

ArevaEPRDCDocsPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Wednesday, June 26, 2013 2:07 PM
To: Snyder, Amy
Cc: Miernicki, Michael; ANDERSON Katherine (EXTERNAL AREVA); DELANO Karen (AREVA); HONMA George (EXTERNAL AREVA); LEIGHLITER John (AREVA); LEWIS Ray (EXTERNAL AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); SHEPHERD Tracey (AREVA); VANCE Brian (AREVA); ABAYAN Victor (AREVA); LOSEKE Brian (AREVA)
Subject: Advanced Response to U.S. EPR Design Certification Application RAI No. 376, FSAR Ch. 3, Question 03.08.05-31
Attachments: RAI 376 Advance Response Q3.8.5-31 - US EPR DC.pdf

Amy,

Attached is an Advanced Response for RAI 376, Question 03.08.05-31 prior to the August 30, 2013 final response date.

To keep our commitment to send a final response to this question by the commitment date, we need to receive all NRC staff feedback and comments no later than **August 15, 2013**.

Please let me know if NRC staff has any questions or if the response to this question can be sent as final.

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 9:27 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. 376, FSAR Ch. 3, Supplement 32

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM

responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplements 18 and 19 on March 18, 2011 and April 19, 2011, respectively. On May 2, 2011, AREVA NP submitted Supplement 20, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplement 21 on May 20, 2011. On June 9, 2011, AREVA NP submitted Supplement 22, to provide a final response to Question 03.08.05-25. On June 27, 2011, AREVA NP submitted Supplement 23 to provide a revised INTERIM response for Question 03.08.05-28. On July 7, 2011, AREVA NP submitted Supplement 24 to provide an INTERIM response for Question 03.08.05-31. On July 20, 2011, AREVA NP submitted Supplement 25 to provide a revised INTERIM response for Question 03.08.05-31. On July 22, 2011, AREVA NP submitted Supplement 26 to provide a revised INTERIM response to Question 03.08.05-31. On July 29, 2011, AREVA NP submitted Supplement 27 to provide a revised INTERIM response to Question 03.08.05-28. On October 10, 2011, AREVA NP submitted Supplement 28 to provide a revised schedule for the remaining 2 questions. On December 13, 2011, AREVA NP submitted Supplement 29 to provide a revised INTERIM response to Question 03.08.05-31 as it pertains to the EPGB and a preliminary revised schedule for a response to Question 03.08.05-31 as it pertains to the ESWB. On January 5, 2012, AREVA NP submitted Supplement 30 to provide a technically correct final response to Question 03.08.05-28. On January 25, 2012, AREVA NP submitted Supplement 31 to provide a revised schedule for the remaining question.

The schedule for the final response to the remaining question has been changed and is indicated 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 376-03.08.05-31	October 25, 2010 (Actual) July 22, 2011 (Actual) December 13, 2011 (Actual)	August 30, 2013

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
 7207 IBM Drive, Mail Code CLT 2B
 Charlotte, NC 28262
 Phone: 704-805-2223
 Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, January 25, 2012 10:18 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. 376, FSAR Ch. 3, Supplement 31

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplements 18 and 19 on March 18, 2011 and April 19, 2011, respectively. On May 2, 2011, AREVA NP submitted Supplement 20, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplement 21 on May 20, 2011. On June 9, 2011, AREVA NP submitted Supplement 22, to provide a final response to Question 03.08.05-25. On June 27, 2011, AREVA NP submitted Supplement 23 to provide a revised INTERIM response for Question 03.08.05-28. On July 7, 2011, AREVA NP submitted Supplement 24 to provide an INTERIM response for Question 03.08.05-31. On July 20, 2011, AREVA NP submitted Supplement 25 to provide a revised INTERIM response for Question 03.08.05-31. On July 22, 2011, AREVA NP submitted Supplement 26 to provide a revised INTERIM response to Question 03.08.05-31. On July 29, 2011, AREVA NP submitted Supplement 27 to provide a revised INTERIM response to Question 03.08.05-28. On October 10, 2011, AREVA NP submitted Supplement 28 to provide a revised schedule for the remaining 2 questions. On December 13, 2011, AREVA NP submitted Supplement 29 to provide a revised INTERIM response to Question 03.08.05-31 as it pertains to the EPGB and a preliminary revised schedule for a response to Question 03.08.05-31 as it pertains to the ESWB. On January 5, 2012, AREVA NP submitted Supplement 30 to provide a technically correct final response to Question 03.08.05-28.

The preliminary schedule for a technically correct and complete response to Question 03.08.05-31 as it pertains to the ESWB 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.

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-31	October 25, 2010 (Actual) July 22, 2011 (Actual) December 13, 2011 (Actual)	February 21, 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, January 05, 2012 6:58 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. 376, FSAR Ch. 3, Supplement 30 (Part 1 of 3)

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplements 18 and 19 on March 18, 2011 and April 19, 2011, respectively. On May 2, 2011, AREVA NP submitted Supplement 20, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplement 21 on May 20, 2011. On June 9, 2011, AREVA NP submitted Supplement 22, to provide a final response to Question 03.08.05-25. On June 27, 2011, AREVA NP submitted Supplement 23 to provide a revised INTERIM response for Question 03.08.05-28. On July 7, 2011, AREVA NP submitted Supplement 24 to provide an INTERIM response for Question 03.08.05-31. On July 20, 2011, AREVA NP submitted Supplement 25 to provide a revised INTERIM response for Question 03.08.05-31. On July 22, 2011, AREVA NP submitted Supplement 26 to provide a revised INTERIM response to Question 03.08.05-31. On July 29, 2011, AREVA NP submitted Supplement 27 to provide a revised INTERIM response to Question 03.08.05-28. On October 10, 2011, AREVA NP submitted Supplement 28 to provide a revised schedule for the remaining 2 questions. On December 13, 2011, AREVA NP submitted Supplement 29 to provide a revised INTERIM response to Question 03.08.05-31 as it pertains to the EPGB.

The attached file, "RAI 376 Supplement 30 Response US EPR DC Part 1 of 3.pdf" and the file "RAI 376 Supplement 30 Response US EPR DC Part 2 of 3.pdf" and the file "RAI 376 Supplement 30 Response US EPR DC Part 3 of 3.pdf" in subsequent emails provide a technically correct final response to Question 03.08.05-28.

Appended to these files are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the final response to RAI 376 Question 03.08.05-28. Some of the FSAR changes were incorporated in U.S. EPR FSAR Rev. 3 as indicated in the response and are not provided in this supplemental response. The FSAR mark-ups showing the changes included in US EPR FSAR Rev. 3 in redline-strikeout format were provided in RAI 376 Supplement 27. The response provided in this supplement (Supplement 30) and the associated markups provided in this supplement and in Supplement 27 provide a final and complete response to RAI 376 Question 03.08.05-28.

The following table indicates the pages in the response document, "RAI 376 Supplement 30 Response US EPR DC Part 1 of 3.pdf" and "RAI 376 Supplement 30 Response US EPR DC Part 2 of 3.pdf" and "RAI 376 Supplement 30 Response US EPR DC Part 3 of 3.pdf" that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 376 — 03.08.05-28	2	73

The preliminary schedule for a technically correct and complete final response to Question 03.08.05-31 as it pertains to the ESWB is unchanged as provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by January 25, 2012.

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-31	October 25, 2010 (Actual) July 22, 2011 (Actual) December 13, 2011 (Actual)	January 25, 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, December 13, 2011 3:41 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. 376, FSAR Ch. 3, Supplement 29 (Part 1 of 2)

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted

Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplements 18 and 19 on March 18, 2011 and April 19, 2011, respectively. On May 2, 2011, AREVA NP submitted Supplement 20, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplement 21 on May 20, 2011. On June 9, 2011, AREVA NP submitted Supplement 22, to provide a final response to Question 03.08.05-25. On June 27, 2011, AREVA NP submitted Supplement 23 to provide a revised INTERIM response for Question 03.08.05-28. On July 7, 2011, AREVA NP submitted Supplement 24 to provide an INTERIM response for Question 03.08.05-31. On July 20, 2011, AREVA NP submitted Supplement 25 to provide a revised INTERIM response for Question 03.08.05-31. On July 22, 2011, AREVA NP submitted Supplement 26 to provide a revised INTERIM response to Question 03.08.05-31. On July 29, 2011, AREVA NP submitted Supplement 27 to provide a revised INTERIM response to Question 03.08.05-28. On October 10, 2011, AREVA NP submitted Supplement 28 to provide a revised schedule for the remaining 2 questions.

The attached file, "RAI 376 Supplement 29 Response US EPR DC – PUBLIC (Part 1 of 2).pdf" and the file "RAI 376 Supplement 29 Response US EPR DC - PUBLIC (Part 2 of 2).pdf" in a subsequent email provide a technically correct revised INTERIM response to Question 03.08.05-31 as it pertains to the EPGB.

Appended to these files are the affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the revised INTERIM response to RAI 376 Question 03.08.05-31 as it pertains to the EPGB. Because the response 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 will be provided in a separate email.

The following table indicates the pages in the response document, "RAI 376 Supplement 29 Response US EPR DC - PUBLIC (Part 1 of 2).pdf" and the file "RAI 376 Supplement 29 Response US EPR DC - PUBLIC (Part 2 of 2).pdf" that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 376 — 03.08.05-31	2	4

The schedule for the final response to Question 03.08.05-28 remains unchanged. In addition, a preliminary revised schedule for a technically correct and complete final response to Question 03.08.05-31 as it pertains to the ESWB is provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by January 25, 2012.

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-28	October 25, 2010 (Actual) July 29, 2011 (Actual)	January 5, 2012
RAI 376-03.08.05-31	October 25, 2010 (Actual) July 22, 2011 (Actual) December 13, 2011 (Actual)	January 25, 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

From: WILLIFORD Dennis (RS/NB)
Sent: Monday, October 10, 2011 4:09 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. 376, FSAR Ch. 3, Supplement 28

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplements 18 and 19 on March 18, 2011 and April 19, 2011, respectively. On May 2, 2011, AREVA NP submitted Supplement 20, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplement 21 on May 20, 2011. On June 9, 2011, AREVA NP submitted Supplement 22, to provide a final response to Question 03.08.05-25. On June 27, 2011, AREVA NP submitted Supplement 23 to provide a revised INTERIM response for Question 03.08.05-28. On July 7, 2011, AREVA NP submitted Supplement 24 to provide an INTERIM response for Question 03.08.05-31. On July 20, 2011, AREVA NP submitted Supplement 25 to provide a revised INTERIM response for Question 03.08.05-31. On July 22, 2011, AREVA NP submitted Supplement 26 to provide a revised INTERIM response to Question 03.08.05-31. On July 29, 2011, AREVA NP submitted Supplement 27 to provide a revised INTERIM response to Question 03.08.05-28.

