

ArevaEPRDCPEm Resource

From: Wunder, George
Sent: Monday, January 27, 2014 11:21 AM
To: ArevaEPRDCPEm Resource
Subject: FW: Response to U.S. EPR Design Certification Application FINAL RAI 587, Chapter 3, Supplement 2
Attachments: RAI 587 Supplement 2 Response US EPR DC.pdf

From: RYAN Tom (AREVA) [mailto:Tom.Ryan@areva.com]
Sent: Monday, January 27, 2014 8:24 AM
To: Wunder, George
Cc: HOTTLE Nathan (AREVA); GUCWA Len (EXTERNAL AREVA); UYEDA Graydon (AREVA); RANSOM Jim (AREVA); LEIGHLITER John (AREVA); WILLIFORD Dennis (AREVA); RYAN Tom (AREVA); ROMINE Judy (AREVA); DELANO Karen (AREVA); WILLS Tiffany (AREVA); BALLARD Bob (AREVA); SCHMITT Tim (AREVA); LOSEKE Brian (AREVA); Miernicki, Michael
Subject: Response to U.S. EPR Design Certification Application FINAL RAI 587, Chapter 3, Supplement 2

George,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 587 on July 23, 2013. On September 30, 2013, AREVA provided a response to the one question.

The attached file, "RAI 587 Supplement 2 Response US EPR DC.pdf" provides a technically correct, complete and final revised response to Question 03.07.02-79, as committed. Appended to this file are the affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 587 Question 03.07.02-79. This response incorporates NRC feedback.

The following table indicates the respective pages in the response document, "RAI 587 Supplement 2 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 587 — 03.07.02-79	2	3

This concludes the formal AREVA NP response to RAI 587, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Nathan Hottle

AREVA Inc.

3315 Old Forest Road

Lynchburg, VA 24501

Phone 434-832-3864

Mobile 434-485-4239

nathan.hottle@areva.com

From: HOTTLE Nathan (EP/PE)
Sent: Monday, September 30, 2013 4:27 PM
To: michael.miernicki@nrc.gov
Cc: GUCWA Len (External RS/NB); UYEDA Graydon (EP/PE); RANSOM Jim (RS/NB); LEIGHLITER John (RS/NB); LOSEKE Brian (EP/PE); DELANO Karen (RS/NB); ROMINE Judy (RS/NB)
Subject: Response to U.S. EPR Design Certification Application FINAL RAI 587, Chapter 3, Supplement 1

Mike,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 587 on July 23, 2013.

The attached file, "RAI 587 Supplement 1 Response US EPR DC.pdf" provides a technically correct, complete and final response to Question 03.07.02-79, as committed. Appended to this file are the affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 587 Question 03.07.02-79.

The following table indicates the respective pages in the response document, "RAI 587 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 587 — 03.07.02-79	2	3

This concludes the formal AREVA NP response to RAI 587, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Nathan Hottle

AREVA Inc.
3315 Old Forest Road
Lynchburg, VA 24501
Phone 434-832-3864
Mobile 434-485-4239
nathan.hottle@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, July 23, 2013 6:17 PM
To: Amy.Snyder@nrc.gov
Cc: Michael.Miernicki@nrc.gov; ANDERSON Katherine (External AREVA NP INC.); DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); MONTAGUE Kelvin (External AREVA NP INC.)
Subject: Response to U.S. EPR Design Certification Application FINAL RAI 587, Chapter 3

Amy,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 587 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the single question cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 587 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 587 — 03.07.02-79	2	2

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

Question #	Advanced Response Date	NRC Comment Request Date	Final Response Date
RAI 587 — 03.07.02-79	August 30, 2013	September 18, 2013	September 30, 2013

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

Phone: 704-805-2223

Email: Dennis.Williford@areva.com

From: Snyder, Amy [<mailto:Amy.Snyder@nrc.gov>]

Sent: Tuesday, June 25, 2013 8:16 AM

To: ZZ-DL-A-USEPR-DL

Cc: Miernicki, Michael; Segala, John; Xu, Jim

Subject: U.S. EPR Design Certification Application FINAL RAI 587, Chapter 3

Attached please find the subject request for additional information (RAI). A draft RAI was provided to you on June 25, 2013. On June 24, 2013, you informed us that the draft RAI does not contain proprietary information and that the draft RAI is clear and no further clarification is needed. As result, the RAI was not changed.

