 439, Supplement 11, Question 14.03.07-36, which shows the Regulatory Guide 1.115 Low-Trajectory Turbine Missile Strike Zone superimposed on the U.S. EPR plot plan. As shown, the strike zone intercepts two of the four ESWBs (3URB and 4 URB). Both 1URB and 2URB and the EPGBs are outside the strike zone.

c. Two of the four divisions remain available and the two divisions are capable of performing the necessary safety functions, as stated in U.S. EPR FSAR, Tier 2, Section 9.2.5.5.

d. The switch gear building and all of its systems and components are not safety-related, as stated in U.S. EPR FSAR, Tier 2, Table 3.2.2-1.

FSAR Impact:

U.S. EPR FSAR, Tier 2, Table 1.8-2, Section 3.5.1.3 and Section 10.2.4 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

Table 1.8-2—U.S. EPR Combined License Information Items
Sheet 9 of 40

Item No.	Description	Section
3.5-1	A COL applicant that references the U.S. EPR design certification will describe essential elements of a program~~controls~~ to confirm that unsecured maintenance equipment, including that required for maintenance and that are undergoing maintenance, will be removed from containment prior to operation, moved to a location where it is not a potential hazard to safety-related SSC, or seismically restrained to prevent it from becoming a missile.	3.5.1.2.3
3.5-2	A COL applicant that references the U.S. EPR design certification will confirm the evaluation of the probability of turbine missile generation for the selected turbine generator, P1, is less than 1 x 10^{-5}~~4~~ for turbine-generators unfavorably oriented. ~~with respect to containment.~~	3.5.1.3
3.5-3	A COL applicant that references the U.S. EPR design certification will assess the effect of potential turbine missiles from turbine generators within other nearby or co-located facilities.	3.5.1.3
3.5-4	A COL applicant that references the U.S. EPR design certification will evaluate the potential for other missiles generated by natural phenomena, such as hurricanes and extreme winds, and their potential impact on the missile protection design features of the U.S. EPR.	3.5.1.4
3.5-5	A COL applicant that references the U.S. EPR design certification will evaluate the potential for site proximity explosions and missiles generated by these explosions for their potential impact on missile protection design features.	3.5.1.5
3.5-6	A COL applicant that references the U.S. EPR design certification will evaluate site-specific aircraft hazards and their potential impact on plant SSC.	3.5.1.6
3.5-7	For sites with surrounding ground elevations higher than plant grade, a COL applicant that references the U.S. EPR design certification will confirm that automobile missiles cannot be generated within a 0.5 mile radius of safety-related SSC that would lead to impact higher than 30 ft above plant grade.	3.5.1.4
3.5-8	A COL applicant that references the U.S. EPR design certification will describe controls to confirm that unsecured compressed gas cylinders will be either removed or seismically supported when not in use to prevent them from becoming missiles.	3.5.1.1.3
3.5-9	A COL applicant that references the U.S. EPR design certification will describe controls to confirm that unsecured maintenance equipment, including that required for maintenance and that are undergoing maintenance, will be either removed or seismically supported when not in use to prevent it from becoming a missile.	3.5.1.1.3
3.6-1	Deleted.	Deleted

Therefore, SSC inside containment are designed to withstand a postulated CRDM missile, even though this event is deemed non-credible.

A COL applicant that references the U.S. EPR design certification will describe essential elements of a program ~~controls~~ to confirm that unsecured maintenance equipment, including that required for maintenance and that are undergoing maintenance, will be removed from containment prior to operation, moved to a location where it is not a potential hazard to safety-related SSC, or seismically restrained to prevent it from becoming a missile.

