

ArevaEPRDCPEm Resource

From: WELLS Russell (AREVA) [Russell.Wells@areva.com]
Sent: Friday, April 08, 2011 1:26 PM
To: Tesfaye, Getachew
Cc: CORNELL Veronica (EXTERNAL AREVA); Miernicki, Michael; BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 463, FSAR Ch. 3, Supplement 2
Attachments: RAI 463 Supplement 2 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 463 on January 27, 2011. On March 29, 2011, AREVA NP submitted Supplement 1 to provide a revised schedule for Question 03.07.03-40.

The attached file, "RAI 463 Supplement 2 Response US EPR DC.pdf" provides a technically correct and complete response to question 03.07.03-40, 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 463 Question 03.07.03-40.

The following table indicates the respective pages in the response document, "RAI 463 Supplement 2 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 463 — 03.07.03-40	2	4

The schedule for a technically correct and complete response to the remaining question is unchanged and is provided below.

Question #	Response Date
RAI 463 — 03.07.01-30	April 28, 2011

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.

3315 Old Forest Road, P.O. Box 10935

Mail Stop OF-57

Lynchburg, VA 24506-0935

Phone: 434-832-3884 (work)

434-942-6375 (cell)

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Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)
Sent: Tuesday, March 29, 2011 10:08 AM
To: 'Tesfaye, Getachew'

Cc: COLEMAN Sue (RS/NB); CORNELL Veronica (External RS/NB); BREDEL Daniel (EP/PE); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); HALLINGER Pat (EXT); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); WILLIFORD Dennis (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 463, FSAR Ch. 3, Supplement 1

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 463 on January 27, 2011.

The schedule for Question 03.07.03-40 is being revised to allow additional time for AREVA NP to interact with the NRC. The schedule for the remaining question is unchanged.

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

Question #	Response Date
RAI 463 — 03.07.01-30	April 28, 2011
RAI 463 — 03.07.03-40	April 28, 2011

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.

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From: BRYAN Martin (External RS/NB)

Sent: Thursday, January 27, 2011 3:04 PM

To: 'Tesfaye, Getachew'

Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 463, FSAR Ch. 3

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 463 Response US EPR DC.pdf" provides a schedule since a technically correct and complete response to the 2 questions can not be provided at this time.

The following table indicates the respective pages in the response document, "RAI 463 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 463 — 03.07.01-30	2	2
RAI 463 — 03.07.03-40	3	3

A complete answer is not provided for the 2 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 463 — 03.07.01-30	April 28, 2011
RAI 463 — 03.07.03-40	March 29, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Tuesday, December 21, 2010 11:14 AM
To: ZZ-DL-A-USEPR-DL
Cc: Chakravorty, Manas; Hawkins, Kimberly; Miernicki, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 463 (5280, 5281), FSAR Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on December 8, 2010, and discussed with your staff on December 16, 2010. No change is 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, excluding the time period of **December 24, 2010 thru January 3, 2011, to account for the holiday season** as discussed with AREVA NP Inc. For any RAIs that cannot be answered **within 45 days**, it is expected that a date for receipt of this information will be provided to the staff within the 40-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: 2826

Mail Envelope Properties (1F1CC1BBDC66B842A46CAC03D6B1CD41043654B7)

Subject: Response to U.S. EPR Design Certification Application RAI No. 463, FSAR Ch. 3, Supplement 2
Sent Date: 4/8/2011 1:26:23 PM
Received Date: 4/8/2011 1:27:15 PM
From: WELLS Russell (AREVA)

Created By: Russell.Wells@areva.com

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Tracking Status: None

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Files	Size	Date & Time
MESSAGE	5487	4/8/2011 1:27:15 PM
RAI 463 Supplement 2 Response US EPR DC.pdf		107068

Options

Priority: Standard

Return Notification: No

Reply Requested: No

Sensitivity: Normal

Expiration Date:

Recipients Received:

Response to

**Request for Additional Information No. 463(5280, 5281), Revision 0,
Supplement 2**

12/21/2010

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 03.07.01 - Seismic Design Parameters

SRP Section: 03.07.03 - Seismic Subsystem Analysis

Application Section: 03.07

QUESTIONS for Structural Engineering Branch 2 (ESBWR/ABWR Projects) (SEB2)

Question 03.07.03-40:**Follow Up to RAI 370, Question 03.07.03-38**

The staff has reviewed the final response to Question 03.07.03-38 and is unable to conclude that the design of a Seismic Category I structure system or component (SC I SSC) is adequately protected from the failure and possible impact by a non-SC I SSC and therefore the SC I SSC may not meet the design requirements of GDC 2.

