

ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Thursday, May 26, 2011 3:30 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); CORNELL Veronica (EXTERNAL AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 9
Attachments: RAI 370 Supplement 9 Response US EPR DC - INTERIM.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 370 on April 26, 2010. AREVA NP submitted Supplement 1 and Supplement 2 to the response on June 8, 2010 and June 24, 2010, respectively, to provide a schedule for the remaining 4 questions. AREVA NP submitted Supplement 3 to the response on August 10, 2010, to provide final responses to Questions 03.07.02-64 and 03.07.02-65. AREVA NP submitted Supplement 4 to the response on September 2, 2010, to provide a final response to Question 03.07.03-38. On November 15, 2010, AREVA NP submitted Supplement 5 to provide a supplemental INTERIM response and a FINAL response schedule for Question 03.07.02-64. AREVA NP submitted Supplement 6 to the response on February 11, 2011, to provide a revised schedule for Question 03.07.01-27 and Question 03.07.02-64. On February 25, 2011, AREVA NP submitted Supplement 7 to provide a revised INTERIM response to Question 03.07.02-64. AREVA NP submitted Supplement 8 to the response on May 2, 2011, to provide a revised schedule for Question 03.07.01-27 and Question 03.07.02-64.

The attached file, "RAI 370 Supplement 9 Response US EPR DC-INTERIM.pdf" provides a technically correct and revised INTERIM response to Question 03.07.02-64. The following table indicates the pages in the response document, "RAI 370 Supplement 9 Response US EPR DC-INTERIM.pdf" that contains AREVA NP's revised INTERIM response to the subject question.

Question #	Start Page	End Page
RAI 370 — 03.07.02-64	2	4

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

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.01-27	NA	December 28, 2011
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual) May 25, 2011 (Actual)	September 23, 2011

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: WELLS Russell (RS/NB)
Sent: Monday, May 02, 2011 10:30 AM
To: Tesfaye, Getachew
Cc: CORNELL Veronica (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 8

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 370 on April 26, 2010. AREVA NP submitted Supplement 1 and Supplement 2 to the response on June 8, 2010 and June 24, 2010, respectively, to provide a schedule for the remaining 4 questions. AREVA NP submitted Supplement 3 to the response on August 10, 2010, to provide final responses to Questions 03.07.02-64 and 03.07.02-65. AREVA NP submitted Supplement 4 to the response on September 2, 2010, to provide a final response to Question 03.07.03-38. On November 15, 2010, AREVA NP submitted Supplement 5 to provide a supplemental INTERIM response and a FINAL response schedule for Question 03.07.02-64. AREVA NP submitted Supplement 6 to the response on February 11, 2011, to provide a revised schedule for Question 03.07.01-27 and Question 03.07.02-64. On February 25, 2011, AREVA NP submitted Supplement 7 to provide a revised INTERIM response to Question 03.07.02-64.

Due to changes in the schedule for FSAR Sections 3.7 and 3.8 as discussed with NRC, the schedule for Questions 03.07.01-27 and 03.07.02-64 is being revised.

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

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.01-27	NA	December 28, 2011
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual)	September 23, 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)
Fax: 434-382-3884
[*Russell.Wells@Areva.com*](mailto:Russell.Wells@Areva.com)

From: WELLS Russell (RS/NB)
Sent: Friday, February 25, 2011 5:24 PM
To: Tesfaye, Getachew
Cc: BRYAN Martin (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); CORNELL Veronica (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, Supplement 7, FSAR Ch. 3

Getachew,

AREVA NP Inc. letter NRC 11:018 dated February 25, 2011 provides a provides a revised supplemental INTERIM response to question 03.07.02-64. AREVA NP considers some of the material contained in the response to be proprietary information. As required by 10 CFR 2.390(b), an affidavit is provided to support the withholding of the proprietary information from public disclosure. Proprietary and non-proprietary versions of the enclosure to this letter are provided separately.

