ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Friday, February 17, 2012 2:54 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); CRIBB Arnie (EXTERNAL AREVA); DELANO Karen (AREVA); HATHCOCK Phillip (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); BREDEL Danny (AREVA); WILLIAMSON Rick (AREVA)
Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Question 3.7.2-64
Attachments: RAI 370 03 07 02-64 Response US EPR DC - DRAFT.pdf

Importance: High

Getachew,

Attached is a revised DRAFT response to Question 03.07.02-64 for RAI No. 370 (FSAR Ch. 3) in advance of the February 28, 2012 final date.

Let me know if the staff has any questions or if this response can be sent as final.

Thanks,

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: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, January 25, 2012 10:05 AM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); Michael.Miernicki@nrc.gov
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 15

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. On May 25, 2011, AREVA NP submitted Supplement 9 to provide a revised INTERIM response to Question 03.07.02-64.

On June 17, 2011, AREVA NP submitted Supplement 10 to provide a revised INTERIM response to Question 03.07.02-64. AREVA NP submitted Supplement 11 to the response on June 27, 2011, to provide a revised schedule for Question 03.07.02-64. AREVA NP submitted Supplement 12 to the response on October 26, 2011, to provide a revised schedule for the final response to Question 03.07.02-64 and a preliminary revised schedule to Question 03.07.01-27. AREVA NP submitted Supplement 13 on November 17, 2011, and Supplement 14 on December 14, 2011, to provide a preliminary revised schedule to Question 03.07.01-27.

The preliminary revised schedule for a technically correct and complete response to Question 03.07.01-27 has been changed as provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by February 21, 2012. The schedule for the final response to Question 03.07.02-64 remains unchanged.

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.01-27	NA	**February 21, 2012**
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual) May 26, 2011 (Actual) June 17, 2011 (Actual)	February 28, 2012

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: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, December 14, 2011 10:23 AM
To: Getachew.Tesfaye@nrc.gov
Cc: 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 14

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. On May 25, 2011, AREVA NP submitted Supplement 9 to provide a revised INTERIM response to Question 03.07.02-64. On June 17, 2011, AREVA NP submitted Supplement 10 to provide a revised INTERIM response to Question 03.07.02-64. AREVA NP submitted Supplement 11 to the response on June 27, 2011, to provide a revised schedule for Question 03.07.02-64. AREVA NP submitted Supplement 12 to the response on October 26, 2011, to provide a revised schedule for the final response to Question

03.07.02-64 and a preliminary revised schedule to Question 03.07.01-27. AREVA NP submitted Supplement 13 to the response on November 17, 2011 to provide a preliminary revised schedule to Question 03.07.01-27.

The preliminary revised schedule for a technically correct and complete response to Question 03.07.01-27 has been changed as provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by January 25, 2012. The schedule for the final response to Question 03.07.02-64 remains unchanged.

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.01-27	NA	**January 25, 2012**
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual) May 26, 2011 (Actual) June 17, 2011 (Actual)	February 28, 2012

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: WILLIFORD Dennis (RS/NB)
Sent: Thursday, November 17, 2011 6:10 PM
To: Getachew.Tesfaye@nrc.gov
Cc: 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 13

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. On May 25, 2011, AREVA NP submitted Supplement 9 to provide a revised INTERIM response to Question 03.07.02-64. On June 17, 2011, AREVA NP submitted Supplement 10 to provide a revised INTERIM response to Question 03.07.02-64. AREVA NP submitted Supplement 11 to the response on June 27, 2011, to provide a revised schedule for Question 03.07.02-64. AREVA NP submitted Supplement 12 to the response on October 26, 2011, to provide a revised schedule for the final response to Question 03.07.02-64 and a preliminary revised schedule to Question 03.07.01-27.

The preliminary revised schedule for a technically correct and complete response to Question 03.07.01-27 has been revised as provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by December 14, 2011.

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.01-27	NA	**December 14, 2011**
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual) May 26, 2011 (Actual) June 17, 2011 (Actual)	February 28, 2012

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: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, October 26, 2011 4:53 PM
To: Getachew.Tesfaye@nrc.gov
Cc: 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 12

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. On May 25, 2011, AREVA NP submitted Supplement 9 to provide a revised INTERIM response to Question 03.07.02-64. On June 17, 2011, AREVA NP submitted Supplement 10 to provide a revised INTERIM response to Question 03.07.02-64. AREVA NP submitted Supplement 11 to the response on June 27, 2011, to provide a revised schedule for Question 03.07.02-64.

The schedule for the final response to Question 03.07.02-64 has been revised, as indicated in bold below. In addition, a preliminary revised schedule for a technically correct and complete response to Question 03.07.01-27 is provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by November 17, 2011.

Question #	Interim Response Date	Response Date

RAI 370 - 03.07.01-27	NA	**November 17, 2011**
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual) May 26, 2011 (Actual) June 17, 2011 (Actual)	**February 28, 2012**

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: WILLIFORD Dennis (RS/NB)
Sent: Monday, June 27, 2011 2:02 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); CORNELL Veronica (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 11

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. On May 25, 2011, AREVA NP submitted Supplement 9 to provide a revised INTERIM response to Question 03.07.02-64. On June 17, 2011, AREVA NP submitted Supplement 10 to provide a revised INTERIM response to Question 03.07.02-64.