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 or July 25, 2013**, 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.

Thank You,

Amy

Amy Snyder, U.S. EPR Design Certification Lead Project Manager

Licensing Branch 1 (LB1)

Division of New Reactor Licensing

Office of New Reactors

U.S. Nuclear Regulatory Commission

 Office: (301) 415-6822

 Fax: (301) 415-6406

 Mail Stop: T6-C20M

 E-mail: Amy.Snyder@nrc.gov

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 4777

Mail Envelope Properties (DAC719623E968245BD52D0369611110001AB51FA2A90)

Subject: FW: Response to U.S. EPR Design Certification Application FINAL RAI 587, Chapter 3, Supplement 2
Sent Date: 1/27/2014 11:20:52 AM
Received Date: 1/27/2014 11:20:55 AM
From: Wunder, George

Created By: George.Wunder@nrc.gov

Recipients:
"ArevaEPRDCPEm Resource" <ArevaEPRDCPEm.Resource@nrc.gov>
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MESSAGE	6359	1/27/2014 11:20:55 AM
RAI 587 Supplement 2 Response US EPR DC.pdf		165735

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

Response to

Request for Additional Information No.587, Supplement 2

6/25/2013

U.S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 03.07.02 - Seismic System Analysis

Application Section: 3.7.2

Question 03.07.02-79:

Follow-up Question to RAI 370 Question 03.07.02-64

In its review of AREVA's response to RAI 370 Question 03.07.02-64, Supplement 24, the staff has identified a number of technical errors as described below.

1. In Attachment B of the response, there is an error on page 28 of 39. In the equation for allowable bearing capacity where shear wave velocities exceed 500 m/sec, a term s_v has been left out which results in an over-prediction on page 29 of the allowable bearing capacity for soil type 4ue. AREVA should also check the allowable bearing capacity for soil case 2sn4ue. In addition, the bearing capacity upper limit of 30.6 times the unit weight is applicable when V_s exceeds 2000 m/sec not 500 m/sec.
2. In the FSAR markup on page 3.7-123, the third paragraph states:

"Bounding analysis cases, using the Table 3.7.1-6 soil cases, are performed for sliding and overturning using the model previously described to demonstrate that..."

It requires that COLs should perform bounding analyses using DC generic soil cases in Table 3.7.1-6. This is inconsistent with the requirements for COL site-specific analysis to demonstrate structural stability. A suggested revision to this paragraph is:

"Bounding analysis cases, ~~using the Table 3.7.1-6 soil cases,~~ are to be performed for sliding and overturning using the model previously described to demonstrate that..."

The staff requests that the applicant provide corrections of these technical errors in the response to RAI 370 Question 03.07.02-64 and associated FSAR markup.

Response to Question 03.07.02-79:***Item 1:***

Allowable bearing pressure for soil case 4uem and 2sn4uem were recalculated based on the revised equations. NAB stability analyses for these soil cases were done with updated allowable bearing pressures to calculate the stability parameters described in RAI 370, Question 03.07.02--64. Factor of safety against seismic interaction between NI and NAB were recalculated for these soil cases. The response to RAI 370 Question 03.07.02-64 was updated in Supplement 25 for the stability parameters and factor of safety against seismic interaction.

Item 2:

The information added in the Response to RAI 370 to U.S. EPR FSAR Tier 2, Section 3.7.2.8 in the Overturning Analysis paragraph, is a description of the design certification analysis activities performed for the standard soil cases in Table 3.7.1-6. The analyses performed for design certification demonstrates an acceptable minimum separation distance between the NI and NAB.