- a. The applicant is requested to provide the basis for assuming a 15 degree impact envelope above the SC I SSC and why this is a conservative assumption.
- b. The wording under the last bullet on Page 3.7-298 of the U.S. EPR FSAR mark up is not consistent with the wording in Section 3.7.3.8.2 on page 3.7-297. In each case the issue being addressed is the same, i.e., evaluation of the impact of an SC I SSC by a non-SC I SSC. On page 3.7-297, it states that an evaluation is performed to determine that the intended safety-function of the SC I SSC is not lost as a result of the impact. This wording is acceptable to the staff. However, in the last bullet on page 3.7-298, it states an evaluation is performed to determine that unacceptable damage has not occurred to the SC I SSC. Ensuring that unacceptable damage has not occurred does not necessarily mean the intended safety-function of the SC I SSC has been preserved. As such, the applicant is requested to explain why the wording of the acceptance criteria for impact evaluation found in the second bullet on page 3.7-298 is different from that on page 3.7-297. In addition, the applicant is requested to provide specific examples of how the criteria on page 3.7-298 will be implemented in evaluating the impact of a SC I SSC by a non-SC I SSC and how the intended safety function of a SC I SSC is ensured through the use of this criteria.

Response to Question 03.07.03-40:

- a) The 15 degree impact envelope will be revised to include a six-foot buffer around the perimeter of a Seismic Category I component and extending upwards at a 45 degree angle as shown in Figure 03.07.03-40-1. The additional six-foot buffer in conjunction with a 45 degree angle is considered adequate to protect any Seismic Category I component from a missile generated by a 1 g horizontal earthquake load simultaneous with a 1 g combination of vertical earthquake and gravity load.

U.S. EPR FSAR Tier 2, Section 3.7.3.8.2 will be revised to add the impact zone criteria.

- b) U.S. EPR FSAR Tier 2, Sections 3.7.3.8 and 3.7.3.8.2 will be revised to clarify that non-Seismic Category I systems, structures, and components (SSC) located in the vicinity of Seismic Category I SSC is acceptable if an analysis demonstrates that the non-seismic SSC interaction does not result in a loss of the safety function of the Seismic Category I SSC.

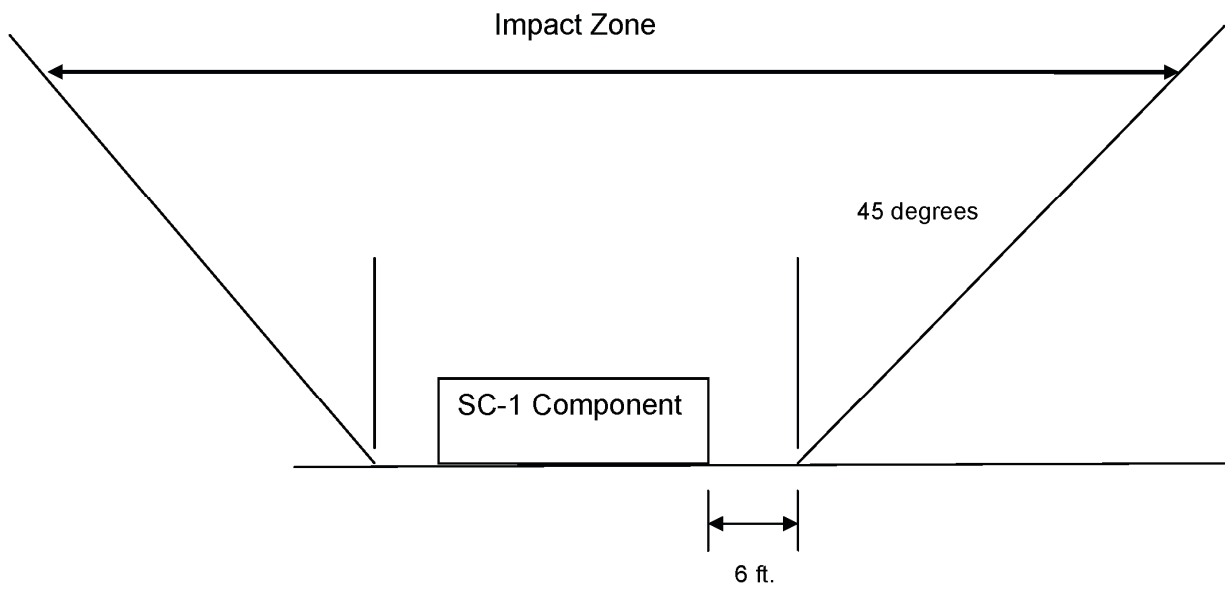
U.S. EPR FSAR Tier 2, Section 3.7.3.8, part 3 will be revised to include anchors and supports as an example of a restraint. In addition, the overturning impact zone described in U.S. EPR FSAR Tier 2, Section 3.7.3.8.2 will be revised to clarify that the impact zone includes the volume encompassed by the height of the non-Seismic Category I subsystem or component, and a radius extending from the perimeter of the non-Seismic Category I subsystem or component to 1.5 times the height of the non-Seismic Category I subsystem or component.