The schedule for the final response to Question 03.07.02-64 is being revised, as indicated in bold below. 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 #	**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 26, 2011 (Actual) June 17, 2011 (Actual)	**October 26, 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: RYAN Tom (RS/NB)
Sent: Friday, June 17, 2011 2:38 PM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); CORNELL Veronica (External RS/NB); WILLIFORD Dennis (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 10

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. On May 25, 2011, AREVA NP submitted Supplement 9 to provide a revised INTERIM response to Question 03.07.02-64.

The attached file, "RAI 370 Supplement 10 Response US EPR DC-INTERIM.pdf" provides a technically correct and revised INTERIM response to Question 03.07.02-64. 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 370 Question 03.07.02-64.

The following table indicates the pages in the response document, "RAI 370 Supplement 10 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 the technically correct and complete response to the remaining questions unchanged and 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) May 26, 2011 (Actual) **June 17, 2011 (Actual)**	September 23, 2011

Sincerely,

Tom Ryan for
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: WILLIFORD Dennis (RS/NB)
Sent: Thursday, May 26, 2011 3:30 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); CORNELL Veronica (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 9

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

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: '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 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: '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 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
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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: 3754

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D4AE95E6)

Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Question 3.7.2-64
Sent Date: 2/17/2012 2:54:09 PM
Received Date: 2/17/2012 2:53:54 PM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

Recipients:
"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>
Tracking Status: None
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Tracking Status: None
"HATHCOCK Phillip (AREVA)" <Phillip.Hathcock@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
"BREDEL Danny (AREVA)" <Daniel.Bredel@areva.com>
Tracking Status: None
"WILLIAMSON Rick (AREVA)" <Rick.Williamson@areva.com>
Tracking Status: None
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Tracking Status: None

Post Office: auscharmx02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	39727	2/17/2012 2:53:54 PM
RAI 370 03 07 02-64 Response US EPR DC - DRAFT.pdf	1832019	

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

Response to

Request for Additional Information No. 370

2/5/2012

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 LRFS 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:

RAI 370, Supplement 3 was submitted on August 10, 2010 in response to Items 1 through 6, and Items 9 through 11. This response addresses RAI 370, Question 03.07.02-64 Items 7 and 8 regarding the methodology and results for Nuclear Auxiliary Building (NAB) stability analysis and the potential for the NAB to interact with Seismic Category I structures.

Item 7:

The NAB (Seismic Category II structure) interaction potential with the nuclear island (NI) (Seismic Category I structure) is evaluated by time-history analysis performed on a 3D finite element model (FEM) of the structure using the ANSYS computer code. The three dimensional NAB FEM stability model represents the NAB superstructure, foundation mat, and the nonlinearity associated with the mat-to-soil interface. Nonlinearities are explicitly considered as 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.

The NAB superstructure is represented with Shells, Solids, and Mass elements. Shell elements are used to represent slabs and walls in the superstructure. Solid elements, four layers through the thickness, represent the NAB 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. Mass elements are used to represent the additional masses from added dead loads, 25 percent of the live loads and 75 percent of the maximum precipitation loads for this superstructure model. Cracked concrete stiffness is used for the superstructure. The cracked concrete stiffness is approximated in two ways:

a) flexural stiffness is reduced to 50 percent code value; the full value is retained for shear and axial stiffness.

b) flexural and shear stiffness is reduced to 50 percent code value; the full value is retained for axial stiffness.

Three translational and three rotational soil springs are derived using Gazetas' methodology presented in Reference 1. Dashpots for three translational directions are also calculated according to Reference 1. Springs and dashpots are developed for each soil case described in U.S. EPR FSAR Tier 2, Table 3.7.1-6. Elliptical spring distributions for each soil case are determined. The distribution methodology is the same as described in U.S. EPR FSAR Tier 2, Section 3.8.5.4.2 for the NI. The foundation is modeled using three translational springs that allow for compression-only load transfer at the concrete/soil interface in the vertical direction. Spring distributions are elliptical over the plan area of the basemat. Rotational spring values are compared with the available rotational springs from the distribution of translational springs. The sliding interface between the concrete basemat and underlying soil is modeled using surface-to-surface sliding/contact elements that incorporate a coefficient of friction and capable of switching between static to dynamic friction in the case of sliding. The buoyant effects of the groundwater are included for water level 1 foot below the ground surface.

Side wall soil springs are modeled on south and east sides in the NAB stability model using the nonlinear force deflection relationship based on at-rest, active and passive soil pressure coefficients. Side soil springs on the east side considers the surcharge loads from Radioactive Waste Processing Building.

For the purpose of NAB stability analysis, both the Certified Seismic Design Response Spectra (CSDRS), and a R.G. 1.60 based target spectra is used. The R.G. 1.60 target spectra are enhanced in the lower frequency range compared to the CSDRS. This lower frequency content is more conservative for predicting displacements.

The CSDRS include the EUR soft, medium and hard input motions, as well as the high frequency lower bound (hflb), best estimate (hfbe) and upper bound (hfub) input motions, described in U.S. EPR FSAR Tier 2, Section 3.7.1.1.