The following table indicates the page in the response document, "RAI 370 Supplement 7 Response US EPR DC-INTERIM.pdf" that contains AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 370 — 03.07.02-64	2	36

The response schedule for the remaining questions is unchanged and is shown below.

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual)	May 13, 2011
RAI 370 - 03.07.01-27	NA	July 22, 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)

Fax: 434-382-3884

Russell.Wells@Areva.com

From: BRYAN Martin (External RS/NB)

Sent: Friday, February 11, 2011 1:37 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. 370, FSAR Ch. 3, Supplement 6

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 370 on April 26, 2010. AREVA NP submitted Supplement 1 and Supplement 2 to the response on June 8, 2010 and June 24, 2010, respectively, to provide a schedule for the remaining 4 questions. AREVA NP submitted Supplement 3 to the response on August 10, 2010, to provide final responses to Questions 03.07.02-64 and 03.07.02-65. AREVA NP submitted Supplement 4 to the response on September 2, 2010, to provide a final response to Question 03.07.03-38. On November 15, 2010, AREVA NP submitted Supplement 5 to provide a new schedule for a supplemental INTERIM response and FINAL response to Question 03.07.02-64.

The schedule for the revised INTERIM response and FINAL response to Question 03.07.02-64 has changed. In addition, the schedule for Question 03.07.01-27 has changed.

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

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011	May 13, 2011
RAI 370 - 03.07.01-27	NA	July 22, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Monday, November 15, 2010 4:36 PM
To: 'Tesyfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB); 'Miernicki, Michael'
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 5, Part 2 of 2

Getachew,

Attached is Part 2 of 2 for the INTERIM response to RAI 370 Question 03.07.02-64.

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Monday, November 15, 2010 4:32 PM
To: 'Tesyfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB); 'Miernicki, Michael'
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 5, Part 1 of 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 370 on April 26, 2010. AREVA NP submitted Supplement 1 and Supplement 2 to the response on June 8, 2010 and June 24, 2010, respectively, to provide a schedule for the remaining 4 questions. AREVA NP submitted Supplement 3 to the response on August 10, 2010, to provide final responses to Questions 03.07.02-64 and 03.07.02-65. AREVA NP submitted Supplement 4 to the response on September 2, 2010, to provide a final response to Question 03.07.03-38.

The schedule for Supplemental INTERIM and FINAL responses to Question 03.07.02-64 is added to provide additional information on the potential for seismic interaction between the Nuclear Auxiliary Building and Seismic Category I structures. The attached file, "RAI 370 Supplement5 Response US EPR DC-INTERIM.pdf" provides a technically correct and complete INTERIM response to Question 03.07.02-64. Because of the file size, this response is being transmitted in two parts. The schedule for the remaining question is unchanged.

Appended to "part 2 of 2" of this file (transmitted separately) is the affected page of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 370 Supplement 5.

The following table indicates the respective pages in the response document, "RAI 370 Supplement 5 Response US EPR DC-INTERIM," that contain the AREVA NP response to the subject question.

Question #	Start Page	End Page
RAI 370 - 03.07.02-64	2	19

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

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.02-64	November 15, 2010 (Actual)	February 15, 2011
RAI 370 - 03.07.01-27	NA	May 18, 2011

Sincerely,

Martin (Marty) C. Bryan
 U.S. EPR Design Certification Licensing Manager
 AREVA NP Inc.
 Tel: (434) 832-3016
 702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Thursday, September 02, 2010 5:41 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB); Miernicki, Michael
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 4

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 370 on April 26, 2010. AREVA NP submitted Supplement 1 and Supplement 2 to the response on June 8, 2010 and June 24, 2010, respectively, to provide a schedule for the remaining 4 questions. AREVA NP submitted Supplement 3 to the response on August 10, 2010, to provide final responses to Questions 03.07.02-64 and 03.07.02-65.

The attached file, "RAI 370 Supplement 4 Response US EPR DC.pdf" provides a technically correct and complete response to Question 03.07.03-38, as committed. The schedule for the remaining question is unchanged.