The schedule for the final response to Questions 03.08.05-28 and 03.08.05-31 has been changed. The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-28	October 25, 2010 (Actual) July 29, 2011 (Actual)	January 5, 2012
RAI 376-03.08.05-31	October 25, 2010 (Actual) July 22, 2011 (Actual)	December 13, 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: Friday, July 29, 2011 5:57 PM
To: 'Getachew Tesfaye'
Cc: WILLIFORD Dennis (RS/NB); ROMINE Judy (RS/NB); LENTZ Tony (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 376, FSAR Ch. 3, Supplement 27 (Part 1 of 3)

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplements 18 and 19 on March 18, 2011 and April 19, 2011, respectively. On May 2, 2011, AREVA NP submitted Supplement 20, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplement 21 on May 20, 2011. On June 9, 2011, AREVA NP submitted Supplement 22, to provide a final response to Question 03.08.05-25. On June 27, 2011, AREVA NP

submitted Supplement 23 to provide a revised INTERIM response for Question 03.08.05-28. On July 7, 2011, AREVA NP submitted Supplement 24 to provide an INTERIM response for Question 03.08.05-31. On July 20, 2011, AREVA NP submitted Supplement 24 to provide a revised INTERIM response for Question 03.08.05-31. On July 20, 2011, AREVA NP submitted Supplement 25 to provide a revised INTERIM response for Question 03.08.05-31. On July 22, 2011, AREVA NP submitted Supplement 25 to provide a AREVA NP submitted Supplement 26 to provide a revised INTERIM response to Question 03.08.05-31.

The attached file, "RAI 376 Supplement 27 Response US EPR DC (Part 1 of 3).pdf" provides the technically correct and revised INTERIM response to Question 03.08.05-28. 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 376 Question 03.08.05-28. The remaining parts will be provided in subsequent e-mails.

The following table indicates the page in the response document, "RAI 376 Supplement 27 Response US EPR DC (Part 1 of 3).pdf" that contains AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 376 — 03.08.05-28	2	50

The schedule for the final response to Question 03.08.05-28 and Question 03.08.05-31 remains unchanged. The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-28	October 25, 2010 (Actual) July 29, 2011 (Actual)	October 10, 2011
RAI 376-03.08.05-31	October 25, 2010 July 22, 2011 (Actual)	November 30, 2011

Sincerely,

Russ Wells 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: WELLS Russell (RS/NB)
Sent: Friday, July 22, 2011 1:03 PM
To: Tesfaye, Getachew
Cc: WILLIFORD Dennis (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 376, FSAR Ch. 3, Supplement 26 (Part 2 of 2)

Getachew
 Attached is part 2 of 2 for the response of RAI No. 376, FSAR Ch 3, Supplement 26.

Russ Wells for
Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
 7207 IBM Drive, Mail Code CLT 2B

From: WELLS Russell (RS/NB)
Sent: Friday, July 22, 2011 1:01 PM
To: 'Tesfaye, Getachew'
Cc: WILLIFORD Dennis (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 376, FSAR Ch. 3, Supplement 26 (Part 1 of 2)

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplements 18 and 19 on March 18, 2011 and April 19, 2011, respectively. On May 2, 2011, AREVA NP submitted Supplement 20, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplement 21 on May 20, 2011. On June 9, 2011, AREVA NP submitted Supplement 22, to provide a final response to Question 03.08.05-25. On June 27, 2011, AREVA NP submitted Supplement 23 to provide a revised INTERIM response for Question 03.08.05-28. On July 7, 2011, AREVA NP submitted Supplement 24 to provide an INTERIM response for Question 03.08.05-31. On July 20, 2011, AREVA NP submitted Supplement 24 to provide a revised INTERIM response for Question 03.08.05-31.

The attached file, "RAI 376 Supplement 26 Response US EPR DC – PUBLIC (Part 1 of 2).pdf" and the file "RAI 376 Supplement 26 Response US EPR DC - PUBLIC (Part 2 of 2).pdf" in a subsequent email provide a technically correct revised INTERIM response to Question 03.08.05-31 to correct an editorial error on FSAR mark-up page 2.1-5 (on U.S. EPR FSAR Tier 2, Table 2.1-1 (the value showed $u = .36$, instead of $u > \text{ and } = \text{ to } .36$).

Appended to these files are the affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 376 Question 03.08.05-31. Because the response 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 will be provided in a separate email.

The following table indicates the pages in the response document, "RAI 376 Supplement 26 Response US EPR DC - PUBLIC (Part 1 of 2).pdf" and the file "RAI 376 Supplement 26 Response US EPR DC - PUBLIC (Part 2 of 2).pdf" that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 376 — 03.08.05-31	2	4

The schedule for the final responses to the remaining questions is unchanged as provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-28	October 25, 2010 (Actual) June 27, 2011 (Actual)	October 10, 2011
RAI 376-03.08.05-31	October 25, 2010 (Actual) July 22, 2011 (Actual)	November 30, 2011

Sincerely,

**Russ Wells 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: Wednesday, July 20, 2011 10:27 AM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); Miernicki, Michael
Subject: Response to U.S. EPR Design Certification Application RAI No. 376, FSAR Ch. 3, Supplement 25 (Part 1 of 2)

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted

Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplements 18 and 19 on March 18, 2011 and April 19, 2011, respectively. On May 2, 2011, AREVA NP submitted Supplement 20, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplement 21 on May 20, 2011. On June 9, 2011, AREVA NP submitted Supplement 22, to provide a final response to Question 03.08.05-25. On June 27, 2011, AREVA NP submitted Supplement 23 to provide a revised INTERIM response for Question 03.08.05-28. On July 7, 2011, AREVA NP submitted Supplement 24 to provide an INTERIM response for Question 03.08.05-31.

The attached file, "RAI 376 Supplement 25 Response US EPR DC – PUBLIC (Part 1 of 2).pdf" and the file "RAI 376 Supplement 25 Response US EPR DC - PUBLIC (Part 2 of 2).pdf" in a subsequent email provide a technically correct revised INTERIM response to Question 03.08.05-31. Appended to these files are the affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 376 Question 03.08.05-31. Because the response 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 will be provided in a separate email.

The following table indicates the pages in the response document, "RAI 376 Supplement 25 Response US EPR DC - PUBLIC (Part 1 of 2).pdf" and the file "RAI 376 Supplement 25 Response US EPR DC - PUBLIC (Part 2 of 2).pdf" that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 376 — 03.08.05-31	2	4

The schedule for the final responses to the remaining questions is unchanged as provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-28	October 25, 2010 (Actual) June 27, 2011 (Actual)	October 10, 2011
RAI 376-03.08.05-31	October 25, 2010 (Actual) July 20, 2011 (Actual)	November 30, 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: WILLIFORD Dennis (RS/NB)
Sent: Thursday, July 07, 2011 1:49 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); Miernicki, Michael
Subject: Response to U.S. EPR Design Certification Application RAI No. 376, FSAR Ch. 3, Supplement 24

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplements 18 and 19 on March 18, 2011 and April 19, 2011, respectively. On May 2, 2011, AREVA NP submitted Supplement 20, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplement 21 on May 20, 2011. On June 9, 2011, AREVA NP submitted Supplement 22, to provide a final response to Question 03.08.05-25. On June 27, 2011, AREVA NP submitted Supplement 23 to provide a revised INTERIM response for Question 03.08.05-28.

The attached file, "RAI 376 Supplement 24 Response US EPR DC - PUBLIC (Part 1 of 2).pdf" and the file "RAI 376 Supplement 24 Response US EPR DC - PUBLIC (Part 2 of 2).pdf" in a subsequent email provides a technically correct INTERIM response to Question 03.08.05-31. Appended to these files are the affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 376 Question 03.08.05-31. Because the response 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 will be provided in a separate email.

The following table indicates the page in the response document, "RAI 376 Supplement 24 Response US EPR DC - PUBLIC (Part 1 of 2).pdf" and the file "RAI 376 Supplement 24 Response US EPR DC - PUBLIC (Part 2 of 2).pdf" that contains AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 376 — 03.08.05-31	2	4

The schedule for the final responses to the remaining questions is unchanged. The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-28	October 25, 2010 (Actual) June 27, 2011 (Actual)	October 10, 2011
RAI 376-03.08.05-31	October 25, 2010 July 7, 2011 (Actual)	November 30, 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: WILLIFORD Dennis (RS/NB)

Sent: Monday, June 27, 2011 4:47 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. 376, FSAR Ch. 3, Supplement 23

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplements 18 and 19 on March 18, 2011 and April 19, 2011, respectively. On May 2, 2011, AREVA NP submitted Supplement 20, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplement 21 on May 20, 2011. On June 9, 2011, AREVA NP submitted Supplement 22 to provide a final response to Question 03.08.05-25.

The attached file, "RAI 376 Supplement 23 Response US EPR DC - INTERIM.pdf (Part 1 of 2).pdf" and the file "RAI 376 Supplement 23 Response US EPR DC - INTERIM.pdf (Part 2 of 2).pdf" in a subsequent email, provide a technically correct INTERIM response to Question 03.08.05-28, as committed. Appended to the file "RAI 376 Supplement 23 Response US EPR DC - INTERIM.pdf (Part 2 of 2).pdf" are the affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 376 Question 03.08.05-28.

The following table indicates the respective pages in the response document, "RAI 376 Supplement 23 Response US EPR DC - INTERIM.pdf (Part 1 of 2).pdf" and "RAI 376 Supplement 23 Response US EPR DC - INTERIM.pdf (Part 2 of 2).pdf" that contain AREVA NP's INTERIM response to Question 03.08.05-28.