The RG 1.60 target spectra (TS) input motions are anchored to a peak ground acceleration of 0.3g. However, the time history peak ground accelerations are 0.3g in X direction, 0.36g in Y direction and 0.3g in vertical direction. Three independent motions (two horizontal and one vertical base line corrected for velocity and displacement) are created in accordance with SRP 3.7.1. These motions will be referred as "RG 1.60 TS based seismic motion". The seed records are taken from the NRC CEUS database representing a magnitude seven earthquake rich in low frequency content. These transient results are developed in accordance with the requirements of Option 1, Approach 2 of the SRP 3.7.1.

RG 1.60 TS based seismic motions are applied at the base of the springs supporting the NAB structure for 1n2ue, 2sn4ue, 4ue, 1n5ae and 5ae cases. The EUR soft, medium and hard input motions are considered for the NAB structure for 1n2ue, 2sn4ue, 4ue, 1n5ae and 5ae soil profiles. The high frequency motions are considered for the NAB structure for high frequency lower bound (hflb), best estimate (hfbe) and upper bound (hfub) soil profiles.

In-structure response spectra produced from application of the CSDRS seismic motions in the ANSYS NAB stability model are compared to those determined from application of the CSDRS motions in the SASSI NAB dynamic model to validate the stability analysis.

NAB sliding stability analysis is performed with a static coefficient of friction of 0.5 and a dynamic coefficient of friction of 0.25. The NAB overturning stability analysis is performed with a static coefficient of friction of 0.7.

The NAB stability model is used to calculate the bearing pressures as well as maximum lateral displacements of the NAB structure.

The maximum displacement of the FB and SB4 superstructure are calculated from the soil structure interaction (SSI) analysis and added to the displacement results from the NI Basemat Model analysis (see Response to RAI 371, Question 3.7.2-66). Maximum lateral displacement of FB and SB4 are added to maximum displacements of the NAB. Additionally, the ½ inch in 50 ft tilt described in U.S. EPR FSAR Tier 2, Section 2.5.4.10.2, is considered for both NI and NAB structures to calculate the reduction in gap between NAB and NI. Absolute values of the results are summed to produce conservative reductions in the shake space between the two structures and compared against the original gap of 18 inches to calculate the factor of safety against possible interaction between NI and NAB. Results of NI and NAB displacements from seismic analysis, tilt displacements, and corresponding factors of safety are shown in Table 03.07.02-64-1 and Table 03.07.02-64-2 for 50 percent reduced flexural stiffness and 50 percent reduced flexural and shear stiffness, respectively.

For NAB with 50 percent reduced flexural stiffness, NI-NAB gap reduces 8.86 inches due to seismic and tilt displacement based on the absolute value summation method. With an original gap of 18 inches between NI and NAB, a minimum factor of safety of 2.03 exists against possible interactions. However, additional consideration of 50 percent reduced shear stiffness along with 50 percent reduced flexural stiffness for NAB produces a factor of safety of 1.79. This lower factor of safety in Y direction is partly a result of the larger time history used as input motion (0.36g peak ground acceleration (PGA) used compared to the 0.3g PGA for RG 1.60

TS). This result is also based on a 50 percent reduction in shear stiffness, which is conservative. The factor of safety of 1.79 is considered adequate.

The dynamic bearing pressure demands for NAB are determined from the nonlinear NAB stability analysis. Static bearing pressure demands are also determined from the same analysis under static loads. The maximum static and dynamic bearing pressure demands are 20.94 ksf and 26.23 ksf, respectively. The static bearing pressure demands are calculated using the NAB stability model under 100 percent dead loads, 25 percent live loads and 75 percent precipitation loads and shown in Table 03.07.02-64-8. Table 03.07.02-64-3 through Table 03.07.02-64-6 list the maximum dynamic bearing pressure demand for all soil cases and corresponding input motions analyzed with the NAB stability model. For those soil cases where isolated corner pressures exceed the tabulated edge pressures, bearing pressure plots are shown in Figure 03.07.02-64-1 through Figure 03.07.02-64-5. Isolated corner pressures that exceed the tabulated edge pressures, as shown in the figures, are acceptable as the pressures will redistribute due to localized yielding of the soil. Sufficient margin exists in the ultimate allowable edge pressure to accommodate the redistribution increases.

Table 03.07.02-64-1—Factor of Safety for NI and NAB Interaction with Flexural Stiffness of NAB Reduced 50 Percent

Soil Case	Seismic NI Maximum Displacement (inch)		Seismic NAB Maximum Displacement (inch)		NI and NAB Total Tilt Displacement (inch)		NI and NAB Total Displacement = Seismic + Tilt (inch)		Factor of Safety[1]	
	X-Dir	Y-Dir	X-Dir	Y-Dir	X-Dir	Y-Dir	X-Dir	Y-Dir	X-Dir	Y-Dir
5ae	0.40	0.29	1.08	2.32	2.80	2.74	4.28	5.35	4.21	3.36
1n5ae	0.41	0.30	1.44	5.51			4.65	8.55	3.87	2.11
4ue	0.67	0.48	1.66	5.64			5.13	8.86	3.51	2.03
2sn4ue	0.88	0.66	3.82	5.08			7.50	8.48	2.40	2.12
1n2ue	0.95	0.87	2.33	5.01			6.08	8.62	2.96	2.09
hfbe	0.08	0.07	0.99	0.72			3.87	3.53	4.65	5.10

Note:

1. Factor of Safety is based on original gap distance of 18 inches between NI and NAB in both X and Y directions.

Table 03.07.02-64-2—Factor of Safety for NI and NAB Interaction with Flexural and Shear Stiffness of NAB Reduced 50 Percent

