

ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Tuesday, February 05, 2013 5:00 PM
To: Snyder, Amy
Cc: Miernicki, Michael; DELANO Karen (AREVA); LEIGHLITER John (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); WILLS Tiffany (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 22
Attachments: RAI 370 Supplement 22 Response US EPR DC.pdf

Amy,

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. AREVA NP submitted Supplement 15 on January 25, 2012 to provide a preliminary revised schedule to Question 03.07.01-27. AREVA NP submitted Supplement 16 on February 21, 2012 to provide a revised schedule for the two remaining questions. AREVA NP submitted Supplement 17 on March 27, 2012 to provide a revised schedule for the two remaining questions. AREVA NP submitted Supplement 18 on July 3, 2012 to provide a revised schedule for one of the two remaining questions. AREVA NP submitted Supplement 19 on August 23, 2012 to provide a revised schedule for Question 03.07.02-64. AREVA NP submitted Supplement 20 on September 27, 2012 to provide a revised schedule for Question 03.07.01-27. On January 17, 2013, AREVA NP submitted Supplement 21 to provide a technically correct and complete response to Question 03.07.01-27.

The attached file, "RAI 370 Supplement 22 Response US EPR DC.pdf" provides a revised technically correct and complete response to Question 03.07.01-27 to incorporate NRC staff comments received during the Civil/Structural Jan 28, 2013 SSI Audit. 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 03.07.01-27.

The following table indicates the pages in the response document, "RAI 370 Supplement 22 Response US EPR DC.pdf" that contain AREVA NP's final response to the subject question.

Question #	Start Page	End Page
RAI 370 — 03.07.01-27	2	4

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

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual) May 26, 2011 (Actual) June 17, 2011 (Actual)	May 21, 2013

Sincerely,

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

7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, January 17, 2013 2:56 PM
To: Amy.Snyder@nrc.gov
Cc: Michael.Miernicki@nrc.gov; DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); WILLS Tiffany (CORP/QP); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 21

Amy,

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. AREVA NP submitted Supplement 15 on January 25, 2012 to provide a preliminary revised schedule to Question 03.07.01-27. AREVA NP submitted Supplement 16 on February 21, 2012 to provide a revised schedule for the two remaining questions. AREVA NP submitted Supplement 17 on March 27, 2012 to provide a revised schedule for the two remaining questions. AREVA NP submitted Supplement 18 on July 3, 2012 to provide a revised schedule for one of the two remaining questions. AREVA NP submitted Supplement 19 on August 23,

2012 to provide a revised schedule for Question 03.07.02-64. AREVA NP submitted Supplement 20 on September 27, 2012 to provide a revised schedule for Question 03.07.01-27.

The attached file, "RAI 370 Supplement 21 Response US EPR DC.pdf" provides a technically correct and complete response to Question 03.07.01-27. 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 03.07.01-27.

The following table indicates the pages in the response document, "RAI 370 Supplement 21 Response US EPR DC.pdf" that contain AREVA NP's final response to the subject question.

Question #	Start Page	End Page
RAI 370 — 03.07.01-27	2	4

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

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual) May 26, 2011 (Actual) June 17, 2011 (Actual)	May 21, 2013

Sincerely,

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

7207 IBM Drive, Mail Code CLT 2B
 Charlotte, NC 28262
 Phone: 704-805-2223
 Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, September 27, 2012 6:30 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); LEIGHLITER John (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 20

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. AREVA NP submitted Supplement 15 on January 25, 2012 to provide a preliminary revised schedule to Question 03.07.01-27. AREVA NP submitted Supplement 16 on February 21, 2012 to provide a revised schedule for the two remaining questions. AREVA NP submitted Supplement 17 on March 27, 2012 to provide a revised schedule for the two remaining questions. AREVA NP submitted Supplement 18 on July 3, 2012 to provide a revised schedule for one of the two remaining questions. AREVA NP submitted Supplement 19 on August 23, 2012 to provide a revised schedule for Question 03.07.02-64.

The schedule for the final response to Question 03.07.01-27 has been changed as provided below. 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 17, 2013
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual) May 26, 2011 (Actual) June 17, 2011 (Actual)	May 21, 2013

Sincerely,

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

7207 IBM Drive, Mail Code CLT 2B
 Charlotte, NC 28262
 Phone: 704-805-2223
 Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, August 23, 2012 6:10 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); LEIGHLITER John (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 19

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. AREVA NP submitted Supplement 15 on January 25, 2012 to provide a preliminary revised schedule to Question 03.07.01-27. AREVA NP submitted Supplement 16 on February 21, 2012 to provide a revised schedule for the two remaining questions. AREVA NP submitted Supplement 17 on March 27, 2012 to provide a revised schedule for the two remaining questions. AREVA NP submitted Supplement 18 on July 3, 2012 to provide a revised schedule for one of the two remaining questions.