Question #	Start Page	End Page
RAI 376 — 03.08.05-28	2	50

The schedule for the final response to Question 03.08.05-28 and Question 03.08.05-31 is being revised. The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-28	October 25, 2010 (Actual) June 27, 2011 (Actual)	October 10, 2011
RAI 376-03.08.05-31	October 25, 2010	November 30, 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: WILLIFORD Dennis (RS/NB)
Sent: Thursday, June 09, 2011 12:46 PM
To: 'Tefaye, 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. 376, FSAR Ch. 3, Supplement 22

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplements 18 and 19 on March 18, 2011 and April 19, 2011, respectively. On May 2, 2011, AREVA NP submitted Supplement 20, to provide a

revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplement 21 on May 20, 2011.

The attached file, "RAI 376 Supplement 22 Response US EPR DC.pdf" provides a technically correct and complete FINAL response to Question 03.08.05-25. 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 376 Question 03.08.05-25.

The following table indicates the pages in the response document, "RAI 376 Supplement 22 Response US EPR DC.pdf" that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 376 — 03.08.05-25	2	5

The schedule for the remaining questions is unchanged. The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376—03.08.05-28	October 25, 2010 (Actual)	July 8, 2011
RAI 376—03.08.05-31	October 25, 2010 (Actual)	July 8, 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: WILLIFORD Dennis (RS/NB)
Sent: Friday, May 20, 2011 5:19 PM
To: 'Tefsaye, 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. 376, FSAR Ch. 3, Supplement 21

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010,

respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplements 18 and 19 on March 18, 2011 and April 19, 2011, respectively. On May 2, 2011, AREVA NP submitted Supplement 20 to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31.

The schedule for Question 03.08.05-25 is being revised. The schedule for the remaining questions is unchanged.

The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-25	August 27, 2010 (Actual)	July 8, 2011
RAI 376-03.08.05-28	October 25, 2010 (Actual)	July 8, 2011
RAI 376-03.08.05-31	October 25, 2010 (Actual)	July 8, 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. 376, FSAR Ch. 3, Supplement 20

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM

responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted a revised schedule for Question 03.08.05-25 in Supplements 18 and 19 on March 18, 2011 and April 19, 2011, respectively.

Due to changes in the schedule for FSAR Sections 3.7 and 3.8 as discussed with NRC, the schedule for Questions 03.08.05-28 and 03.08.05-31 is being revised. The schedule for the remaining question is unchanged.

The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-25	August 27, 2010 (Actual)	May 26, 2011
RAI 376-03.08.05-28	October 25, 2010 (Actual)	July 8, 2011
RAI 376-03.08.05-31	October 25, 2010 (Actual)	July 8, 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: Tuesday, April 19, 2011 7:39 AM

To: 'Tefaye, 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. 376, FSAR Ch. 3, Supplement 19

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010,

to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31. AREVA NP submitted Supplement 18 on March 18, 2011, to provide a revised schedule for Question 03.08.05-25.

The schedule for Question 03.08.05-25 is being revised to allow AREVA NP additional time to address NRC comments. The schedule for the remaining questions is unchanged.

The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-25	August 27, 2010 (Actual)	May 26, 2011
RAI 376-03.08.05-28	October 25, 2010 (Actual)	May 4, 2011
RAI 376-03.08.05-31	October 25, 2010 (Actual)	May 26, 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, March 18, 2011 4:43 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. 376, FSAR Ch. 3, Supplement 18

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3

on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29. On February 11, 2011, AREVA NP submitted Supplement 17, to provide a revised schedule for Question 03.08.05-28 and Question 03.08.05-31.

The schedule for Question 03.08.05-25 is being revised to allow AREVA NP additional time to interact with the NRC. The schedule for the remaining questions is unchanged.

The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-25	August 27, 2010 (Actual)	April 21, 2011
RAI 376-03.08.05-28	October 25, 2010 (Actual)	May 4, 2011
RAI 376-03.08.05-31	October 25, 2010 (Actual)	May 26, 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 2:51 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. 376, FSAR Ch. 3, Supplement 17

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14

questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30. AREVA NP submitted Supplement 16 on February 8, 2011, to provide a revised schedule for Question 03.08.05-25 and FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29.

The schedule for Question 03.08.05-28 and Question 03.08.05-31 has changed. The schedule for the remaining question is unchanged.

The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-25	August 27, 2010 (Actual)	March 30, 2011
RAI 376-03.08.05-28	October 25, 2010 (Actual)	May 4, 2011
RAI 376-03.08.05-31	October 25, 2010 (Actual)	May 26, 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: Tuesday, February 08, 2011 5:23 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. 376, FSAR Ch. 3, Supplement 16

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted

Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 25, 2010, to provide a revised schedule for Question 03.08.05-29. On November 22, 2011, AREVA NP submitted Supplement 15 to provide FINAL responses to Questions 03.08.05-27 and 03.08.05-30.

The attached file, "RAI 376 Supplement 16 Response US EPR DC.pdf" provides technically correct and complete FINAL responses to Questions 03.08.05-24, 03.08.05-26 and 03.08.05-29, as committed.

The following table indicates the respective pages in the response document, RAI 376 Supplement 16 Response US EPR DC.pdf," that contains AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 376 – 03.08.05-24	2	5
RAI 376 – 03.08.05-26	6	6
RAI 376 – 03.08.05-29	7	7

The schedule for Question 03.08.05-25 is being revised to allow additional time for AREVA NP to address NRC comments. The schedule for the remaining questions is unchanged.

The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-25	August 27, 2010 (Actual)	March 30, 2011
RAI 376-03.08.05-28	October 25, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-31	October 25, 2010 (Actual)	February 17, 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 22, 2010 7:33 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. 376, FSAR Ch. 3, Supplement 15

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3

on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31. AREVA NP submitted Supplement 14 on October 27, 2010, to provide a revised schedule for Question 03.08.05-29.

The attached file, "RAI 376 Supplement 15 Response US EPR DC.pdf" provides technically correct and complete FINAL responses to Questions 03.08.05-27 and 03.08.05-30, as committed.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 376 Question 03.08.05-27.

The following table indicates the respective pages in the response document, RAI 376 Supplement 15 Response US EPR DC.pdf," that contains AREVA NP's response to the subject questions. Please note that the similar table for RAI 376 Supplement 13 listed the RAI question as 354 when it should have been 376. The schedule for the remaining questions is unchanged.

Question #	Start Page	End Page
RAI 376 - 03.08.05-27	2	4
RAI 376 - 03.08.05-30	5	5

The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-24	July 15, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-25	August 27, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-26	August 16, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-28	October 25, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-29	August 27, 2010 (Actual)	February 28, 2011
RAI 376-03.08.05-31	October 25, 2010 (Actual)	February 17, 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: Wednesday, October 27, 2010 1:24 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. 376, FSAR Ch. 3, Supplement 14

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively. On October 25, 2010, AREVA NP submitted Supplement 13 to provide INTERIM responses for Questions 03.08.05-28 and 03.08.05-31.

The schedule for Question 03.08.05-29 is being revised to allow additional time for AREVA NP to address NRC comments. The schedule for the remaining questions is unchanged.

The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-24	July 15, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-25	August 27, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-26	August 16, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-27	August 16, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-28	October 25, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-29	August 27, 2010 (Actual)	February 28, 2011
RAI 376-03.08.05-30	N/A	November 22, 2010
RAI 376-03.08.05-31	October 25, 2010 (Actual)	February 17, 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, October 25, 2010 4:37 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. 376, FSAR Ch. 3, Supplement 13

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted a revised schedule for the final response to question 03.08.05-30 in Supplements 11 and 12 on September 15, 2010 and October 7, 2010, respectively.

The attached file, "RAI 376 Supplement 13 Response US EPR DC-INTERIM.pdf" provides a technically correct and complete INTERIM response to Questions 03.08.05-28 and 03.08.05-31, as committed.

The following table indicates the respective pages in the response document, RAI 376 Supplement 13 Response US EPR DC - INTERIM.pdf," that contains AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 354 - 03.08.05-28	2	10
RAI 354 - 03.08.05-31	11	12

The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-24	July 15, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-25	August 27, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-26	August 16, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-27	August 16, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-28	October 25, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-29	August 27, 2010 (Actual)	October 29, 2010
RAI 376-03.08.05-30	N/A	November 22, 2010
RAI 376-03.08.05-31	October 25, 2010 (Actual)	February 17, 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, October 07, 2010 2:50 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. 376, FSAR Ch. 3, Supplement 12

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29. AREVA NP submitted Supplement 11 on September 15, 2010, to provide a revised schedule for the final response to question 03.08.05-30

The schedule for Question 03.08.05-30 is being revised to allow additional time for AREVA NP to address NRC comments. The schedule for the remaining questions is unchanged.

The schedule for technically correct and complete responses to the remaining questions is provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-24	July 15, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-25	August 27, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-26	August 16, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-27	August 16, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-28	October 25, 2010	February 17, 2011
RAI 376-03.08.05-29	August 27, 2010 (Actual)	October 29, 2010
RAI 376-03.08.05-30	N/A	November 22, 2010
RAI 376-03.08.05-31	October 25, 2010	February 17, 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: Wednesday, September 15, 2010 9:21 AM

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. 376, FSAR Ch. 3, Supplement 11

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25. On August 27, 2010, AREVA NP submitted Supplement 10 to provide INTERIM responses for Questions 03.08.05-25 and 03.08.05-29.

The schedule for Question 03.08.05-30 is being revised to allow additional time for AREVA NP to interact with the NRC. The schedule for the remaining questions is unchanged.

The schedule for technically correct and complete responses to the remaining 8 questions is unchanged and provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-24	July 15, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-25	August 27, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-26	August 16, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-27	August 16, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-28	October 25, 2010	February 17, 2011
RAI 376-03.08.05-29	August 27, 2010 (Actual)	October 29, 2010
RAI 376-03.08.05-30	N/A	October 14, 2010
RAI 376-03.08.05-31	October 25, 2010	February 17, 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: Friday, August 27, 2010 4:58 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. 376, FSAR Ch. 3, Supplement 10-INTERIM

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3

on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29. AREVA NP submitted Supplement 9 on August 16, 2010, to provide INTERIM responses for Questions 03.08.05-26 and 03.08.05-27 and a revised schedule for INTERIM response to question 03.08.05-25.

The attached file, "RAI 376 Supplement 10 Response US EPR DC- INTERIM.pdf" provides a technically correct and complete INTERIM response to 2 of the remaining 8 questions, as committed.