Soil Case	Seismic NI Maximum Displacement (inch)		Seismic NAB Maximum Displacement (inch)		NI and NAB Total Tilt Displacement (inch)		NI and NAB Total Displacement = Seismic + Tilt (inch)		Factor of Safety[1]	
	X-Dir	Y-Dir	X-Dir	Y-Dir	X-Dir	Y-Dir	X-Dir	Y-Dir	X-Dir	Y-Dir
5ae	0.40	0.29	1.27	1.86	2.80	2.74	4.47	4.89	4.03	3.68
1n5ae	0.41	0.30	1.88	5.87			5.09	8.91	3.54	2.02
4ue	0.67	0.48	2.30	6.81			5.77	10.03	3.12	1.79
2sn4ue	0.88	0.66	4.11	5.04			7.79	8.44	2.31	2.13
1n2ue	0.95	0.87	2.48	5.23			6.23	8.84	2.89	2.04
hfbe	0.08	0.07	0.99	0.72			3.87	3.53	4.65	5.10

Note:

1. Factor of Safety is based on original gap distance of 18 inches between NI and NAB in both X and Y directions.

Figure 03.07.02-64-1—Soil Case 2sn4ue: Dynamic Bearing Pressure Distribution for EUR motions for NAB with 50 Percent Reduced Flexural Stiffness

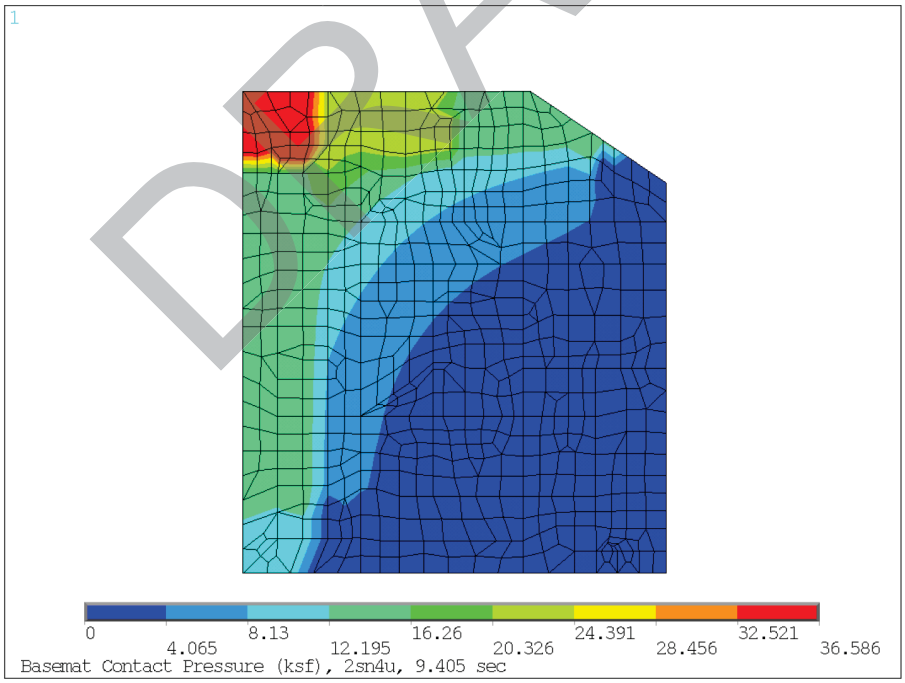


Figure 03.07.02-64-2—Soil Case 4ue: Dynamic Bearing Pressure Distribution for EUR motions for NAB with 50 Percent Reduced Flexural Stiffness

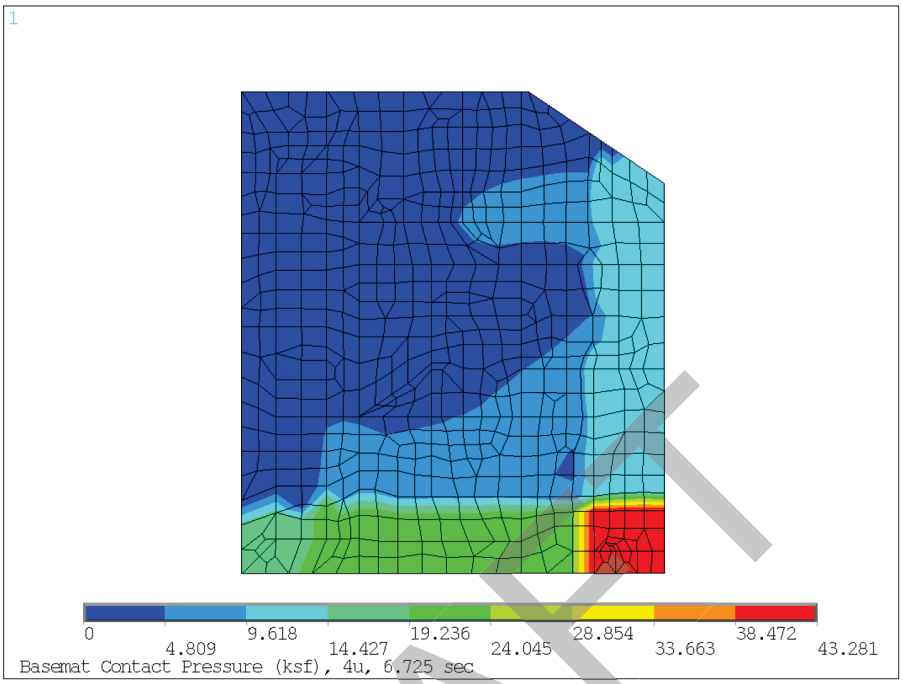


Figure 03.07.02-64-3—Soil Case 1n5ae: Dynamic Bearing Pressure Distribution for EUR motions for NAB with 50 Percent Reduced Flexural Stiffness