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 370 Supplement 4.

The following table indicates the respective pages in the response document, "RAI 370 Supplement 4 Response US EPR DC," that contain the AREVA NP response to the subject question.

Question #	Start Page	End Page
RAI 370 - 03.07.03-38	2	3

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

Question #	Response Date
RAI 370-03.07.01-27	May 18, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Tuesday, August 10, 2010 6:44 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 3

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 370 on April 26, 2010. AREVA NP submitted Supplement 1 and Supplement 2 to the response on June 8, 2010 and June 24, 2010, respectively, to provide a schedule for the remaining 4 questions.

Because the response file contains security-related sensitive information that should be withheld from public disclosure in accordance with 10 CFR 2.390, a public version is provided with the security-

related sensitive information redacted. This email and attached file do not contain any security-related information. An unredacted security-related version is provided under separate email.

The attached file, "RAI 370 Supplement 3 Response US EPR DC-PUBLIC.pdf" provides technically correct and complete responses to Questions 03.07.02-64 and 03.07.02-65, as committed.

The schedule for Question 03.07.03-38 is being revised to allow additional time for AREVA NP to address NRC comments. The schedule for Question 03.07.01-27 question is unchanged.

The following table indicates the respective pages in the response document, "RAI 370 Supplement 3 Response US EPR DC -PUBLIC," that contain the AREVA NP response to the subject questions.

Question #	Start Page	End Page
RAI 370 - 03.07.02-64	2	3
RAI 370 - 03.07.02-65	4	7

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

Question #	Response Date
RAI 370-03.07.01-27	May 18, 2011
RAI 370-03.07.03-38	September 2, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Thursday, June 24, 2010 12:31 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); CORNELL Veronica (EXT); VAN NOY Mark (EXT); RYAN Tom (AREVA NP INC); GARDNER George Darrell (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 370 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 8, 2010, to provide a schedule for the remaining 4 questions, which were affected by the work underway to address NRC comments from the April 26, 2010, audit.

Based upon the civil/structural re-planning activities and revised RAI response schedule presented to the NRC during the June 9, 2010, Public Meeting, and to allow time to interact with the NRC on the responses, the schedule has been changed.

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

Question #	Response Date
RAI 370-03.07.01-27	May 18, 2011
RAI 370-03.07.02-64	August 10, 2010
RAI 370-03.07.02-65	August 10, 2010
RAI 370-03.07.03-38	August 10, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Tuesday, June 08, 2010 3:57 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); VAN NOY Mark (EXT); CORNELL Veronica (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 1

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 370 on April 26, 2010.

The schedule for question 03.07.01-27 is not being changed by this supplement. The schedule for Questions 03.07.02-64, 03.07.02-65 and 03.07.03-38 has been changed. The dates for the 4 remaining questions will be evaluated and revised, as necessary, based on the information that will be presented at the June 9, 2010, public meeting and subsequent NRC feedback.

Question #	Response Date
RAI 370-03.07.01-27	August 3, 2010
RAI 370-03.07.02-64	July 8, 2010
RAI 370-03.07.02-65	July 8, 2010
RAI 370-03.07.03-38	July 8, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016

702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Monday, April 26, 2010 1:18 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); RYAN Tom (AREVA NP INC); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 370 Response US EPR DC.pdf" provides technically correct and complete responses to 1 of the 5 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 370 Question 03.07.03-39.