The following table indicates the respective pages in the response document, "RAI 376 Supplement 10 Response US EPR DC- INTERIM.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 376 — 03.08.05-25	2	3
RAI 376 — 03.08.05-29	4	5

The schedule for technically correct and complete responses to the remaining questions is unchanged and provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-24	July 15, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-25	August 27, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-26	August 16, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-27	August 16, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-28	October 25, 2010	February 17, 2011
RAI 376-03.08.05-29	August 27, 2010 (Actual)	October 29, 2010
RAI 376-03.08.05-30	N/A	September 16, 2010
RAI 376-03.08.05-31	October 25, 2010	February 17, 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, August 16, 2010 12:34 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. 376, FSAR Ch. 3, Supplement 9

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3

on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed. AREVA NP submitted Supplement 8 on August 9, 2010, to provide a revised schedule for INTERIM response to question 03.08.05-29.

The schedule for INTERIM response to Question 03.08.05-25 is revised to allow AREVA NP additional time to prepare the response. The FINAL response date for Question 03.08.05-25 has not changed. The FINAL response date for Question 03.08.05-30 is being changed to account for the interaction with NRC being scheduled at a later date than the existing FINAL response date.

The attached file, "RAI 376 Supplement 9 Response - INTERIM.pdf" provides a technically correct and complete INTERIM response to 2 of the remaining 8 questions, as committed.

The following table indicates the respective pages in the response document, "RAI 376 Supplement 9 Response - INTERIM.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 376 — 03.08.05-26	2	2
RAI 376 — 03.08.05-27	3	5

The schedule for technically correct and complete responses to the remaining 8 questions is changed and provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-24	July 15, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-25	September 8, 2010	February 8, 2011
RAI 376-03.08.05-26	August 16, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-27	August 16, 2010 (Actual)	February 8, 2011
RAI 376-03.08.05-28	October 25, 2010	February 17, 2011
RAI 376-03.08.05-29	August 27, 2010	October 29, 2010
RAI 376-03.08.05-30	N/A	September 16, 2010
RAI 376-03.08.05-31	October 25, 2010	February 17, 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: Monday, August 09, 2010 5:45 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. 376, FSAR Ch. 3, Supplement 8

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, to provide an INTERIM response to question 03.08.05-24. AREVA NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed. AREVA NP submitted Supplement 7 on July 29, 2010, to provide a FINAL response to 2 of the remaining 10 question, as committed.

The schedule for INTERIM response to Question 03.08.05-29 is revised to allow AREVA NP additional time to prepare the interim response. The final response date for Question 03.08.05-29 has not changed.

The schedule for technically correct and complete responses to the remaining 8 questions is unchanged and provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-24	July 15, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-25	August 16, 2010	February 8, 2011
RAI 376-03.08.05-26	August 16, 2010	February 8, 2011
RAI 376-03.08.05-27	August 16, 2010	February 8, 2011
RAI 376-03.08.05-28	October 25, 2010	February 17, 2011
RAI 376-03.08.05-29	August 27, 2010	October 29, 2010
RAI 376-03.08.05-30	N/A	August 16, 2010
RAI 376-03.08.05-31	October 25, 2010	February 17, 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: Thursday, July 29, 2010 7:56 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)
Subject: Response to U.S. EPR Design Certification Application RAI No. 376, FSAR Ch. 3, Supplement 7

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010 to provide an INTERIM response to question 03.08.05-24. AREVA

NP submitted Supplement 6 on July 26, 2010, to provide a FINAL response to 3 of the remaining 13 question, as committed.

The attached file, "RAI 376 Supplement 7 FINAL Response US EPR DC.pdf" provides technically correct and complete responses to 2 of the remaining 10 questions, as committed.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 376 Questions 03.08.01-48 and 03.08.03-24.

The following table indicates the respective pages in the response document, RAI 376 Supplement 7 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 376 — 03.08.01-48	2	3
RAI 376 — 03.08.03-24	4	8

The schedule for technically correct and complete responses to the remaining 8 questions is unchanged and provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.05-24	July 15, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-25	August 16, 2010	February 8, 2011
RAI 376-03.08.05-26	August 16, 2010	February 8, 2011
RAI 376-03.08.05-27	August 16, 2010	February 8, 2011
RAI 376-03.08.05-28	October 25, 2010	February 17, 2011
RAI 376-03.08.05-29	August 9, 2010	October 29, 2010
RAI 376-03.08.05-30	N/A	August 16, 2010
RAI 376-03.08.05-31	October 25, 2010	February 17, 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: Monday, July 26, 2010 4:00 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. 376, FSAR Ch. 3, Supplement 6

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted a revised schedule for the remaining 13 questions in Supplements 2 and 3 on June 8, 2010, and June 24, 2010, respectively. AREVA NP submitted Supplement 4 on July 13, 2010, to

provide a revised schedule for question 03.08.05-30. AREVA NP submitted Supplement 5 on July 15, 2010, an INTERIM response to question 03.08.05-24.

The attached file, "RAI 376 Supplement 6 Response U.S. EPR DC.pdf" provides a technically correct and complete FINAL response to 3 of the remaining 13 questions, as committed. The schedule for the remaining 10 questions is unchanged.

The following table indicates the respective pages in the response document, "RAI 376 Supplement 6 Response U.S. EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 376 — 03.08.01-47	2	3
RAI 376 — 03.08.03-21	4	5
RAI 376 — 03.08.03-22	6	7

The schedule for technically correct and complete responses to the remaining 13 questions is provided below.

Question #	Interim Response Date	Response Date
RAI 376-03.08.01-48	N/A	July 29, 2010
RAI 376-03.08.03-24	N/A	July 29, 2010
RAI 376-03.08.05-24	July 15, 2010 (Actual)	February 17, 2011
RAI 376-03.08.05-25	August 16, 2010	February 8, 2011
RAI 376-03.08.05-26	August 16, 2010	February 8, 2011
RAI 376-03.08.05-27	August 16, 2010	February 8, 2011
RAI 376-03.08.05-28	October 25, 2010	February 17, 2011
RAI 376-03.08.05-29	August 9, 2010	October 29, 2010
RAI 376-03.08.05-30	N/A	August 16, 2010
RAI 376-03.08.05-31	October 25, 2010	February 17, 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: Thursday, July 15, 2010 7:13 PM
To: 'Tefsaye, 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. 376, FSAR Ch. 3, Supplement 5 - Interim

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to RAI No. 376 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on May 20, 2010 to address 1 of the remaining 14 questions. AREVA NP submitted Supplement 2 to the response on June 8, 2010, to change the schedule for responding to Question 03.08.05-30. AREVA NP submitted Supplement 3 to the response on June 24, 2010, to provide a changed schedule 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. AREVA NP submitted Supplement 4 on July 13, 2010 to provide a revised schedule for question 03.08.05-30. The attached file, "RAI 376 Question 03.08.05-24 Response - INTERIM.pdf" provides a technically correct and complete INTERIM response to 1 of the remaining 13 questions, as committed.

The following table indicates the respective pages in the response document, "RAI 376 Question 03.08.05-24 Response - INTERIM.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 376 — 03.08.05-24	2	5

The schedule for technically correct and complete FINAL responses to the remaining 13 questions is unchanged and provided below:

Question #	Interim Response Date	Response Date
RAI 376-03.08.01-47	N/A	August 17, 2010
RAI 376-03.08.01-48	N/A	July 29, 2010
RAI 376-03.08.03-21	N/A	July 26, 2010
RAI 376-03.08.03-22	N/A	July 26, 2010
RAI 376-03.08.03-24	N/A	July 29, 2010
RAI 376-03.08.05-24	July 15, 2010 Actual	February 17, 2011
RAI 376-03.08.05-25	August 16, 2010	February 8, 2011
RAI 376-03.08.05-26	August 16, 2010	February 8, 2011
RAI 376-03.08.05-27	August 16, 2010	February 8, 2011
RAI 376-03.08.05-28	October 25, 2010	February 17, 2011
RAI 376-03.08.05-29	August 9, 2010	October 29, 2010
RAI 376-03.08.05-30	N/A	August 16, 2010
RAI 376-03.08.05-31	October 25, 2010	February 17, 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, July 13, 2010 6:08 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)

Subject: Response to U.S. EPR Design Certification Application RAI No. 376, FSAR Ch. 3, Supplement 4

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted Supplement 2 to the response on June 8, 2010, to provide a schedule for the remaining 13 questions, which were affected by the work underway to address NRC comments from the April 26, 2010, audit. AREVA NP submitted RAI No. 376 Supplement 3 on June 24, 2010, to reflect the revised RAI response schedule as a result of the civil/structural re-planning activities.

RAI 376 Supplement 4 revises the schedule for the response to Question 03.08.05-30 to allow time to interact with the NRC on the draft response. The schedule for the remaining 12 questions is unchanged.

The schedule for technically correct and complete responses to the remaining 13 questions is provided below.

Question #	Interim Response Date	Response Date
RAI 376-03.08.01-47	N/A	August 17, 2010
RAI 376-03.08.01-48	N/A	July 29, 2010
RAI 376-03.08.03-21	N/A	July 26, 2010
RAI 376-03.08.03-22	N/A	July 26, 2010
RAI 376-03.08.03-24	N/A	July 29, 2010
RAI 376-03.08.05-24	July 15, 2010	February 17, 2011
RAI 376-03.08.05-25	August 16, 2010	February 8, 2011
RAI 376-03.08.05-26	August 16, 2010	February 8, 2011
RAI 376-03.08.05-27	August 16, 2010	February 8, 2011
RAI 376-03.08.05-28	October 25, 2010	February 17, 2011
RAI 376-03.08.05-29	August 9, 2010	October 29, 2010
RAI 376-03.08.05-30	N/A	August 16, 2010
RAI 376-03.08.05-31	October 25, 2010	February 17, 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: Thursday, June 24, 2010 11:56 AM

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); CORNELL Veronica (EXT); GARDNER George Darrell (AREVA NP INC)

Subject: Response to U.S. EPR Design Certification Application RAI No. 376, FSAR Ch. 3, Supplement 3

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions. AREVA NP submitted Supplement 2 to the response on June 8, 2010, to provide a schedule for the

remaining 13 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 schedule for 03.08.05-30 remains unchanged.