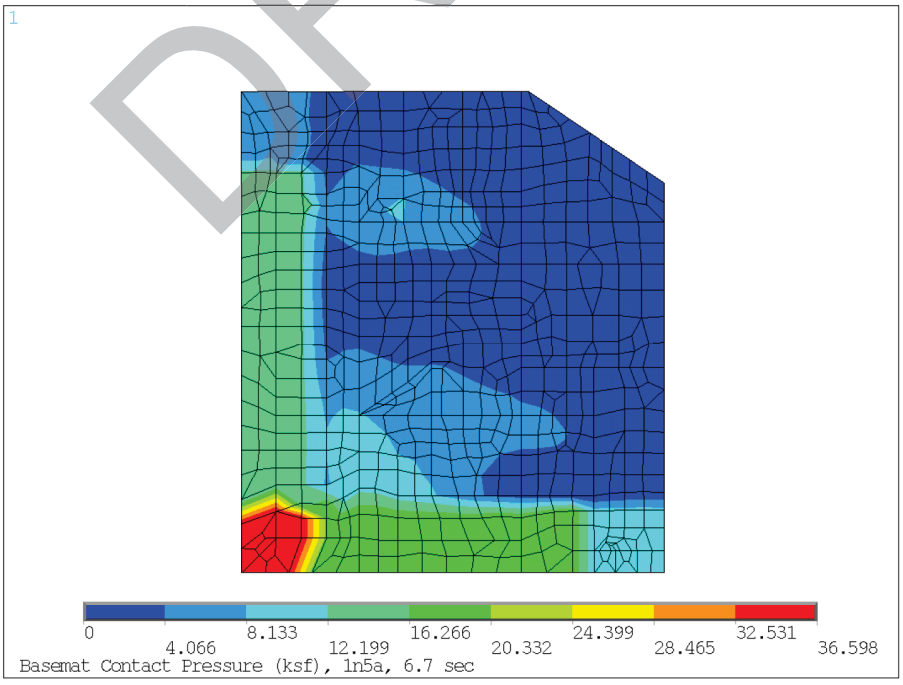


Figure 03.07.02-64-4—Soil Case 5ae: Dynamic Bearing Pressure Distribution for EUR motions for NAB with 50 Percent Reduced Flexural Stiffness

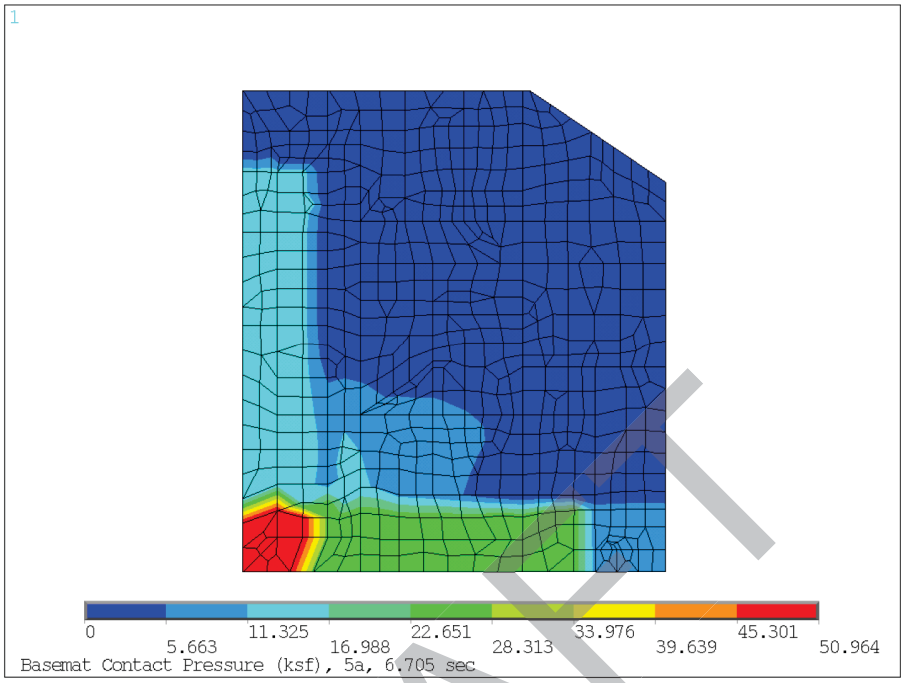
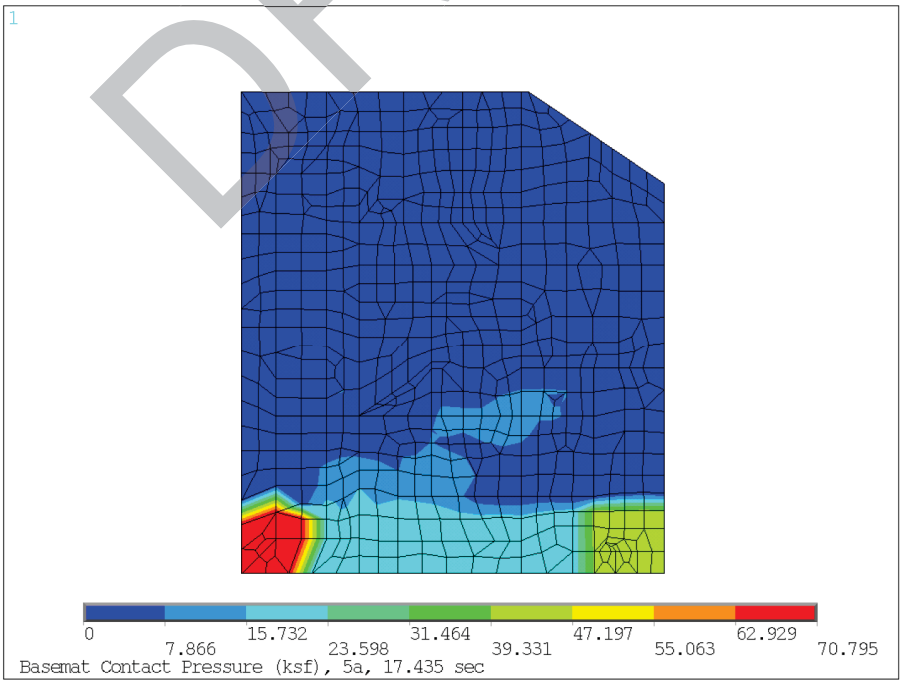