The schedule for the final response to Question 03.07.02-64 has been changed as provided below. The schedule for the final response to Question 03.07.01-27 remains unchanged.

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.01-27	NA	August 30, 2013
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual) May 26, 2011 (Actual) June 17, 2011 (Actual)	May 21, 2013

Sincerely,

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

7207 IBM Drive, Mail Code CLT 2B
 Charlotte, NC 28262
 Phone: 704-805-2223
 Email: Dennis.Williford@areva.com

From: RYAN Tom (RS/NB)
Sent: Tuesday, July 03, 2012 2:00 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); Michael.Miernicki@nrc.gov; WILLIFORD Dennis (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 18

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. AREVA NP submitted Supplement 15 on January 25, 2012 to provide a preliminary revised schedule to Question 03.07.01-27. AREVA NP submitted Supplement 16 on February 21, 2012 to provide a revised schedule for the two remaining questions. AREVA NP submitted Supplement 17 on March 27, 2012 to provide a revised schedule for the two remaining questions.

Based on additional comments and discussions with NRC staff, the schedule for the final response to question 03.07.02-64 has been changed as provided below. The schedule for the final response to Question 03.07.01-27 remains unchanged.

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.01-27	NA	August 30, 2013
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual) May 26, 2011 (Actual) June 17, 2011 (Actual)	November 14, 2012

Sincerely,

Tom Ryan
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: Tuesday, March 27, 2012 1:57 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 17

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. AREVA NP submitted Supplement 15 on January 25, 2012 to provide a preliminary revised schedule to Question 03.07.01-27. AREVA NP submitted Supplement 16 on February 21, 2012 to provide a revised schedule for the two remaining questions.

Based on additional comments and discussions with NRC staff, the schedule for the final response to question 03.07.02-64 has been changed as provided below. The schedule for the final response to Question 03.07.01-27 remains unchanged.

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.01-27	NA	August 30, 2013
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual) May 26, 2011 (Actual) June 17, 2011 (Actual)	July 5, 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: Tuesday, February 21, 2012 9:20 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 16

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. AREVA NP submitted Supplement 15 on January 25, 2012, to provide a preliminary revised schedule to Question 03.07.01-27.

The schedule for the final response to the remaining two questions has been changed as provided below. This schedule was transmitted to the NRC in AREVA NP letter 12:008 dated February 21, 2012.

Question #	Interim Response Date	Response Date
RAI 370 - 03.07.01-27	NA	August 30, 2013
RAI 370 - 03.07.02-64	November 15, 2010 (Actual) February 25, 2011 (Actual) May 26, 2011 (Actual) June 17, 2011 (Actual)	March 29, 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, 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
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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

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: 'Tefsaye, 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: 'Tefsaye, 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: 'Tesyfaye, 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: 'Tefaye, 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: 'Tesyfaye, 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.

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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: 4212

Mail Envelope Properties (554210743EFE354B8D5741BEB695E6560C29E9)

Subject: Response to U.S. EPR Design Certification Application RAI No. 370, FSAR Ch. 3, Supplement 22
Sent Date: 2/5/2013 5:00:29 PM
Received Date: 2/5/2013 5:00:46 PM
From: WILLIFORD Dennis (AREVA)

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RAI 370 Supplement 22 Response US EPR DC.pdf		259341

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Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
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Response to

Request for Additional Information No. 370, Supplement No. 22

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 03.07.01-27**Follow Up to RAI 248, Question 03.07.01-25**

In NUREG/CR6919 "Recommendations for Revision of Seismic Damping Values in Regulatory Guide 1.61" it states on page 6 "If significant stresses due to load combinations that include SSE are less than 80 percent of the applicable code stress limits, then using SSE damping values may under-predict the structure's response to seismic loads. In this case structural evaluation and development of in-structure response spectra should be based on a seismic analysis utilizing the OBE damping values specified in Table 2." The OBE damping value in Table 2 recommended for reinforced concrete is 4 percent. In the tables provided in the applicant's response there are only 14 instances where one of the load components results in a stress that exceeds 80 percent of the allowable stress. In addition the locations in the table are at critical sections of the NI common basemat structures. Other locations may have stress levels lower than those presented in the applicant's response. Thus the staff believes it does not have sufficient information to justify the use of SSE damping for the generation of ISRS. The staff is requesting that the applicant provide additional information on the state of stress within the NI common basemat structures (such as stress contours from the GT STRUDL model) to support its position on the use of SSE structural damping values. Justification for the use of SSE damping values for the generation of ISRS should also be provided in the FSAR.