Combined License (COL) Item 2.5-13, located in U.S. EPR FSAR Tier 2, Section 2.5.4.10.1 requires the COL applicant to perform a site specific analysis to determine the bearing pressure demand and peak displacement of the NAB. U.S. EPR FSAR Tier 2, Table 1.8-2 is updated for

COL Item 2.5-13, to remove the reference to U.S. EPR FSAR Tier 2, Section 3.7.2.8. The NAB overturning analysis described in U.S. EPR FSAR Tier 2, Section 3.7.2.8 will be revised to add clarification for actions required by the COL applicant to address this requirement. The NAB overturning analysis described in US EPR FSAR Tier 2, Section 3.7.2.8 will be revised to remove the discussion of the bearing pressure evaluation in the second bullet and combine the first bullet with the introductory paragraph.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 1.8-2, and Section 3.7.2.8 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 7 of 40**

Item No.	Description	Section
2.5-9	A COL applicant that references the U.S. EPR design certification will reconcile the site-specific soil and backfill properties with those used for design of U.S. EPR Seismic Category I structures and foundations described in Section 3.8	2.5.4.2
2.5-10	A COL applicant that references the U.S. EPR design certification will investigate and determine the uniformity of the soil layer(s) underlying the foundation basemats of Seismic Category I structures.	2.5.4.10.3
2.5-11	Deleted.	Deleted
2.5-12	A COL applicant that references the U.S. EPR design certification will provide an assessment of predicted settlement values across the basemat of Seismic Category I structures during and post construction. The assessment will address both short term (elastic) and long term (heave and consolidation) settlement effects with the site-specific soil parameters, including the soil loading effects from adjacent structures.	2.5.4.10.2
2.5-13	A COL applicant that references the U.S. EPR design certification will perform a site-specific analysis to determine the bearing pressure demand and peak displacement of the NAB. The foundation soils beneath the NAB foundation basemat shall have the capacity to support the bearing pressure with a factor of safety of 3.0 under static conditions, or 2.0 under combined static and dynamic conditions, whichever is greater. The minimum required separation distance is a factor of two times the calculated absolute sum of the maximum combined site-specific NAB and U.S. EPR NI design displacements, but not less than 30 inches.	2.5.4.10.1 3.7.2.8
3.1-1	A COL applicant that references the U.S. EPR design certification will identify the site-specific QA Program Plan that demonstrates compliance with GDC-1.	3.1.1.1.1
3.2-1	A COL applicant that references the U.S. EPR design certification will identify the seismic classification of applicable site-specific SSC that are not identified in Table 3.2.2-1.	3.2.1
3.2-2	A COL applicant that references the U.S. EPR design certification will identify the quality group classification of site-specific pressure-retaining components that are not identified in Table 3.2.2-1.	3.2.2

structures. Section 2.5.4.10.1 describes the criteria for the separation distance between the NI and NAB.

Sliding Analysis

The bounding soil case will produce the most displacement when the frictional resistance available is low, forcing more of the seismic motion energy into sliding the building.

A bilinear coefficient of friction of $\mu = 0.5$ static and $\mu = 0.25$ dynamic are analyzed.

Overtaking Analysis

The bounding soil case will produce the most displacement when the frictional coefficient is high forcing more of the seismic motion energy into rocking the building.

A coefficient of friction of $\mu = 0.7$ is used to maximize the uplift.

Bounding analysis cases, ~~using the Table 3.7.1-6 soil cases,~~ are performed for sliding and overturning using the model previously described to demonstrate that the combination of rotational and translational displacements does not close the NI to NAB shake space resulting in structure-to-structure contact. A minimum safety factor of 3.0 is determined when flexural and shear stiffness of the NAB superstructure is reduced to 50%. A minimum safety factor of 2.4 is determined when flexural and shear stiffness of NAB superstructure is reduced to 50% as well as consideration of additional lateral movement of the NAB due to redistribution of high corner bearing pressure.

- ~~The combination of rotational and translational displacements does not close the NI to NAB shake space resulting in structure to structure contact. A minimum safety factor of 3.0 is determined when flexural and shear stiffness of the NAB superstructure is reduced to 50%. A minimum safety factor of 2.4 is determined when flexural and shear stiffness of NAB superstructure is reduced to 50% as well as consideration of additional lateral movement of the NAB due to redistribution of high corner bearing pressure.~~
- ~~Bearing pressure demands calculated at the concrete to soil interface are less than or equal to the calculated capacities using the principles of soil mechanics. Section 2.5.4.10.1 lists the safety factors to be used in the calculations.~~

Bearing pressure demands at the NAB concrete-to-soil interface will be determined by site-specific analysis by the COL applicant who will also determine the gap closure between the NI and NAB per Section 2.5.4.10.1. Section 2.5.4.10.1 provides the safety factors to be used by the COL applicant in bearing pressure calculations as well as the separation criteria for the gap between the NI and the NAB.