Figure 03.07.02-64-5—Soil Case 5ae: Dynamic Bearing Pressure Distribution for RG 1.60 TS Based Seismic Motions for NAB with 50 Percent Reduced Flexural Stiffness



Item 8:

Bounding Case for Sliding of the NAB

As described in Item 7 above, AREVA NP performed a nonlinear sliding analysis with the NAB stability model with a static friction coefficient of 0.5 and dynamic friction coefficient of 0.25. Results of maximum dynamic bearing pressure, maximum sliding and uplift, and maximum lateral movements of NAB nodes near NI are listed in Table 03.07.02-64-3 and Table 03.07.02-64-4 for 50 percent reduced flexural stiffness and 50 percent reduced flexural and shear stiffness, respectively.

Table 03.07.02-64-3—Maximum Dynamic Bearing Pressure, Maximum Sliding/Uplift and Lateral Movements of NAB for RG 1.60 TS Based Seismic Motions for 50 Percent Reduced Flexural Stiffness

Soil Case	Maximum Dynamic Bearing Pressure Demand		Maximum Sliding in X-direction (inch)	Maximum Sliding in Y-direction (inch)	Maximum Uplift (inch)	NAB Peak Displacement in X-Direction (inch)	NAB Peak Displacement in Y-Direction (inch)
	Edge (ksf)	Corner (ksf)					
1n2ue	10.97	13.73	1.49	4.36	0.00	1.46	5.01
2sn4ue	14.89	23.37	3.55	4.67	0.09	3.82	5.08
4ue	17.97	28.77	1.61	5.45	0.07	1.66	5.64
1n5ae	18.85	31.49	1.41	5.36	0.08	1.44	5.51
5ae	18.18	70.79	0.70	2.07	0.23	1.08	2.32

Table 03.07.02-64-4—Maximum Dynamic Bearing Pressure, Maximum Sliding/Uplift and Lateral Movements of NAB for RG 1.60 TS Based Seismic Motions for 50 Percent Reduced Flexural and Shear Stiffness

Soil Case	Maximum Dynamic Bearing Pressure Demand		Maximum Sliding in X-direction (inch)	Maximum Sliding in Y-direction (inch)	Maximum Uplift (inch)	NAB Peak Displacement in X-Direction (inch)	NAB Peak Displacement in Y-Direction (inch)
	Edge (ksf)	Corner (ksf)					
1n2ue	10.18	12.9	1.50	4.54	0.00	1.50	5.23
2sn4ue	14.94	23.6	3.69	4.57	0.13	4.11	5.04
4ue	16.23	29.6	2.24	6.53	0.18	2.30	6.81
1n5ae	13.29	32.1	1.81	5.64	0.20	1.88	5.87
5ae	21.93	32.4	0.68	1.48	0.31	1.27	1.86

Bounding Case for Overturning of the NAB

As described in item 7 above, AREVA NP performed nonlinear overturning analysis with NAB stability model with a static coefficient of friction 0.7. Results of maximum dynamic bearing pressure, maximum sliding/uplift and maximum lateral movements of NAB nodes near NI are listed in Table 03.07.02-64-5 and Table 03.07.02-64-6 for 50 percent reduced flexural stiffness and 50 percent reduced flexural and shear stiffness, respectively.