Response to Question 03.07.01-27:

During the January 28-31, 2013 NRC Civil/Structural audit, AREVA agreed to clarify in the Response to RAI 370, Question 03.07.01-27 regarding: (1) the structural damping for Nuclear Island high-frequency motion, and (2) the Nuclear Island Zero Period Accelerations. For completeness, the Response to Question 03.07.01-27 is resubmitted in its entirety and includes the clarifications as described above.

AREVA will revise the seismic analysis methodology to include OBE damping results for the generation of in-structure response spectra (ISRS), per Regulatory Guide 1.61, Revision 1, "Damping Values for Seismic Design of Nuclear Power Plants." The ISRS for the Nuclear Island will include results from two seismic analysis cases: (1) OBE damping (per R.G. 1.61, Table 2) and un-cracked concrete section properties, and (2) SSE damping (per R.G. 1.61, Table 1) with out-of-plane cracked section properties. There is an exception to the use of SSE damping in that OBE damping with out-of-plane cracked section properties will be used for the high-frequency (HF) motions.

For nuclear island structural design, including stability evaluations, the analysis results based on SSE damping with out-of-plane cracking will be used for the EUR-based ground motions and the results based on OBE damping with out-of-plane cracking will be used for the high-frequency ground motions.

This is summarized in Table 03.07.01-27-1 below.

Table 03.07.01-27-1–U.S. EPR Seismic Analysis Structural Damping

Structure	Stiffness (Note 1)	Ground Motion	Damping	ISRS	Structural Analysis and Design
NI Common Basemat	Un-Cracked	EUR-S, M, H, HF	OBE	X	N/A (Note 2)
	Out-of-Plane Cracked	EUR-S, M, H	SSE	X	X
	Out-of-Plane Cracked	HF	OBE	X	X
EPGB and ESWB	Un-Cracked	EUR-S, M, H, HF	OBE	X	X
	Out-of-Plane Cracked	EUR-S, M, H, HF	OBE	X	X

Note 1: Out-of-Plane bending stiffness reduced 50%

Note 2: Damping Compatible Response not a concern for structural evaluations per RG 1.61

U.S. EPR FSAR Tier 2, Section 2.5.2.6 - Step 8, will be revised to require the applicant to reconcile with the ZPAs in Tables 3.7.2-10, 3.7.2-28, and 3.7.2-29 in addition to reconciliation with the U.S. EPR ISRS as indicated on the enclosed markup. Clarification will be added to ensure the COL applicant recognizes that structural design is performed with individual soil case results and reconciliation is to be based on individual soil case results.

U.S. EPR FSAR Tier 2, Section 2.5.2.6 - Step 8, will be revised to add a statement describing how “key locations” are determined. Key locations are selected based on the location of major equipment and at high elevations in the structure where the ISRS is expected to be amplified.

U.S. EPR FSAR Tier 2, Section 2.5.2.6 - Step 8, will be revised to add an additional location for comparison of ISRS. Fuel building crane rail support elevation +88 ft, 7 in will be added with a pointer to the ISRS envelope figures to be added with the Supplemental Response to RAI 320, Question 3.7.2-63, to be submitted with revised soil structure interaction analysis results.

U.S. EPR FSAR Tier 2, Section 3.7.1.2, will be revised to include OBE damping results in the generation of ISRS and further describe the application of damping to structural design and ISRS generation as indicated on the enclosed markup. A description is added for the RCS analysis to indicate that the RBIS wall model will consider OBE damping. This change will require a revision to U.S. EPR FSAR Tier 2, Appendix 3C. This revision will be provided in Response to RAI 371, Question 3.7.1-29. The RCS components in the RCS analysis will continue to use the SSE damping values in Table 3.7.1-1 consistent with R.G. 1.61. In addition, AREVA will supplement the Response to RAI 335, Question 03.08.01-44, to clarify the section properties that are used for structural design and generation of ISRS per Table 03.07.01-27-1 in this RAI response.

U.S. EPR FSAR Tier 2, Section 3.7.2.4.2, will be revised to include OBE structural damping for reinforced concrete, pre-stressed concrete, and the RCS model in the soil structure interaction seismic analysis for the generation of ISRS, as indicated on the enclosed markup. This section describes the structural damping used in the SSI analysis models including the reinforced

concrete structures (NI common basemat structures including RBIS, and the NAB), Pre-stressed concrete containment, and the RCS,

U.S. EPR FSAR Tier 2, Section 3.7.2.4.6, will be revised to reflect the eight SSI analysis cases where ZPAs are calculated for structural design as indicated on the enclosed markup.