Prior to submittal of the final RAI response, AREVA NP will provide an interim RAI response that includes:

- (1) a description of the technical work (e.g., methodology)
- (2) U.S. EPR FSAR revised pages, as applicable

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

Question #	Interim Response Date	Response Date
RAI 376-03.08.01-47	N/A	August 17, 2010
RAI 376-03.08.01-48	N/A	July 29, 2010
RAI 376-03.08.03-21	N/A	July 26, 2010
RAI 376-03.08.03-22	N/A	July 26, 2010
RAI 376-03.08.03-24	N/A	July 29, 2010
RAI 376-03.08.05-24	July 15, 2010	February 17, 2011
RAI 376-03.08.05-25	August 16, 2010	February 8, 2011
RAI 376-03.08.05-26	August 16, 2010	February 8, 2011
RAI 376-03.08.05-27	August 16, 2010	February 8, 2011
RAI 376-03.08.05-28	October 25, 2010	February 17, 2011
RAI 376-03.08.05-29	August 9, 2010	October 29, 2010
RAI 376-03.08.05-30	N/A	July 14, 2010
RAI 376-03.08.05-31	October 25, 2010	February 17, 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, June 08, 2010 3:32 PM
To: 'Tefsaye, 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. 376, FSAR Ch. 3, Supplement 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 376 on April 26, 2010. RAI 376 Supplement 1 provided a technically correct and complete response to 1 of 14 questions.

The schedule for the response to Question 03.08.05-30 has been changed. The final schedule for this question as well as the remaining questions below will be evaluated based on the information that will be presented at the June 9, 2010, public meeting and subsequent NRC feedback.

Question #	Response Date
RAI 376-03.08.01-47	July 14, 2010
RAI 376-03.08.01-48	August 3, 2010
RAI 376-03.08.03-21	June 24, 2010
RAI 376-03.08.03-22	June 24, 2010
RAI 376-03.08.03-24	August 3, 2010
RAI 376-03.08.05-24	August 3, 2010
RAI 376-03.08.05-25	August 3, 2010
RAI 376-03.08.05-26	August 3, 2010
RAI 376-03.08.05-27	July 14, 2010
RAI 376-03.08.05-28	August 3, 2010
RAI 376-03.08.05-29	August 3, 2010
RAI 376-03.08.05-30	July 14, 2010
RAI 376-03.08.05-31	August 3, 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, May 20, 2010 4:24 PM
To: 'Tesyfaye, 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. 376, FSAR Ch. 3, Supplement 1

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to RAI No. 376 on April 26, 2010. The attached file, "RAI 376 Supplement 1 Response US EPR DC.pdf," provides technically correct and complete responses to 1 of the remaining 14 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 376 Question 03.08.03-23.

The response to one question, 03.08.05-30, cannot be provided at this time due to its dependence on path-to-closure related work-planning currently being rescheduled and reviewed by the NRC.

The following table indicates the respective pages in the response document, "RAI 376 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 376-03.08.03-23	2	2

A complete answer is not provided for 13 of the 14 questions. The schedule for a technically correct and complete response to these questions has been changed and is provided below.

Question #	Response Date
RAI 376-03.08.01-47	July 14, 2010
RAI 376-03.08.01-48	August 3, 2010
RAI 376-03.08.03-21	June 24, 2010
RAI 376-03.08.03-22	June 24, 2010
RAI 376-03.08.03-24	August 3, 2010
RAI 376-03.08.05-24	August 3, 2010
RAI 376-03.08.05-25	August 3, 2010
RAI 376-03.08.05-26	August 3, 2010
RAI 376-03.08.05-27	July 14, 2010
RAI 376-03.08.05-28	August 3, 2010
RAI 376-03.08.05-29	August 3, 2010
RAI 376-03.08.05-30	June 10, 2010
RAI 376-03.08.05-31	August 3, 2010

Sincerely,

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From: BRYAN Martin (EXT)
Sent: Monday, April 26, 2010 12:49 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. 376 (4355,4367,4377), FSAR Ch. 3

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 376 Response US EPR DC.pdf" provides a schedule since a technically correct and complete response to the 14 questions is not provided.

The following table indicates the respective pages in the response document, "RAI 376 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 376-03.08.01-47	2	2

RAI 376-03.08.01-48	3	4
RAI 376-03.08.03-21	5	6
RAI 376-03.08.03-22	7	7
RAI 376-03.08.03-23	8	8
RAI 376-03.08.03-24	9	10
RAI 376-03.08.05-24	11	12
RAI 376-03.08.05-25	13	13
RAI 376-03.08.05-26	14	14
RAI 376-03.08.05-27	15	16
RAI 376-03.08.05-28	17	19
RAI 376-03.08.05-29	20	20
RAI 376-03.08.05-30	21	21
RAI 376-03.08.05-31	22	22

A complete answer is not provided for 14 of the 14 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 376-03.08.01-47	July 14, 2010
RAI 376-03.08.01-48	August 3, 2010
RAI 376-03.08.03-21	June 24, 2010
RAI 376-03.08.03-22	June 24, 2010
RAI 376-03.08.03-23	May 20, 2010
RAI 376-03.08.03-24	August 3, 2010
RAI 376-03.08.05-24	August 3, 2010
RAI 376-03.08.05-25	August 3, 2010
RAI 376-03.08.05-26	August 3, 2010
RAI 376-03.08.05-27	July 14, 2010
RAI 376-03.08.05-28	August 3, 2010
RAI 376-03.08.05-29	August 3, 2010
RAI 376-03.08.05-30	May 20, 2010
RAI 376-03.08.05-31	August 3, 2010

Sincerely,
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Thursday, March 25, 2010 2:13 PM
To: ZZ-DL-A-USEPR-DL
Cc: Xu, Jim; Hawkins, Kimberly; Miernicki, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 376 (4355,4367,4377), FSAR Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on March 11, 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_Docs_Public
Email Number: 29

Mail Envelope Properties (554210743EFE354B8D5741BEB695E6561A74B2)

Subject: Advanced Response to U.S. EPR Design Certification Application RAI No. 376, FSAR Ch. 3, Question 03.08.05-31
Sent Date: 6/26/2013 2:06:43 PM
Received Date: 6/26/2013 2:07:31 PM
From: WILLIFORD Dennis (AREVA)

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Files	Size	Date & Time
MESSAGE	122056	6/26/2013 2:07:31 PM
RAI 376 Advance Response Q3.8.5-31 - US EPR DC.pdf		2355575

Options

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

Advanced Response to

Request for Additional Information No. 376, Question 03.08.05-31

3/25/2010

U.S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 03.08.01 - Concrete Containment

**SRP Section: 03.08.03 - Concrete and Steel Internal Structures of Steel or
Concrete Containments**

SRP Section: 03.08.05 - Foundations

Application Section: 3.8

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

Question 03.08.05-31:**Follow-up to RAI 155, Questions 03.08.05-10 and 03.88.05-12**

The staff finds that the information provided in the responses to RAIs 3.8.5-10 and 3.8.5-12 requires additional clarification as discussed below. This clarification is needed to determine if the foundation design related to stability evaluations and soil pressures meets the acceptance criteria in SRP 3.8.5.II.

1. Provide a summary of the procedure used to determine the static and dynamic soil bearing pressures, including representative values for all soil cases considered in the design certification, and include this information in the relevant sections of the FSAR. In this regard, the staff notes that the markup to FSAR Section 3.8.5.4.1 (paragraph 1), included with the response to RAI 3.8.5-8, states: "The underlying soil medium is represented by FEM for SSI analysis for the NI and by soil springs for other Category I structures as described in subsequent sections." This statement appears to indicate that the dynamic soil bearing pressures are determined from an equivalent-static seismic analysis with the soil represented by equivalent springs. If this is the case, then final values of soil bearing pressures will need to be reconfirmed after resolution of RAI 3.8.1-28 (adequacy of modification factors used in equivalent-static seismic analysis) and RAI 3.8.5-9 (adequacy of soil springs utilized in the analysis of the EPGB and ESWB).
2. Provide a summary of the procedure used to calculate minimum factors of safety against sliding and overturning, and include this information in the relevant sections of the FSAR.
3. Confirm whether the coefficients of friction used in the sliding stability analyses are consistent with those given in the response to RAI 3.8.5-8 Item 4; that is, static coefficients of friction of 0.5 representing saturated conditions and 0.7 representing dry conditions. If these values are used, additional justification should be provided to demonstrate that no sliding of the structure occurs for any soil cases considered in the design certification. Otherwise, as mentioned in the staff's evaluation of RAI 3.8.5-8 Item 4, dynamic coefficients of friction need to be used, typically having lower values. It is important to note that if the coefficients of friction are overestimated then the corresponding factors of safety against sliding could also be overestimated, and it would not be possible to determine if the foundation design meets the acceptance criteria in SRP 3.8.5.II.
4. Explain the procedures used to calculate seismic induced lateral soil pressures and provide the pressure distributions on foundations for the following cases: (a) seismic SSI analyses, (b) sliding and overturning stability analyses, and (b) design of below-grade foundation walls. In addition, the explanation should demonstrate that these pressures are bounded by the full passive pressures that can be developed in the soil, for all soil cases referenced in the design certification, and that the design of the foundation walls is performed for the envelop of cases (a) and (b) identified above. Finally, in the case of stability analyses, the explanation should be consistent with the sliding/non-sliding assumption discussed in Item 3 above (i.e. full passive pressures in the soil cannot be mobilized if no sliding of the structures occurs). Information regarding this issue should be provided in conjunction with the response to the follow-up to RAI 3.8.5-4 Item 5.

Response to 03.08.05-31:

The stability results for the Emergency Power Generating Building (EPGB) and Essential Service Water Building (ESWB) are provided in the response to this question. The stability results for the Nuclear Island (NI) Common Basemat Structure is provided in the response to RAI 376, Question 3.8.5-28. In addition, the response updates the previous EPGB Soil-Structure Interaction (SSI) analysis results with SSI analysis results using MTR/SASSI direct method.

Item 1

The methodology for determining the static and dynamic bearing pressures for Seismic Category I structures is described in U.S. EPR FSAR Tier 2, Sections 3.8.5.4.1, 3.8.5.5.2, and 3.8.5.5.3. Static and dynamic soil bearing pressures are obtained from MTR/SASSI analysis. For the ESWB, the soil bearing pressures were determined using SSI direct method results. For the EPGB, comparisons of SSI subtraction method and direct method results were performed and determined to be comparable.