Table 03.07.02-64-5—Maximum Dynamic Bearing Pressure, Maximum Sliding/Uplift and Lateral Movements of NAB for EUR and High Frequency Motions for 50 Percent Reduced Flexural Stiffness

Soil Case	Maximum Dynamic Bearing Pressure Demand		Maximum Sliding in X-direction (inch)	Maximum Sliding in Y-direction (inch)	Maximum Uplift (inch)	NAB Peak Displacement in X-Direction (inch)	NAB Peak Displacement in Y-Direction (inch)
	Edge (ksf)	Corner (ksf)					
1n2ue	14.40	30.01	0.23	0.27	0.15	2.33	3.77
2sn4ue	21.59	36.58	0.53	1.24	0.78	1.91	1.95
4ue	23.32	43.28	0.26	0.70	0.21	1.17	1.17
1n5ae	19.17	36.60	0.09	0.27	0.14	0.37	0.74
5ae	26.23	50.96	0.11	0.29	0.27	0.51	0.84
hflb	10.35	17.19	0.00	0.01	0.00	0.67	1.78
hfbe	10.27	17.88	0.00	0.01	0.01	0.99	0.72
hfub	11.58	21.05	0.00	0.01	0.01	1.24	1.80

Table 03.07.02-64-6—Maximum Dynamic Bearing Pressure, Maximum Sliding/Uplift and Lateral Movements of NAB for EUR and High Frequency Motions for 50 Percent Reduced Flexural and Shear Stiffness

Soil Case	Maximum Dynamic Bearing Pressure Demand		Maximum Sliding in X-direction (inch)	Maximum Sliding in Y-direction (inch)	Maximum Uplift (inch)	NAB Peak Displacement in X-Direction (inch)	NAB Peak Displacement in Y-Direction (inch)
	Edge (ksf)	Corner (ksf)					
1n2ue	14.35	24.8	0.29	0.38	0.21	2.48	3.83
2sn4ue	18.24	35.9	0.50	1.13	0.76	1.89	1.92
4ue	19.41	44.3	0.22	0.82	0.40	1.14	1.44
1n5ae	18.33	37.4	0.08	0.31	0.21	0.56	0.89
5ae	18.56	33.5	0.07	0.16	0.18	0.50	0.84
hflb	9.8	17.05	0.00	0.01	0.00	0.67	1.79
hfbe	10.07	17.53	0.00	0.01	0.00	0.99	0.72
hfub	10.95	18.65	0.00	0.01	0.01	1.24	1.79

Based on the original gap of 18 inches between NI and NAB superstructures and factors of safety shown in Table 03.07.02-64-1 and Table 03.07.02-64-2, NAB will not slide or overturn into adjacent category I structures.

Factors of Safety for Sliding, Overturning and Flotation due Tornado, Wind and Flooding

In addition to II/I interaction analysis, factors of safety for sliding, overturning and flotation are calculated in accordance with SRP 3.8.5 for tornado, wind and flooding. Tornado loads envelope the wind loads. Therefore, factor of safety for wind loads are at least equal to tornado loads. Minimum factors of safety are compared with required factor of safety with the Seismic Category I structures and shown in Table 03.07.02-64-7.

Table 03.07.02-64-7—Factors of Safety for Sliding, Overturning and Flotation under Tornado, Wind and Flooding

Load Type	Load Combinations	Type of Stability Check	Available Minimum Factor of Safety	Required Minimum Factor of Safety
Tornado	$D+H+W_t$	Sliding	2.8	1.1
Tornado	$D+H+W_t$	Overturn	3.8	1.1
Wind	D+H+W	Sliding	2.8	1.5
Wind	D+H+W	Overturn	3.8	1.5
Flooding	D+F'	Flotation	3.0	1.1

Note: D = Dead Loads, H = Lateral Earth Pressure, W = Wind load, W_t = Tornado loads, F' = Flood Water Loads

Maximum Static Bearing Pressure

Table 03.07.02-64-8 lists the static bearing pressure demand under 100 percent dead loads, 25 percent live loads, and 75 percent precipitation loads for all soil cases described in U.S. EPR FSAR Tier 2, Table 3.7.1-6.

Table 03.07.02-64-8—NAB Maximum Static Bearing Pressure Demand for All Soil Cases

Soil Case	Flexural Stiffness Reduced 50% (ksf)	Flexural and Shear Stiffness Reduced 50% (ksf)
1n2ue	15.57	11.69
2sn4ue	14.83	11.32
4ue	15.17	11.98
1n5ae	14.68	12.13
5ae	14.59	20.94
hflb	14.70	12.18
hfbe	14.66	12.23
hfub	14.63	11.89

Reference:

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

FSAR Impact:

U.S. EPR FSAR Tier 2, 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

guidelines given below is to prevent impairment of Category I structure design basis safety functions.

- The collapse of the non-Category I structure does not cause the non-Category I structure to strike a Category I SSC.
- The collapse of the non-Category I structure does not impair the integrity of seismic Category I SSC, nor result in incapacitating injury to control room occupants.
- The non-Category I structure will be analyzed and designed to prevent its failure under SSE conditions such that the margin of safety is equivalent to that of a Category I structure.

The seismic interaction criteria and assessment guidelines are summarized in Table 3.7.2-30—Seismic Structural Interaction Criteria for Building Structures. The NAB, Access Building (AB), and the Turbine Building (TB) have the potential to interact with the NI Common Basemat Structures and are categorized as Seismic Category II. Results of the seismic interaction assessment for those structures are presented below, with associated discussions of the Radioactive Waste Building (RWB) and Fire Protection Storage Tanks and Building.

The TB and AB are conceptual design structures, as stated in Section 1.8, and a seismic interaction analysis has not been performed.

Nuclear Auxiliary Building

Figure 3B-1 shows that the separation gap between the Nuclear Auxiliary Building and the NI Common Basemat Structures is 18 in.