U.S. EPR FSAR Tier 2, Section 3.7.2.5, will be revised to add an additional figure for the Fuel Building ISRS locations and three additional figures for the Fuel Building X, Y, and Z response spectrum. These figures will be included in a supplemental response to RAI 320, Question 3.7.2-63.

U.S. EPR FSAR Tier 2, Table 3.7.1-1 - Note 4, will be revised to indicate that OBE damping, as well as SSE damping, is used for generation of ISRS for the NI common basemat structures. OBE damping is used for ISRS and structural analysis for the EPGB and ESWB, and to add a pointer to Sections 3.7.1.2 and 3.7.2.4 for additional description of the application of damping as indicated on the enclosed markup. Section 3.7.1.2 includes a statement that OBE damping is used for the concrete walls in all of the RCS analysis cases. Section 3.7.1.2 also identifies the damping method used in RCS seismic analysis to determine the stress in the RCS components. Section 3.7.2.4.2 describes the structural damping used in the SSI analysis, including the reinforced concrete structures (NI common basemat structures including RBIS, and the NAB), Pre-stressed concrete containment, and the RCS. Both SSE and OBE structural damping is identified for generation of ISRS.

U.S. EPR FSAR Tier 2, Table 3.7.2-10, will be revised as indicated on the enclosed markup to include the ZPAs only for the cracked concrete cases, which will be used for structural design of the NI common basemat structures. The last column, which has the ZPA envelopes of the soil cases, will be deleted and an elevation will be added for fuel building ZPAs. Table 3.7.2-28, Maximum Accelerations in EPGB, and Table 3.7.2-29, Maximum Accelerations in ESWB, will be renamed and revised to include the ZPAs for all soil cases. The ZPA results will be included in a supplemental Response to RAI 320, Question 3.7.2-63 and RAI 376, Question 03.08.05-31.

U.S. EPR FSAR Tier 2, Appendix 3C, will be revised to include OBE damping for the RBIS concrete wall model. This revision will be provided in Response to RAI 371, Question 3.7.1-29.

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 2.5.2.6, 3.7.1.2, 3.7.2.4.2, 3.7.2.4.6, and Tables 3.7.1-1 and 3.7.2-10 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

proposed site. The applicant may perform intermediate-level additional studies to demonstrate that the particular site is bounded by the design of the U.S. EPR. An example of such studies is to show that the site-specific motion at top-of-basemat level, with consideration of the range of structural frequencies involved, is bounded by the U.S. EPR design.

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8. If the evaluations of step 7 are not sufficient, the applicant will perform detailed site-specific SSI analyses with the soil column properties for the particular site. This site-specific evaluation will include dynamic seismic analyses and development of in-structure response spectra (ISRS) for comparison with ISRS and zero period accelerations (ZPAs) for the U.S. EPR at key locations in the U.S. EPR structure. Key locations are selected based on the location of major equipment (reactor pressure vessel supports, steam generator supports, emergency diesel generator foundation) and at high elevations in the structure where the ISRS is expected to be amplified. These analyses will be performed in accordance with the methodologies described in Section 3.7.1 and Section 3.7.2. Results from this comparison will be acceptable if the amplitude of the site-specific ISRS do not exceed the ISRS for the U.S. EPR as shown in the figures indicated for each location below and the site-specific ZPAs are enveloped by any one of the individual soil cases for the U.S. EPR in Tables 3.7.2-10, 3.7.2-28, and 3.7.2-29.

Comparisons will be made at the following key locations, defined in Section 3.7.2:

- Reactor Building Internal Structures (RBIS)—Reactor Vessel Support at elevation +16 ft, 10-3/4 in (Figures 3.7.2-74, 3.7.2-75, and 3.7.2-76) and steam generator supports at elevation +63 ft, 11-3/4 in (Figures 3.7.2-77, 3.7.2-78, and 3.7.2-79).
- Safeguard Building (SB) 1—elevation +26 ft, 7 in (Figures 3.7.2-80, 3.7.2-81, and 3.7.2-82) and +68 ft, 11 in (Figures 3.7.2-83, 3.7.2-84, and 3.7.2-85).
- SBs 2/3—elevation +26 ft, 7 in (Figures 3.7.2-86, 3.7.2-87, and 3.7.2-88) and +53 ft, 6 in (Figures 3.7.2-89, 3.7.2-90, and 3.7.2-91).
- SB 4—elevation +68 ft, 11 in (Figures 3.7.2-92, 3.7.2-93, and 3.7.2-94).
- Reactor Containment Building (RCB)—Polar crane support at elevation +123 ft, 4-1/4 in (Figures 3.7.2-95, 3.7.2-96, and 3.7.2-97) and top-of-dome at elevation +190 ft, 3-1/2 in (Figures 3.7.2-98, 3.7.2-99, and 3.7.2-100).
- Fuel Building (FB)—elevation + 12 ft, 1-2/3 in. (Figures 3.7.2-110, 3.7.2-111, and 3.7.2-112).
- Emergency Power Generator Building (EPGB)—center of basemat (Figures 3.7.2-101, 3.7.2-102, and 3.7.2-103) and +51 ft, 6 in. (Figures 3.7.2-148, 3.7.2-149, and 3.7.2-150).
- Essential Service Water Building (ESWB)—Node 10385 on elevation +14 ft, 0 in (Figures 3.7.2-107, 3.7.2-108, and 3.7.2-109) and Node 12733 on elevation +63 ft, 0 in (Figures 3.7.2-104, 3.7.2-105, and 3.7.2-106).