U.S. EPR FSAR Tier 1, Table 5.0-1 and U.S. EPR FSAR Tier 2, Table 2.1-1 identify the site enveloping static and dynamic bearing pressure demands for Seismic Category I structures. U.S. EPR FSAR Tier 2, Table 3E.2-2 includes the calculated EPGB bearing pressures. The calculated ESWB bearing pressures will be added to U.S. EPR FSAR Tier 2, Table 3E.3-2.

The EPGB and ESWB soil spring development and distribution methodologies are the same as the NI and are described in U.S. EPR FSAR Tier 2, Section 3.8.5.4.2. U.S. EPR FSAR Tier 2, Table 3.8-19 is updated to show the EPGB static and dynamic soil spring distributions for the soil cases in U.S. EPR FSAR Tier 2, Table 3.7.1-8. Similarly, U.S. EPR FSAR Tier 2, Table 3.8-20 is added to show the ESWB static and dynamic soil spring distributions for the soil cases in U.S. EPR FSAR Tier 2, Table 3.7.1-9. A description of soil pressures used in the U.S. EPR design is described in the Response to RAI 547, Question 03.07.02-78.

Item 2

A summary of the methods used to calculate the minimum factor of safety against sliding and overturning for Seismic Category I structures is described in U.S. EPR FSAR Tier 2, Section 3.7.2.1. The sidewall coefficient of friction of 0.36 in U.S. EPR FSAR Tier 2, Table 2.1-1 is applied to the vertical faces of embedded concrete walls of the EPGB to develop an adequate factor of safety for overturning. .

U.S. EPR FSAR Tier 2, Table 3E.2-1 provides the minimum factors of safety against sliding and overturning for each EPGB soil case. Similarly, U.S. EPR FSAR Tier 2, Table 3E.3-1 is added to provide the minimum factors of safety against sliding and overturning for each ESWB soil case. A coefficient of friction of 0.5 is used in the ESWB sliding stability analyses.

Item 3

The coefficients of friction used in the sliding stability analyses are described in the U.S. EPR FSAR Tier 2, Section 2.5.4.2 and Table 2.1-1.

Item 4

- a) The SSI procedures for the EPGB and ESWB are the same as the NI. U.S. EPR FSAR Tier 2, Section 3.7.2, describes the SSI procedures and includes the SSI analysis results. The EPGB maximum accelerations have been revised and are shown in U.S. EPR FSAR Tier 2, Table 3.7.2-28. In addition, updated in-structure response spectra (ISRS) are shown in U.S. EPR FSAR Tier 2, Figures 3.7.2-71 to 3.7.2-73, Figures 3.7.2-101 to 3.7.2-103; and Figures 3.7.2-148 to 3.7.2-150. The ESWB SSI results were provided in the Response to RAI 320, Question 03.07.02-63.

Lateral soil pressures and resulting pressure distributions on foundations are described in the Response to RAI 547, Question 03.07.02-78.

U.S. EPR Tier 2, Section 3.7.1.1.1 will be revised to provide clarification on the modified CSDRS and determination of SSSI factor.

- b) The EPGB and ESWB sliding and overturning stability methodology is the same as the NI; and it is described in U.S. EPR FSAR Tier 2, Section 3.7.2.1 and Section 3.7.2.3.2. The ESWB stability results will be added to U.S. EPR FSAR Tier 2, Appendix 3E.3.
- c) Design of below grade walls for the EPGB and ESWB is described in U.S. EPR FSAR Tier 2, Sections 3.8.4.4.3 and 3.8.4.4.4, respectively. The EPGB shear keys are shown in U.S. EPR FSAR Tier 2, Figures 3.8-93 and 3.8-94. U.S. EPR FSAR Tier 2, Figure 3.7.2-57 and Figure 3.7.2-58 show isometric and section views of the EPGB, respectively. The notes in U.S. EPR FSAR Tier 2, Figures 3.7.2-57 and 3.7.2-58, clarify the layers representing the shear keys for the EPGB.

The design of the ESWB includes a two foot increase in wall height to ensure sufficient margin for the expected water volume, and the basemat was extended laterally around the perimeter and thickened to meet the required minimum factor of safety of 1.1. U.S. EPR FSAR Tier 2, Figures 3.8-101 and 3.8-102, show section views of the ESWB. Specific design details for EPGB and ESWB critical sections will be provided in U.S. EPR FSAR Tier 2, Appendices 3E.2 and 3E.3, respectively.

- d) Development of passive pressure in the soil to resist lateral loads for Seismic Category I structures is described in U.S. EPR FSAR Tier 2, Section 3.8.5.4.1. The foundation walls are designed for the loading conditions described in U.S. EPR FSAR Tier 2, Section 3.8.5.4.1. U.S. EPR FSAR Tier 2, Section 3.8.4.3.2 provides additional details on load combinations used to design walls.

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 3.7.1, 3.7.2, 3.8.4, 3.8.5, Appendix 3E.3, Tables 3.7.2-28, and 3.8-19, and Figures 3.7.2-71, 3.7.2-72, 3.7.2-73, 3.7.2-101, 3.7.2-102, 3.7.2-103, 3.7.2-148, 3.7.2-149, and 3.7.2-150 were revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR Tier 2, Tables 3.8-20, 3E.3-1 and 3E.2 will be added as described in the response and indicated on the enclosed markup.

U.S. EPR
Final Safety Analysis Report
MARKUPS



horizontal motion, the RG 1.60 horizontal spectrum exceeds the EUR spectra below about 3 Hz and the HFH spectrum below about 10.5 Hz. For vertical motion, the RG 1.60 vertical spectrum exceeds the EUR spectra in the frequency range below approximately 0.65 Hz and the HFV spectrum below about 11.0 Hz. The EUR control motions anchored at 0.3g also exceed the 0.1g minimum horizontal design ground motion.

The three EUR control motions and high frequency content motion, HFH for the horizontal and HFV for the vertical directions, comprise the seismic design basis for the U.S. EPR standard plant (i.e., the CSDRS). The standard plant SSE is the CSDRS since the minimum horizontal design response spectra requirement is also met by the design for the CSDRS.

For the U.S. EPR standard plant, the bottom of the NI Common Basemat is located 36 ft 5 in (Reactor Building) and 41 ft 4 in (remaining NI Common Basemat Structures) below plant grade. For the seismic analysis of the U.S. EPR standard plant, the seismic input is defined at the foundation level (at elevation 38 ft 10-1/2 in). Consistent with the guidance of SRP 3.7.1 (Reference 6) and RG 1.208 as well as the NEI approach for ISG-17, the control point is modeled in site response and soil-structure interaction (SSI) analyses as an outcrop or hypothetical outcrop at the same 38 ft 10-1/2 in foundation level.

For Seismic Category I structures that are not on the NI Common Basemat, namely, the Emergency Power Generating Buildings (EPGB) and the Essential Service Water Buildings (ESWB), the seismic input at the basemat for those structures is the design basis motion (the CSDRS) modified to account for the effects of structure-soil-structure interaction (SSSI) between those structures and the Nuclear Island Common Basemat Structures. The SSI analyses in Section 3.7.2 provide insight into the effects of seismic-induced structure-soil-structure interaction between the NI Common Basemat Structures and nearby Seismic Category I and non-Seismic Category I structures.

The SSI analysis of the NI Common Basemat Structures establishes an SSSI amplification factor (greater than or equal to 1.0) applied to the CSDRS, which defines the amplified seismic input to the respective structural model. Modification of the CSDRS at basemat elevations of the EPGB and ESWB takes into account the differences in elevation of each building when considering SSSI effects.

The modified CSDRS for the EUR-based control motions are defined using a three step approach. The first step involves computing SSSI amplification factors. SSSI amplification factors, which are frequency-based, are computed by dividing the computed response spectra at the surface footprint locations of the EPGB and ESWB obtained from the NI SSI analysis by the input response spectra of the surface motion for all soil cases except 1n5a. In the second step, the input response spectra at the foundation level of EPGB and ESWB which take into account the soil-column

effect due to difference in elevations of the respective foundations of each building are multiplied with the SSSI amplification factors computed in the first step (greater than or equal to 1.0) to obtain amplified response spectra at each of the EPGB and ESWB foundation locations. In the third step, the modified CSDRS are defined by the smoothed spectrum enveloping all the amplified response spectra at the foundation locations of the EPGB and ESWB. The modified CSDRS is then propagated to the top of the EPGB and ESWB soil columns (including 1n5a) to obtain the surface input motion.

~~The modified CSDRS for the EUR control motions are defined by the smoothed spectrum enveloping all the response spectra at the surface footprint locations of the EPGB and ESWB. The soil column effect for the EUR soil profiles (excluding the soil case 1n5a) is determined to be minimal based on soil column studies. Therefore, the smooth envelope thus computed, which inherently includes the SSSI amplification factor, does not need to be modified for soil column effects.~~

The modified CSDRS for the HF control motions are defined using the above-mentioned three step approach. SSSI amplification factors, which are frequency-based, are computed by dividing the computed response spectra at the surface footprint locations of the EPGB and ESWB obtained from the NI SSI analysis by the input response spectra of the surface motion. The input response spectra at the foundation level are multiplied with the SSSI amplification factors (greater than or equal to 1.0) to obtain amplified response spectra at each of the EPGB and ESWB foundation locations. The modified HF CSDRS are defined by the smoothed spectrum enveloping all the amplified response spectra at the foundation locations of the EPGB and ESWB.

Figure 3.7.1-33—Input Motion for Structures not on the Nuclear Island Common Basemat, Horizontal Motion 5% Damping (EUR) and Figure 3.7.1-34—Input Motion for Structures not on the Nuclear Island Common Basemat, Vertical Motion 5% Damping (EUR) show the input motion obtained by modifying the EUR control motions, identified as SSSI motion, for the Seismic Category I Structures that are not on the NI Common Basemat. Figure 3.7.1-49—Input Motion for Structures Not on the NI Common Basemat, Horizontal (SSSIHF) and Figure 3.7.1-50—Input Motion for Structures Not on the NI Common Basemat, Vertical (SSSIHF) show the high frequency input motion obtained by modifying the HF control motion, identified as SSSIHF motion, for the ESWB and EPGB. These input motions do not constitute an additional seismic design basis (i.e., a second set of CSDRS); they are the logical extension of the seismic design basis CSDRS that provide input motion to structures not on the NI eCommon bBasemat.