The following table indicates the respective pages in the response document, "RAI 370 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 370 - 03.07.01-27	2	2
RAI 370 -03.07.02-64	3	3
RAI 370 -03.07.02-65	4	5
RAI 370 -03.07.03-38	6	6
RAI 370 -03.07.03-39	7	8

A complete answer is not provided for 4 of the 5 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 370 - 03.07.01-27	August 3, 2010
RAI 370 -03.07.02-64	June 10, 2010
RAI 370 -03.07.02-65	June 10, 2010
RAI 370 -03.07.03-38	June 10, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Thursday, March 25, 2010 2:00 PM
To: ZZ-DL-A-USEPR-DL

Cc: Chakravorty, Manas; Hawkins, Kimberly; Miernicki, Michael; Patel, Jay; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 370 (4292,4272,4275), FSAR Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on February 18, 2010, and on March 24, 2010, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. 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: 3035

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D4727CE8)

Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 9
Sent Date: 5/26/2011 3:29:54 PM
Received Date: 5/26/2011 3:30:09 PM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

Recipients:

"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>

Tracking Status: None

"DELANO Karen (AREVA)" <Karen.Delano@areva.com>

Tracking Status: None

"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>

Tracking Status: None

"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>

Tracking Status: None

"CORNELL Veronica (EXTERNAL AREVA)" <Veronica.Cornell.ext@areva.com>

Tracking Status: None

"Tsfaye, Getachew" <Getachew.Tsfaye@nrc.gov>

Tracking Status: None

Post Office: auscharm02.adom.ad.corp

Files	Size	Date & Time
MESSAGE	21333	5/26/2011 3:30:09 PM
RAI 370 Supplement 9 Response US EPR DC - INTERIM.pdf		81130

Options

Priority: Standard

Return Notification: No

Reply Requested: No

Sensitivity: Normal

Expiration Date:

Recipients Received:

Response to

Request for Additional Information No. 370, Supplement 9

3/25/2010

U.S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 03.07.01 - Seismic Design Parameters

SRP Section: 03.07.02 - Seismic System Analysis

SRP Section: 03.07.03 - Seismic Subsystem Analysis

Application Section: 03.07

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

Question 03.07.02-64:**Follow Up to RAI 248, Question 03.07.02-53:**

The applicant has proposed utilizing a lateral-force resisting system (LFRS) with a controlled collapse zone as the design basis for the NAB under an SSE event. In order for the staff to evaluate the acceptability of this design feature and whether it meets Acceptance Criteria 8 of SRP 3.7.2, the staff is requesting the following additional information:

1. The design codes applicable to the LFRS and the controlled collapse zone.
2. A detailed description of the LFRS and the controlled collapse zone.
3. Figures that depict the physical dimensions of the LFRS and the collapse zone of the NAB.
4. A description of the loads and the loading combinations applicable to each portion of the building.
5. A description of the methods used to control the collapse of the non-seismic portion of the NAB in such a way that the collapse zone does not impact a Category I structure or reduce the structural integrity of the LFRS.
6. A description of the seismic analysis method including assumptions, description of the model, description and point of application of the seismic input, and a description of how the seismic loads are determined and applied to the NAB structure.
7. A description of the method used to calculate the seismic displacement of the NAB from which it is concluded that the gap between the NAB and Safeguard building (SB4) and the gap between the NAB and Fuel Building is sufficient to prevent an interaction with these adjacent Category I structures.
8. The results of an analysis that demonstrates that the NAB does not slide or overturn into adjacent Category I structures.
9. The interaction between the LFRS and the controlled collapse zone including the collapse or impact loads that are expected to be applied to the LFRS by the collapse zone.
10. The interaction between the NAB and the RWB including a detailed description of how the NAB prevents an indirect transfer of load from the RWB to Seismic Category I structures. Include in your response a description of the loads that will be transmitted to the NAB by a failure of the RWB and describe how these loads will be accounted for in the design of the LFRS.
11. Examples of a LFRS and collapse zone design concept used in the seismic design of structures that have been built especially structures at nuclear power plants.

Response to Question 03.07.02-64:

AREVA NP submitted responses to Items 1 through 6, and Items 9 through 11 in RAI 370, Supplement 3, dated August 10, 2010. This response addresses RAI 370, Items 7 and 8 regarding the methodology for Nuclear Auxiliary Building (NAB) stability analysis, including the potential for the NAB to interact with Seismic Category I structures. Building displacements for the Nuclear Island (NI) and NAB will be included in the final response.