The three components of synthetic time history are statistically independent of each other because the cross-correlation coefficients between them, as listed in Table 3.7.1-5—Cross-Correlation Coefficients Among Synthetic Time Histories, are well within the limit value of 0.16.

3.7.1.2 Percentage of Critical Damping Values

Structural systems or materials that experience seismic excitation exhibit energy dissipation through viscous damping. Viscous damping is a form of damping in which the damping force is proportional to the velocity. The mathematical modeling techniques described in Section 3.7.2 and Section 3.7.3 for elastic seismic analysis account for the damping of SSC by including terms to represent equivalent viscous modal damping as a percentage of critical damping.

The equivalent modal damping values for SSE used in the seismic dynamic analysis of U.S. EPR Seismic Category I structures are presented in Table 3.7.1-1—Damping

Values for Safe Shutdown Earthquake. SSE damping values are used for the seismic analysis of the NI with EUR control motion cases and the OBE damping values are used with the HF control motion cases. OBE damping values are used for all seismic analysis of the EPGB and ESWB structures. In addition, OBE structural damping is included for generation of ISRS for the NI with EUR control motion cases. The damping values are based primarily on the guidance in RG_1.61, Rev. 1 ~~and ASCE Std-43-05 (Reference 2).~~

Piping analyzed for the U.S. EPR uses damping in accordance with RG 1.61, Revision_1. A damping ratio of four percent of critical is used when the USM response spectrum method is used to analyze piping systems that are susceptible to stress corrosion cracking or that contain supports that are designed to dissipate energy by yielding.

Values of critical damping in Table 3.7.1-1 for the seismic analysis of the RCS are consistent with RG 1.61. Seismic analysis of the reactor pressure vessel (RPV) Isolated Model is by direct step-by-step integration time history analysis techniques, owing to the non-linear nature of the pressure vessel internals. As such, Rayleigh damping is applied. The Rayleigh mass and stiffness weighted damping coefficients are selected to provide generally conservative damping across the frequency range of interest relative to the values in Table 3.7.1-1. The elements representing the fuel assemblies are damped at a maximum value of 30 percent, as described in Framatome Technologies Topical Report BAW-10133NP-A (Reference 7). For high energy line break analyses more conservative values of Rayleigh mass and stiffness weighted damping coefficients are used. This is addressed further in Section 3C.4.2.1.1. The RCS analysis includes a simplified model of the reactor building interior concrete walls as described in Appendix 3C. OBE damping is used for the concrete walls in all of the RCS analysis cases.

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In-structure response spectra (ISRS) for the NI Common Basemat Structures are generated using ~~SSE~~OBE damping for uncracked concrete and SSE damping for out-of-plane cracking of walls and slabs for EUR-based ground motions. ISRS are generated using OBE damping for uncracked concrete and out-of-plane cracking of walls and slabs for HF ground motions. ~~values rather than the OBE damping values suggested in Table 2 of RG 1.61. It is appropriate to use SSE structural damping for the NI Common Basemat Structures to generate ISRS. This approach is used because the standard plant seismic design basis (see Section 3.7.1.1) coupled with a representative set of soil cases (see Section 3.7.1.3) results in structural loads on both walls and floor diaphragms of NI Common Basemat Structures that are expected to produce cross section demands greater than 50 percent of design strength.~~

The structural analysis of the NI common basemat structures use the out of plane cracking results from the EUR control motion cases with SSE damping and out of plane cracking results from the HF control motion cases with OBE damping.

The ISRS for the Emergency Power Generating Building and the Essential Service Water Buildings are based on both cracked and uncracked section properties with OBE structural damping.

The structural analysis of the EPGB and ESWB structures use both the out of plane cracking and un-cracked results from the EUR and HF control motion cases, all with OBE damping.