U.S. EPR FSAR Tier 2, Section 3.7.3.8.2, bullet four regarding the impact evaluation is redundant to the third bullet and will be deleted.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 3.7.3.8 and Section 3.7.3.8.2 will be revised as described in the response and indicated on the enclosed markup.

Figure 03.07.03-40-1—Illustration of Impact Zone Criteria



U.S. EPR Final Safety Analysis Report Markups

These modal results are combined with the low frequency modal results using the methods described in Section 3.7.3.7.1.

For multiply supported systems analyzed using ISM, the rigid range (missing mass) results will be combined with the low frequency modal results by SRSS, per Reference 8, Volume 4. All of the provisions of Reference 8 for the ISM method of analysis will be followed. For ISM, the responses in the rigid range are considered in phase and combined by algebraic summation and the total rigid response will then be combined with the modal results by SRSS.

3.7.3.8 Interaction of Non-Seismic Category I Subsystems

The U.S. EPR uses state-of-the-art computer modeling tools for design and location of structures, subsystems, equipment, and piping. These same tools are used to minimize interactions of Seismic Category I and non-Seismic Category I components, making it possible to protect Seismic Category I subsystems from adverse interactions with non-Seismic Category I subsystem components. If any part of a Seismic Category I subsystem lies within the impact zone of a non-Seismic Category I subsystem component, one of the following methods is used to prevent the Seismic Category I subsystem from losing functionality being unable to perform its safety function as a result of impact from the non-Seismic Category I component during the SSE event.

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1. The ~~two components~~ Seismic Category I subsystems are isolated from ~~one another~~ non-Seismic Category I subsystems so that interaction does not occur.
2. The Seismic Category I subsystem is analyzed to confirm that the ability to perform its safety function is not lost as a result of impact from a non-Seismic Category I component during the SSE event. An impact analysis assumes the non-Seismic Category I component falls from a static state and impacts the Seismic Category I component concurrent with SSE loading. Impact loads are determined in accordance with SRP 3.5.3.H.2 according to appropriate energy methods and locally added to the analyzed stress of the Seismic Category I subsystem for load combinations that include seismic. Code allowables for the Seismic Category I subsystem with the additional impact load shall not be exceeded. This method shall not be used for vibratory sensitive Seismic Category I subsystems, including equipment qualified by vibration testing. Isolation or application of a restraint system shall be used for vibratory sensitive Seismic Category I subsystems.
3. A restraint system is used to verify that no interaction occurs between the Seismic Category I subsystem and the non-Seismic Category I subsystem. Non-Seismic Category I subsystems located in the MCR are supported to Seismic Category I criteria. The restraint system is designed to Seismic Category I standards and qualifications and is classified as Seismic Category II. Examples of restraint systems are anchors, supports, barriers, lanyards, or shields.

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For non-Seismic Category I subsystems attached to Seismic Category I subsystems, the dynamic effects of the non-Seismic Category I subsystem are accounted for in the

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modeling of the Seismic Category I subsystem. The attached non-Seismic Category I subsystem is classified as Seismic Category II and is designed to not result in a loss of the safety function ~~cause failure~~ of the Seismic Category I subsystem during a seismic event. Section 3.7.3.3 describes decoupling criteria used to determine if the flexibility of the non-Seismic Category I subsystem is included in the subsystem model.