The NAB is classified as an RS structure designed and analyzed to meet the commitments defined for RW-IIa structures in RG 1.143. The NAB is also classified as Seismic Category II due to its potential to interact with a Seismic Category I structure during an SSE. The NAB is analyzed to SSE load conditions and designed to the codes and standards associated with Seismic Category I structures so that the margin of safety is equivalent to that of a Category I structure with the exception of sliding and overturning criteria. Because the NAB does not have a safety function, it may slide or uplift provided that the gap between the NAB and any Category I structure is adequate to prevent interaction. The effects of sliding, overturning, and any other calculated building displacements (e.g., building deflections, settlement) ~~must be~~ are considered when demonstrating the gap adequacy between NAB and adjacent Seismic Category I structures.

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The NAB (Seismic Category II) stability and interaction potential with the NI (Seismic Category I) ~~will be~~ is evaluated by time-history analysis performed on a 3D FEM of the structure using the ANSYS computer code. The 3D FEM represents the

superstructure, foundation mat, and 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 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 (Reference 10). Springs are developed for each soil case in Table 3.7.1-6. Spring distributions are elliptical over the plan area of the basemat. The distribution methodology is the same as the NI and is described in Section 3.8.5.4.2.

The concrete-only mass of the structure is accounted for through the use of 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 springs supporting the structure. Side wall, soil driving/resisting forces are ~~will be~~ modeled in the analysis.

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~~Bounding analysis cases, using the Table 3.7.1-6 soils cases, will be 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 safety factor of two will be used in the calculation.~~
- ~~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.~~

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

For the purpose of NAB stability analysis, both the Certified Seismic Design Response Spectra (CSDRS), and a R.G. 1.60 based target spectra is used. The CSDRS include the EUR soft, medium and hard input motions, as well as, the high frequency lower bound

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(hflb), best estimate (hfbe) and upper bound (hfub) input motions, described in Section 3.7.1.1. The RG 1.60 target spectra (TS) input motions are anchored to a peak ground acceleration of 0.3g. Three independent motions (two horizontal and one vertical base line corrected for velocity and displacement) are created in accordance with SRP 3.7.1. The seed records are taken from the NRC CEUS database representing a magnitude seven earthquake rich in low frequency content. These transient results are developed in accordance with the requirements of Option 1, Approach 2 of the SRP 3.7.1.

NI displacement results ~~will be~~ are obtained and added to the NAB displacement results. The NI superstructure displacement results are obtained from the soil structure interaction (SSI) analysis and added to the displacement results from the 3D basemat FEM described in Section 3.7.2.3.1.4.~~augmented by the rigid body results from the NI stability analysis.~~ Additionally the ½" in 50' tilt described in Section 2.5.4.10.2 ~~will be~~ is included for both structures. Absolute values of the results ~~will be~~ are summed to produce conservative reductions in the shake space between the two structures.

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.

~~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 0.3 g (see Figures 3.7.1-2 and 3.7.1-3). Three independent motions (i.e., 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 earthquake 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 coefficient~~s~~ of friction of $\mu = 0.5$ static and $\mu = 0.25$ dynamic are ~~will be~~ analyzed.

Overturning 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.

~~The input motions used for analysis will be the Table 3.7.1-6 generic soil cases.~~ A coefficient of friction of $\mu = 0.7$ ~~will be~~ is used to maximize the uplift.

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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 safety factor of 2.0 is determined when the flexural stiffness of the NAB is reduced 50%. A safety factor of 1.8 is determined when flexural and shear stiffness of NAB is reduced 50%.

- 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.

Access Building

The Access Building is a non-Seismic Category I structure for which continued operation during an SSE event is not required. The Access Building is classified as Seismic Category II based on its proximity to the NI, a Seismic Category I structure. [[The Access Building is analyzed to site-specific SSE load conditions and designed to the codes and standards associated with Seismic Category I structures so that the margin of safety is equivalent to that of a Category I structure with the exception of sliding and overturning criteria. Because the Access Building does not have a safety function, it may slide or uplift provided that the gap between the Access Building and any Category I structure is adequate to prevent interaction. The effects of sliding, overturning, and any other calculated building displacements (e.g., building deflections, settlement) must be considered when demonstrating the gap adequacy between the Access Building and adjacent Category I structures. The separation gaps between the Access Building and SBs 3 and 4 are 0.98 ft and 1.31 ft, respectively (see Figure 3B-1).]] The walls of the Access Building are not physically connected to the SBs. SB 3 is protected by the aircraft hazard (ACH) shield wall which not only protects the structure, but also isolates control room personnel from adverse impact effects. SB 4 is not protected by the ACH shield wall

A COL applicant that references the U.S. EPR design certification will demonstrate that the response of the Access Building to an SSE event will not impair the ability of Seismic Category I systems, structures, or components to perform their design basis safety functions.

For COL applicants that incorporate the conceptual design for the Access Building presented in the U.S. EPR FSAR (i.e., [[the Access Building is analyzed to site-specific SSE load conditions and designed to the codes and standards associated with Seismic Category I structures so that the margin of safety is equivalent to that of a Category I structure with the exception of sliding and overturning criteria]]), this COL item is addressed by demonstrating that the gap between the Access Building and adjacent Category I structures is sufficient to prevent interaction. The effects of sliding,