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The damping values for conduits and cable tray systems are presented in Table 3.7.1-1. Several test programs and studies have demonstrated that higher damping values may be utilized for certain cable tray systems (References 3 through 5). For cable tray systems that meet the criteria in Table 3.7.1-7 for similarity to the Bechtel-ANCO test program and satisfy tray loading criteria of RG 1.61, the damping values in Figure 3.7.1-16—Damping Values for Cable Tray Systems, may be used on a case-by-case basis. These systems are limited to a maximum damping value of 15 percent in the transverse direction (horizontal direction perpendicular to direction of tray run) and limited to damping values of RG 1.61 in the other directions. For cable tray systems that do not meet the criteria in Table 3.7.1-7 for similarity to the Bechtel-ANCO test program, the damping values of RG 1.61 shall be used for each of the three orthogonal directions. See Appendix 3A for additional discussion on cable tray and conduit system damping.

Heating, ventilation, and air conditioning duct systems use damping values of 10 percent for pocket-lock construction, seven percent for companion-angle construction, and four percent for welded construction. The damping values provided in Table 3.7.1-1 are applicable to time history, response spectra and equivalent static analysis procedures for structural qualification as discussed in regulatory position C.4 of RG 1.61.

**Table 3.7.1-1—Damping Values for Safe Shutdown Earthquake
Sheet 2 of 2**

Item	Percent Critical Damping, SSE ⁴
HVAC Duct Systems	
• Pocket lock	10
• Companion angle	7
• Welded	4
Metal Atmospheric Storage Tanks	
• Impulsive Mode	3
• Sloshing mode	0.5

Notes:

1. For steel structures with a combination of different connection types, use the lowest specified damping value, or as an alternative, use a “weighted average” damping value based on the number of each type present in the structure.
2. As specified in RG 1.61, Revision 1 and ANP-10264NP-A.
3. The following clarifications are applicable.
 - A. Deleted
 - B. Spare and initially empty cable trays and conduits, are analyzed with zero cable load and a maximum of seven percent damping for cable trays and five percent damping for conduits. (Note: Reanalysis is performed when put into service.)
 - C. Deleted
 - D. The selected damping value shall be in accordance with Figure 3.7.1-16.
 - E. Damping values beyond RG 1.61 and as shown in Figure 3.7.1-16 apply solely to the transverse direction (horizontal direction perpendicular to direction of tray run) of cable tray systems meeting the criteria in Table 3.7.1-7 for similarity to Bechtel-ANCO test program (Reference 3) and having 50 percent to fully loaded tray.
4. SSE and OBE structural damping values per RG 1.61 are used for generation of ISRS for the NI Common Basemat Structures. ~~A OBE structural damping value of four percent per RG 1.61~~ is used for generation of the ISRS and structural analysis for the EPG and ESWB. See description of application of damping for generation of ISRS and structural design in Sections 3.7.1.2 and 3.7.2.4.
5. The model elements representing the fuel assemblies are damped at a maximum of 30% per Framatome Topical Report BAW 10133PA-01 (including Addendum 1

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3.7.2.4.2 Step 2 - Development of Models for Structures and Basemat

(1) NI Common Basemat Structures and NAB

Development of the dynamic 3D FEM for the NI Common Basemat Structures has previously been described in Section 3.7.2.3.1.3. The dynamic 3D FEM incorporates the NI Common Basemat Structures including the RBIS, RCB, RSB, FB, SBs 1, 2/3 and 4, SB 2/3 shield structure, FB shield structure, Polar Crane, and RCS. The ground surface is at elevation $-9\frac{3}{4}$ inches (-0.25 m) and the bottom of the NI basemat is at elevation -38 ft, $10\frac{1}{2}$ inches (-11.85 m). A reinforced concrete tendon gallery extends down from the bottom of the RCB base to elevation -52 ft, 2 inches (-15.90 m). An isometric and elevation view of the dynamic 3D FEM is shown in Figure 3.7.2-113—Dynamic 3D Finite Element Model of Nuclear Island, Isometric View and Figure 3.7.2-114—Dynamic 3D Finite Element Model of Nuclear Island, Elevation View, respectively. The finite element models of FB, SB1, SB2/3, SB4, RCB and RBIS are shown in Figure 3.7.2-115 through Figure 3.7.2-120. The dynamic 3D FEM is a detailed finite element model that consists mainly of shell elements that represent the concrete floors, walls and basemat, as depicted in Figure 3.7.2-123—SSI Analysis Model – Nuclear Island Shell Elements. The excavated soil representing the region occupied by the subgrade portion of the NI foundation is modeled by solid elements as shown in Figure 3.7.2-121—SSI Analysis Model – Excavated Soil Solid Elements, Nuclear Island Foundation.

The RCS components are represented by the simplified stick model previously shown in Figure 3.7.2-56. The simplified stick model is coupled to the RBIS finite element model at the appropriate locations. The stick model of the RCS along with other beam elements of the NI Structures are shown in Figure 3.7.2-122—SSI Analysis Model – Nuclear Island Beam Elements.