Item 7:

The NAB (Seismic Category II) stability and interaction potential with the NI (Seismic Category I) will be evaluated by time-history analysis performed on a 3D finite element model (FEM) of the structure using the ANSYS computer code. The 3D FEM represents the superstructure, foundation mat, and the nonlinearity associated with the mat to soil interface. Nonlinearities explicitly considered are the compression only nature of the concrete/soil interface in the vertical direction and the sliding coefficient of friction between the foundation basemat and underlying soil.

Shell/beam elements are used to represent slabs, diaphragms, beams and columns in the superstructure, as appropriate. Solid elements, typically four through the thickness, represent the mat.

The foundation is modeled using springs that allow for compression only load transfer at the concrete/soil interface in the vertical direction. The sliding interface between the concrete basemat and underlying soil is modeled using sliding/contact elements that incorporate a coefficient of friction. Soil springs are derived using Gazetas methodology presented in "Foundation Vibrations," Foundation Engineering Handbook, 2nd Edition, H.Y. Fang, Ed., Van Nostrand Reinholds, Chapter 15, pp.553-593,1991 (Reference 1). Spring distribution is uniform over the plan area of the basemat.

The concrete only mass of the structure is accounted for through the use of the material weight density associated with each finite element that forms the structure. Additional masses representing added dead loads, 25 percent of the live loads and 75 percent of the maximum precipitation loads are included in the analysis. The buoyant effects of the groundwater are also included. Seismic motions are applied at the base of the structure. Side wall soil driving/resisting forces are not modeled.

Bounding analysis cases, using the U.S. EPR FSAR Tier 2, Table 3.7.1-6 soils cases, will be performed for sliding and overturning using the model described above to demonstrate that:

- The combination of rotational and translational displacements do not result in structure to structure contact between NI to NAB.
- Bearing pressure demands calculated at the concrete to soil interface are consistent with the range of allowable capacities given in engineering literature for U.S. EPR soil cases.

Cracked concrete stiffness will be used for analysis. The stiffnesses will be approximated by setting Young's modulus to 50 percent of the code based values for flexure and shear. However the full value will be retained for axial stiffness calculations.

NI displacement results will be obtained and added to the NAB displacement results. The NI results are obtained from the soil structure interaction (SSI) analysis and augmented by the rigid body results from the NI stability analysis. Additionally the 1/2" in 50' tilt described in U.S. EPR FSAR Tier 2, Section 2.5.4.10.2 will be included for both structures. Absolute values of the results will be summed to produce conservative reductions in the shake space between the two structures.

Item 8:**Bounding case for sliding of the NAB**

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

The input motions used in this analysis are associated with the U.S. EPR soil cases. Additionally a motion set will be generated based on RG 1.60 target spectra anchored to a peak ground acceleration of 0.3g. Three independent motions (two horizontal and one vertical base line correct for velocity and displacement) will be created in accordance with SRP 3.7.1. The seed records will be taken from the NRC CEUS database representing a magnitude seven rich in low frequency content. These transient results will be used in lieu of the multiple time history approach required by SRP 3.7.1 and ASCE 43-05.

A bilinear coefficients of friction of $\mu = 0.5$ static and $\mu = 0.25$ dynamic will be analyzed.

Bounding case for rocking of the NAB

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

The input motions used for analysis will be the U.S. EPR FSAR Tier 2, Table 3.7.1-6 soil cases. A coefficient of friction of $\mu = 0.7$ will be used to maximize the uplift.

Factors of safety for sliding, overturning and flotation will be calculated in accordance with SRP 3.8.5 for wind, tornado, and flooding to demonstrate equivalent margin of safety with the Seismic Category 1 structures.

Reference

1. "Foundation Vibrations," Foundation Engineering Handbook, 2nd Edition, H.Y. Fang, Ed., Van Nostrand Reinholds, Chapter 15, pp.553-593,1991.

FSAR Impact:

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