Seismic Category I subsystem design requirements extend to the first seismic restraint beyond the system boundary with non-Seismic Category I subsystems. In addition, the following requirements must be met:

- If the first seismic restraint beyond the Seismic Category I subsystem boundary is an anchor restraining the Category I subsystem in the six degrees of freedom, the analysis model includes the Category I system and any extended portion of the system which is Category II up to the anchor defining the analysis boundary. The subsystem components within the analysis boundary will be designed to Seismic Category I requirements. Loads from the non-Seismic Category I subsystem will be developed as described in Section 5.5 of Reference 1.
- If the first seismic restraint cannot be an anchor, the non-Seismic Category I subsystem and supports beyond this location that affect the Seismic Category I subsystem dynamic analysis are classified Seismic Category II, included in the model, and designed to the same requirements as Seismic Category I components. Loads from the non-Seismic Category I subsystem will be developed as described in Section 5.5 of Reference 1.

Boundary conditions of the model at the Seismic Category I to non-Seismic Category I interface are described in Section 5.5 of Reference 1.

3.7.3.8.1 Isolation of Seismic Category I and Non-Seismic Category I Subsystems

Isolation of Seismic Category I and non-Seismic Category I subsystems is provided by geographical separation. Isolation eliminates the interaction effects that must be considered for a Seismic Category I subsystem and minimizes the overall number of impact analyses performed and restraint systems needed to prevent interaction.

Several routing considerations are used to isolate Seismic Category I and non-Seismic Category I subsystems. When possible, non-Seismic Category I SSC are not routed in rooms containing safety-related SSC. If a non-Seismic Category I SSC can not be completely separated from Seismic Category I SSC, then the non-Seismic Category I SSC must be restrained or an analysis must be performed to verify that the functionality of the Seismic Category I SSC is maintained if impacted by the non-Seismic Category I component during a seismic event.

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3.7.3.8.2 Interaction Evaluation

Unrestrained, non-Seismic Category I SSC may be located in the vicinity of ~~safety-related~~ Seismic Category I SSC provided an impact evaluation is performed and it is

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determined that ~~functionality~~ the safety function of the ~~safety-related~~ Seismic Category I SSC is not lost as a result of impact. In this evaluation, the non-Seismic Category I components are assumed to fall or overturn as a result of a seismic event. Any safety-related subsystem or component which may be impacted by the non-Seismic Category I component is identified as an interaction target and is evaluated to establish that there is no loss of ability to perform its ~~safety-related~~ function.

The following assumptions and guidelines are used to evaluate non-Seismic Category I and Seismic Category I interactions, resulting from an SSE seismic event:

- The non-Seismic Category I subsystem or component (source) is assumed to fail instantaneously at every connection allowing each section to fall or overturn independently.
- The fall trajectory or overturning of the source is evaluated for potential impacts. Impact is assumed for non-Seismic Category I subsystem or components within an impact evaluation zone around the safety-related system or component. If the falling or overturning source is outside of the impact zone, no interaction occurs. Otherwise, the falling or overturning source could potentially impact the target.

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The impact zone is defined by the volume extending in such a way that it is wholly or partially within a ~~15-degree angle from the vertical extending from each side~~ 45-degree angle beginning six feet beyond the perimeter of the Seismic Category I subsystem or component. The impact zone for overturning includes the volume encompassed by the height of the non-Seismic Category I subsystem or component and a radius extending from the perimeter of the non-Seismic Category I subsystem or component to 1.5 times the height of the non-Seismic Category I subsystem or component. The impact evaluation zone does not need to extend beyond Seismic Category I structures (e.g., walls or slabs).

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- The parameters of the target are evaluated to determine if it has significant structural integrity to withstand impact without loss of ability to perform its ~~safety-related~~ function.

- ~~The energy of the source impacting the target is evaluated to determine if the energy level is low enough not to cause adverse impact on the target.~~

Unrestrained, non-Seismic Category I SSC located in the vicinity of ~~safety-related~~ Seismic Category I SSC is acceptable if an analysis demonstrates that the weight and configuration of the non-Seismic Category I SSC, relative to the target, and the trajectory of the falling non-seismic SSC interaction does not cause unacceptable damage to result in a loss of the safety function of the safety-related Seismic Category I SSC. Otherwise, the non-Seismic Category I SSC present a hazard, and are relocated or restrained.

3.7.3.9 Multiply-Supported Equipment and Components with Distinct Inputs

The criteria presented are primarily applicable to distribution subsystems that span between multiple locations within a structure or between locations in different