Figure 3.7.2-128—SSI Analysis Model – Nuclear Auxiliary Building Stick Model shows the stick model of the NAB structure. The NAB foundation and side wall rigid beams and NAB foundation excavated soil are shown in Figure 3.7.2-126—SSI Analysis Model – Nuclear Auxiliary Building Foundation and Sidewall Rigid Beams and Figure 3.7.2-129—SSI Analysis Model – Nuclear Auxiliary Building Foundation Excavated Soil, respectively. For the excavated soil region of the NAB, only the south side wall rigid beams are provided because the other sides are closely adjacent to the surrounding buildings, as shown in Figure 3.7.2-132—Nuclear Island Foundation Layout Showing Basemat, Sidewalls, and Shear Key. Table 3.7.2-6 lists the frequencies and modal mass ratios calculated using the GTSTRUDL code for the first 25 modes of the fixed-base stick model of the NAB structure.

Structural damping values used in the SSI analysis are based on Table 3.7.1-1:

- Reinforced concrete (RBIS, balance-of-NI Common Basemat Structures and NAB) – 7 percent. (4 percent structural damping is also used for generation of ISRS.)

- Prestressed concrete (containment) – 5 percent. (3 percent damping is also used for generation of ISRS)
- RCS components – 4 percent. (3 percent damping is also used for generation of ISRS)

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(2) EPGB and ESWB

Section 3.7.2.3.2 describes the development of the GTSTRUDL code 3D FEM of the structure, the translation of the FEM to that suitable for the MTR/SASSI code, and the development of the cracked FEM with reduced flexural stiffness in the out-of-plane direction of walls and slabs. Table 3.7.2-7, Table 3.7.2-8, and Table 3.7.2-32 show the frequencies computed by GTSTRUDL for the 3D FEM of the EPGB, ESWB (EUR motions), and ESWB (HF motion), respectively.

Both EPGB and ESWB are reinforced concrete structures. A structural damping equal to 4 percent is conservatively used in the SSI analysis.

3.7.2.4.3 Step 3 - Development of Soil Model

To develop the soil model for use in the SSI analysis with the SASSI code, each of the soil profiles is discretized into a sufficient number of sub-layers, followed by a uniform half space beneath the lowest sub-layer. The passing frequency f_p , which is the maximum frequency that can be represented by the soil model, is based on $f_p = V_s / (5L_e)$, where V_s is the soil shear wave velocity and L_e is the element size for discretizing the soil. Both the excavated soil element size and soil layer thickness are considered for L_e to assess the high-frequency transmission capability of the model in both the horizontal and vertical directions. The soil cases subjected to EUR soft input motions govern the design response spectra up to a frequency that is well below the calculated passing frequency of the subgrade. The medium and hard soil cases transmit frequencies up to the input motion frequency of interest. The upper bound HF (hfub) soil case bounds the ISRS responses in the high frequency range. The analysis models used in the seismic analyses, thus, adequately develop the seismic demand. The soil properties of the sub-layers corresponding to different generic shear wave velocities are shown in Table 3.7.2-9.

3.7.2.4.4 Step 4 - Development of SSI Analysis Model

(1) NI Common Basemat Structures and NAB

The NI Common Basemat Structures and NAB are embedded with the ground surface modeled at elevation -9-3/4 inches (-0.25 m) and the bottom of the basemat at elevation -38 ft, 10-1/2 inches (-11.85 m). The SSI analysis model is established by coupling the dynamic 3D FEM for the NI Common Basemat Structures and the stick model for the NAB with each of the soil models described in Step 3, at all interface nodes that represent the bottom faces of the NI Common Basemat Structures and NAB

SSI analysis cases resulting from the combination of the eight soil profiles and the four CSDRS design ground motions. The analysis cases combining each of the soil profiles with the corresponding ground motion are specified in Table 3.7.1-6.

Similarly, the SSI analysis of the EPGB and ESWB is performed using MTR/SASSI, Version 8.3. One SSI analysis is performed for each of the soil profiles, and the modified CSDRS is the input motion at the surface of the soil model for the EPGB and at the basemat elevation of the soil model for the ESWB. The analysis cases are specified in Table 3.7.1-8 and Table 3.7.1-9.