3.5.1.3 Turbine Missiles

The turbine~~plant~~ layout, as shown in Figure 1.2-37~~1~~ in Section 1.2, is a longitudinal arrangement for the turbine generators. The axis of the turbine rotor shafts is positioned such that safety-related structures, except for two of the four ESWBs ~~and two EPGBs~~, are located outside the turbine low-trajectory hazard zone, as defined by RG 1.115. Redundant safety systems are physically separated into four divisions (one in each ESWB). Only two of the ESWBs are considered "essential systems" requiring protection from turbine missiles (as defined by RG 1.115) to perform the necessary functions to safely shut down the plant.~~Redundancy of the UHS and ESW systems and the EDGs provides adequate protection for U.S. EPR safety-related systems.~~ Therefore, the turbine generator is considered unfavorably positioned, as defined by RG 1.115, because all essential SSC are not located outside the low-trajectory hazard zone. ~~favorably positioned, as defined by NUREG-0800 (Reference 10) SRP Section 3.5.1.3, because the containment and most of the safety-related SSC are located outside the low-trajectory hazard zone defined by RG 1.115.~~

Section 10.2 describes the design of the turbine generator. The probability of turbine failure resulting in ejection of the turbine rotor (or internal structure) fragments through the turbine casing, P_1, will be less than 1×10^{-5}~~4~~. In accordance with guidance provided by Reference 10, SRP Section 3.5.1.3, Table 3.5.1.3-1, an overall turbine missile safety objective for the probability of unacceptable damage resulting from turbine missiles, P_4, of less than 1×10^{-7} is satisfied with P_1 less than 1×10^{-5}~~4~~ for unfavorably oriented turbine-generators. Therefore, given the redundancy and the low probability of a turbine missile being generated, the impact of turbine-generated missiles on safety-related SSC is not safety significant. A COL applicant that references the U.S. EPR design certification will confirm the evaluation of the probability of turbine missile generation for the selected turbine generator, P_1, is less than 1×10^{-5}~~4~~ for turbine-generators unfavorably oriented. ~~with respect to containment.~~

Section 10.2 describes requirements for disk and rotor integrity, rotor material fracture toughness, overspeed protection, inspection, testing, examination, startup procedures, operation procedures, and maintenance of the turbine generator equipment. A COL

- Visual inspection and magnetic particle examination of the external faces of the discs in the area of blade attachments. If surface indications are detected, ultrasonic inspections will be performed.

- Dismantle last stage blades of the LP rotor. Magnetic particle examination of rotor fir-tree roots.

- Penetrant examination of welded plugs.

A COL applicant that references the U.S. EPR design certification will include ultrasonic examination of the turbine rotor welds or provide an analysis which demonstrates that defects in the root of the rotor welds will not grow to critical size for the life of the rotor.

10.2.4 Safety Evaluation

The TG is not safety-related and does not perform any safety-related functions.

The TG design satisfies general design criteria (GDC 4) relating to the protection of structures, systems and components (SSC) important to safety from turbine missiles. A failure in the TG package does not affect any structures, systems and components (SSC) important to safety and does not preclude safe shutdown of the reactor.

- The orientation of the U.S. EPR TG is considered to be unfavorably oriented as defined by RG 1.115 because ~~the containment and most of the safety-related~~ not all essential SSC are located outside the low-trajectory hazard zone. Turbine missiles are addressed in Section 3.5.1.3.

- The TG design includes a redundant overspeed protection system, which terminates an overspeed event prior to reaching design overspeed.

- The TG package and associated piping, valves and controls are located completely within the Turbine Building. There are no safety-related systems or components located in the Turbine Building.

- Turbine speed is continuously monitored. Alarms are issued if specified limits are exceeded.

- The turbine and its auxiliaries are manufactured, erected, tested and operated in accordance with manufacturers standard practices and applicable U.S. codes to engender high reliability of systems and the mechanical integrity of the TG package.

Normally there is no radioactivity in this system. Radioactivity is only present as a result of primary to secondary leakage in the steam generators. If steam generator tube leakage occurs, the small amount of radioactivity which may be present in the secondary system is monitored and detected by the steam generator blowdown system (refer to Section 10.4.8) and in the exhaust air system from the main condenser