Figure 3.7.1-4—EUR Design Ground Spectra for Hard Conditions Normalized to 0.3g, Figure 3.7.1-5—EUR Design Ground Spectra for Medium Conditions Normalized to 0.3g, and Figure 3.7.1-6—EUR Design Ground Spectra for Soft Conditions Normalized to 0.3g, illustrate the seismic demand associated with the CSDRS spectra on an SSC as a

Basemat Structures. The simplified stick model is shown in Figure 3.7.2-56. The simplified stick model is coupled to appropriate nodal locations of the dynamic 3D FEM of the RBIS. The modal frequencies of the simplified RCS stick model are shown in Table 3.7.2-4.

(3) Stick Model for NAB

The stick model for the NAB is developed in a manner similar to that for the RBIS stick model. Dynamic compatibility between the stick model and 3D FEM is ensured by comparing the ISRS generated at selected locations for both models. Figure 3.7.2-67—Elevation View of NAB Stick Model in Y-Z Plane, shows elevation views of the stick model in the global X-Z and Y-Z plane.

3.7.2.3.1.4 Finite Element Model for NI Common Basemat Foundation

The 3D basemat FEM is used for the analysis and design of the NI Common Basemat foundation and the tendon gallery. The FE discretization is selected so that the elements representing elevations and varying thickness of the basemat are able to produce reliable forces and moments for design. ~~The 3D basemat FEM consists of solid elements connected to the shell or beam element of the SASSI dynamic model described in Section 3.7.2.3.1.2 using the ANSYS code.~~

The basemat foundation consists of solid elements, five layers through thickness on average in the 10 ft thickness basemat areas, connected to the shell/beam element representation of the SASSI dynamic model described in Section 3.7.2.3.1.2 using the ANSYS code (Reference 12). The particular elements of the ANSYS code used are listed below:

- SOLID45 – An eight-node solid element used to model the common basemat.
- SHELL43 – A four-node shell element used to model walls, slabs and the shell of the RB. This element is suitable for moderately thick shell structures and can also provide out of plane shear forces.
- BEAM4 – Used to model NSSS and Polar Crane.
- BEAM44 – Used to model beams and columns.
- LINK8 and COMBIN39 – A linear 3-D truss element and a non-linear spring element combination used to model sidewall soil springs.
- COMBIN40 – A spring-slider and damper combination element used to model bottom springs.
- MASS21 – Point mass element used to represent structural mass and rotational inertia.

locations represents the ISRS at the particular structural elevation for the particular SSI analysis case. The ISRS from the eight SSI analysis cases, with each case considering both FEMs simulating cracked and uncracked section properties, are enveloped, and the spectrum envelope is broadened by ± 15 percent and smoothed to account for uncertainty anticipated in the structural modeling and SSI analysis techniques.

(2) EPGB and ESWB

The ISRS for the EPGB and ESWB are calculated similarly using MTR/SASSI~~EXT~~, Version 1.0 at the same set of 98 frequencies. The ISRS from the analyzed soil cases are then enveloped, and the ISRS envelope is broadened by ± 15 percent and smoothed to account for uncertainty anticipated in the structural modeling and SSI analysis techniques.

Results of the Response Spectrum Development

The results of the response spectrum development are presented below for the NI Common Basemat Structures, EPGB and ESWB separately:

(1) NI Common Basemat Structures

Figure 3.7.2-68—Response Spectra at NI Common Basemat Bottom ~~Node 274~~- 5% Damping, X-Direction, Figure 3.7.2-69—Response Spectra at NI Common Basemat Bottom ~~Node 274~~- 5% Damping, Y-Direction, and Figure 3.7.2-70—Response Spectra at NI Common Basemat Bottom ~~Node 274~~- 5% Damping, Z-Direction show the ISRS at ~~Node 274~~, the center bottom node of NI Common Basemat at elevation -38 ft, 10-1/2 inches, for five percent damping for the individual SSI analysis cases. No spectrum peak broadening and smoothing is applied.

Figure 3.7.2-71—Soil Model Surface Response Spectra at Centers of Footprint of EPGB - 5% Damping, X-Direction, Figure 3.7.2-72—Soil Model Surface Response Spectra at Centers of Footprint of EPGB - 5% Damping, Y-Direction, and Figure 3.7.2-73—Soil Model Surface Response Spectra at Centers of Footprint of EPGB - 5% Damping, Z-Direction show the 5 percent damping response spectra of the response motions from all SSI analysis cases at the soil model surface (i.e., elevation -38 ft, 10-1/2 inches) at the center nodes of the footprints of EPGB 1 and 2 and ESWB 1 to 4. Figure 3.7.2-158—Soil Model Surface Response Spectra at Centers of Footprint of ESWB - 5% Damping, X-Direction, Figure 3.7.2-159—Soil Model Surface Response Spectra at Centers of Footprint of ESWB - 5% Damping, Y-Direction, and Figure 3.7.2-160—Soil Model Surface Response Spectra at Centers of Footprint of ESWB - 5% Damping, Z-Direction show the five percent damping response spectra of the response motions from all SSI analysis cases at the center nodes of the footprints of ESWB 1 to 4. These response spectra are used as the basis for developing the modified CSDRS discussed in Section 3.7.2.1.1 for use as seismic input to the SSI analysis of the EPGB and ESWB.

The listed figures show the peak-broadened and smoothed ISRS envelopes at representative locations of the NI Common Basemat Structures.

Building at Elev. +48 ft, 6-3/4 in (+14.8m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction.

(2) EPGB and ESWB

Figure 3.7.2-101—Spectrum Envelope of EPGB at the Center of Basemat - 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction, Figure 3.7.2-102—Spectrum Envelope of EPGB at the Center of Basemat - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction, and Figure 3.7.2-103—Spectrum Envelope of EPGB at the Center of Basemat - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction show the peak-broadened and smoothed ISRS envelopes at elevation -6 ft, 0 inches of the EPGB.

Figure 3.7.2-148—Spectrum Envelope of EPGB at Elev. +51 ft, 6 in - 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction, Figure 3.7.2-149—Spectrum Envelope of EPGB at Elev. +50± ft, 6 in - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction, and Figure 3.7.2-150—Spectrum Envelope of EPGB at Elev. +50± ft, 6 in - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction show the peak-broadened and smoothed ISRS envelopes on elevation +50± ft, 6 inches of the EPGB.

Figure 3.7.2-104—Spectrum Envelope of ESWB at Elev +63 ft, 0 in ~~at Node 12733~~- 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction, Figure 3.7.2-105—Spectrum Envelope of ESWB at Elev +63 ft, 0 in ~~at Node 12733~~- 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction, Figure 3.7.2-106—Spectrum Envelope of ESWB at Elev +63 ft, 0 in ~~at Node 12733~~- 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction, Figure 3.7.2-107—Spectrum Envelope of ESWB at Elev +14 ft, 0 in ~~at Node 10385~~- 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction, Figure 3.7.2-108—Spectrum Envelope of ESWB at Elev +14 ft, 0 in ~~at Node 10385~~- 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction, and Figure 3.7.2-109—Spectrum Envelope of ESWB at Elev +14 ft, 0 in ~~at Node 10385~~- 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction show the peak-broadened and smoothed ISRS envelopes ~~at Node 12733~~ on elevation +63 ft, 0 inches and Node 10385 on elevation +14 ft, 0 inches of the ESWB.

~~As discussed in Section 3.8.4.4.3 and Section 3.8.4.4.4, subsequent analyses will incorporate certain design details for the EPGBs and ESWBs that are not reflected in the existing respective SASSI models used for the SSI analyses described in Section 3.7.2. The subsequent analyses will determine the impact of these design details on the seismic responses and ISRS presented in Section 3.7.2.~~

3.7.2.6 Three Components of Earthquake Motion

(1) NI Common Basemat Structures and NAB

As previously stated in Section 3.7.2.4.6, the floor acceleration time history in a given direction is obtained by algebraically combining the three corresponding time histories due to the three earthquake components. Therefore, both the floor ZPA and the ISRS for the floor acceleration time history properly account for the contributions from the three components of earthquake motion.



Table 3.7.2-9—Soil Properties Associated with Different Shear Wave Velocities
Sheet 2 of 4

Applicable Soil Profiles	Shear Wave Velocity (ft/s)	Shear Wave Velocity (m/s)	Poisson's Ratio μ	Weight Density (pcf)	Weight Density (kN/m ³)	Shear Wave Damping Ratio (%)	Dynamic Shear Modulus (ksf)	Static Shear Modulus (ksf)
hf c (EPGB)	11,759	3,584	0.26	170	26.70	0.47	730,200	365,100
	720.5	220	0.35	140	21.98	2.10	2,257	1,129
	9,017	2,748	0.20	140	21.98	0.50	353,506	176,753
	8,803	2,683	0.33	170	26.69	0.70	409,124	204,562
	9,311	2,838	0.31	170	26.69	0.50	457,705	228,853
	9,126	2,782	0.31	170	26.69	0.50	439,697	219,849
	10,200	3,109	0.31	170	26.69	0.60	549,280	274,640
	10,960	3,341	0.31	170	26.69	0.50	634,182	317,091
	708	216	0.35	140	21.98	2.50	2,179	1,090
	769	234	0.35	140	21.98	2.60	2,571	1,286
	928	283	0.35	140	21.98	2.80	3,744	1,872
915	279	0.48	140	21.98	3.30	3,640	1,820	
1,135	346	0.47	140	21.98	2.10	5,601	2,800	
1,115	340	0.47	140	21.98	2.40	5,405	2,703	
1,100	335	0.47	140	21.98	2.60	5,261	2,630	
1,132	345	0.47	140	21.98	2.30	5,571	2,786	
1,122	342	0.47	140	21.98	2.50	5,473	2,737	
1,114	340	0.47	140	21.98	2.60	5,396	2,698	
7,598	2,316	0.36	170	26.69	0.60	304,784	152,392	
8,460	2,579	0.31	170	26.69	0.50	377,862	188,931	
9,011	2,747	0.30	170	26.69	0.50	428,686	214,343	



Table 3.7.2-9—Soil Properties Associated with Different Shear Wave Velocities
Sheet 3 of 4