3.7.2.4.6 Step 6 - Extracting Global Seismic SSI Responses

(1) NI Common Basemat Structures and NAB

The SSI analyses of the NI Common Basemat Structures generate the global seismic responses of the NI Common Basemat Structures of all of the eight SSI analysis cases. In each analysis case, the analysis is performed for one component of the input motion at a time, and it outputs the time histories of the requested seismic responses (floor accelerations, member forces and moments, etc.) to the particular component of input motion. To account for the contributions from the three components of input motion to the floor acceleration response, the three output time histories for the floor acceleration in a given global direction and at a given location are algebraically summed to produce the total floor acceleration response time history in the corresponding global direction. The ZPA is the maximum amplitude of the total floor acceleration time history in the corresponding global direction. ZPAs at specified locations are computed using AREVA code SASSIEXT, Version 1.0. In addition, as discussed in Section 3.7.2.5 below, the in-structure response spectra (ISRS) for the floor acceleration time histories at specified locations are also computed using AREVA code SASSIEXT, Version 1.0.

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At key elevations of the FEM for the individual structure, the envelope of ZPAs at the building corners is taken to be the ZPA representative of the particular SSI analysis case. The ZPAs are shown in Table 3.7.2-10—NI Common Basemat Structures ZPAs, which presents the floor elevation individual envelope of ZPAs from the ~~sixteen cases~~ (eight SSI analysis cases ~~times two uncracked and with~~ cracked analysis models) ~~as well as the envelope of all sixteen cases.~~ The structural design is performed for individual soil cases.

The time history of the displacement at the NI Common Basemat relative to the input ground motion is determined by double integrating the acceleration response time history at the basemat, applying a linear baseline correction, and subtracting from it the displacement time history of the free field ground motion for each SSI analysis case. The maximum relative displacement at a given structural location in the NI Common Basemat Structures with respect to the basemat is conservatively taken from

Table 3.7.2-10—NI Common Basemat Structures ZPAs

Nuclear Island Key Locations										
Zero Period Accelerations at Each Floor Level [g]										
		Motion =>	EURS	EURH	EURM	EURM	EURH	HF	HF	HF
Designation	Elevation [m]	Direction	Cracked							
			Case 1n2ue	Case 1n5ae	Case 2sn4ue	Case 4ue	Case 5ae	Case hflb	Case hfbe	Case hfub
Containment Building	37.60	X	0.32	0.68	0.65	0.76	0.76	0.19	0.31	0.35
		Y	0.31	0.74	0.72	0.95	0.92	0.21	0.22	0.37
		Z	0.35	0.69	0.50	0.65	0.89	0.24	0.25	0.33
	58.00	X	0.41	1.05	0.83	0.95	1.02	0.28	0.32	0.38
		Y	0.38	0.91	0.93	1.27	1.00	0.36	0.40	0.47
		Z	0.34	1.11	0.58	0.95	1.35	0.49	0.69	1.04
Reactor Building Internal Structure	5.15	X	0.20	0.36	0.36	0.45	0.37	0.16	0.24	0.21
		Y	0.22	0.37	0.32	0.40	0.40	0.14	0.17	0.19
		Z	0.29	0.49	0.46	0.50	0.54	0.18	0.23	0.25
	19.50	X	0.22	0.55	0.57	0.66	0.61	0.23	0.24	0.23
		Y	0.26	0.53	0.44	0.54	0.60	0.16	0.18	0.22
Safeguard Building 1	8.10	X	0.22	0.41	0.34	0.37	0.45	0.14	0.18	0.40
		Y	0.22	0.40	0.31	0.42	0.37	0.17	0.19	0.46
		Z	0.32	0.49	0.40	0.50	0.42	0.16	0.17	0.25
	21.00	X	0.24	0.49	0.44	0.51	0.60	0.18	0.22	0.29
		Y	0.26	0.44	0.37	0.51	0.59	0.19	0.21	0.32
Safeguard Building 2 & 3	8.10	X	0.23	0.74	0.37	0.59	0.92	0.31	0.40	0.38
		Y	0.23	0.51	0.34	0.59	0.62	0.22	0.27	0.26
		Z	0.37	0.48	0.43	0.49	0.52	0.18	0.20	0.24
	16.30	X	0.24	0.71	0.42	0.77	1.08	0.25	0.26	0.34
		Y	0.25	0.68	0.43	0.69	0.81	0.28	0.27	0.32
Safeguard Building 4	21.00	X	0.22	0.49	0.35	0.47	0.51	0.20	0.20	0.27
		Y	0.27	0.41	0.37	0.53	0.56	0.17	0.19	0.25
		Z	0.33	0.55	0.47	0.44	0.51	0.26	0.31	0.39
	Fuel Building Shield Structure	X	0.17	0.39	0.30	0.34	0.45	0.19	0.19	0.25
		Y	0.22	0.40	0.35	0.39	0.46	0.18	0.19	0.23
3.70	Z	0.32	0.47	0.50	0.44	0.46	0.21	0.23	0.25	

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Uncracked columns deleted

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Column deleted