Applicable Soil Profiles	Shear Wave Velocity (ft/s)	Shear Wave Velocity (m/s)	Poisson's Ratio μ	Weight Density (pcf)	Weight Density (kN/m ³)	Shear Wave Damping Ratio (%)	Dynamic Shear Modulus (ksf)	Static Shear Modulus (ksf)
	10,280	3,133	0.31	170	26.69	0.50	557,929	278,965
	10,960	3,341	0.30	170	26.69	0.50	634,182	317,091
hf c (ESWB)	706	215	0.35	140	21.98	2.80	2,160	1,080
	724	221	0.35	140	21.98	2.84	2,272	1,136
	928	283	0.35	140	21.98	3.16	3,733	1,866
	919	280	0.47	140	21.98	3.52	3,661	1,830
	917	280	0.48	140	21.98	3.59	3,645	1,822
	1,206	368	0.47	144	22.62	3.22	6,484	3,242
	8,586	2,617	0.33	170	26.70	0.62	387,997	193,998
	9,172	2,796	0.31	170	26.70	0.63	442,766	221,383
	9,253	2,820	0.31	170	26.70	0.41	450,621	225,311
	10,255	3,126	0.31	170	26.70	0.46	553,500	276,750
	10,961	3,341	0.30	170	26.70	0.47	632,334	316,167
HF s (ESWB)	705	215	0.35	140	21.98	2.51	2,154	1,077
	724	221	0.35	140	21.98	2.54	2,272	1,136
	932	284	0.35	140	21.98	2.86	3,765	1,882
	919	280	0.48	140	21.98	3.33	3,661	1,830
	1,075	328	0.47	140	21.98	2.33	5,009	2,504
	1,102	336	0.47	140	21.98	2.19	5,264	2,632
	1,082	330	0.47	140	21.98	2.48	5,074	2,537
	1,068	326	0.47	140	21.98	2.68	4,944	2,472



Table 3.7.2-28—Maximum Accelerations in EPGB

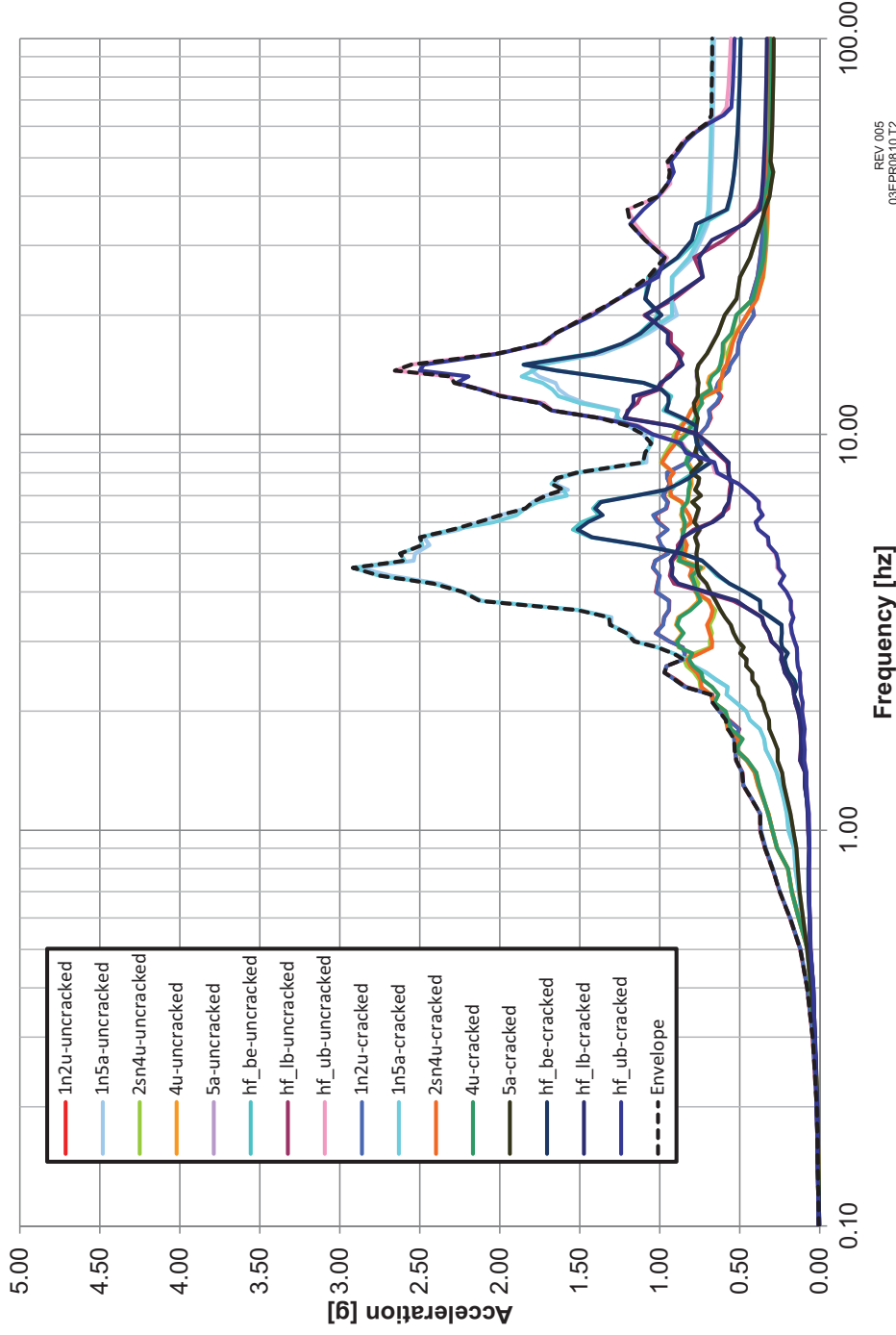
Slab Elevation	X-Direction	Y-Direction	Z-Direction
+68 ft, 0 in	1.37 g	1.58 g	2.64 3 g
+50 1 ft, 6 in	1.22 16 g	1.50 22 g	3.69 1.84 g
+19 ft, 3 in	0.65 g	1.00 g	0.61 g
0 ft, 0 in	0.46 g	0.44 g	0.58 g

Table 3.7.2-29—Maximum Accelerations in ESWB

<u>Slab Elevation</u>	<u>X-Direction</u>	<u>Y-Direction</u>	<u>Z-Direction</u>
<u>+63 ft, 0 in</u>	<u>1.07g</u>	<u>1.04g</u>	<u>3.07g</u>
<u>+14 ft, 0 in</u>	<u>0.50g</u>	<u>1.05g</u>	<u>0.72g</u>
Will be provided later.			



Figure 3.7.2-71—Soil Model Surface Response Spectra at Centers of Footprint of EPGB - 5% Damping, X-Direction

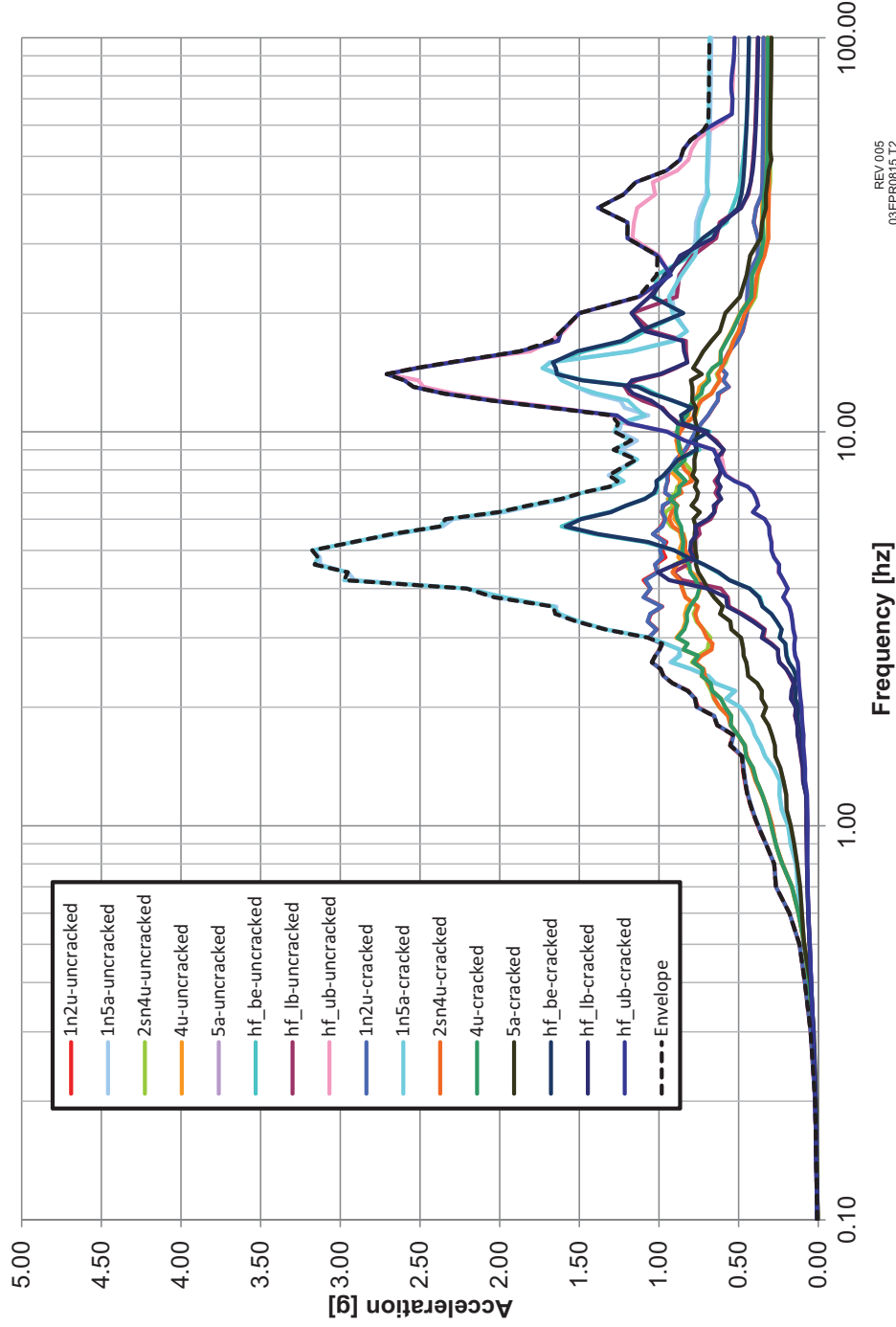


Note:

Plots include the soil profiles in Table 3.7.1-6 for the footprint locations of both EPGBs with cracked and un-cracked properties.



Figure 3.7.2-72—Soil Model Surface Response Spectra at Centers of Footprint of EPGB - 5% Damping, Y-Direction

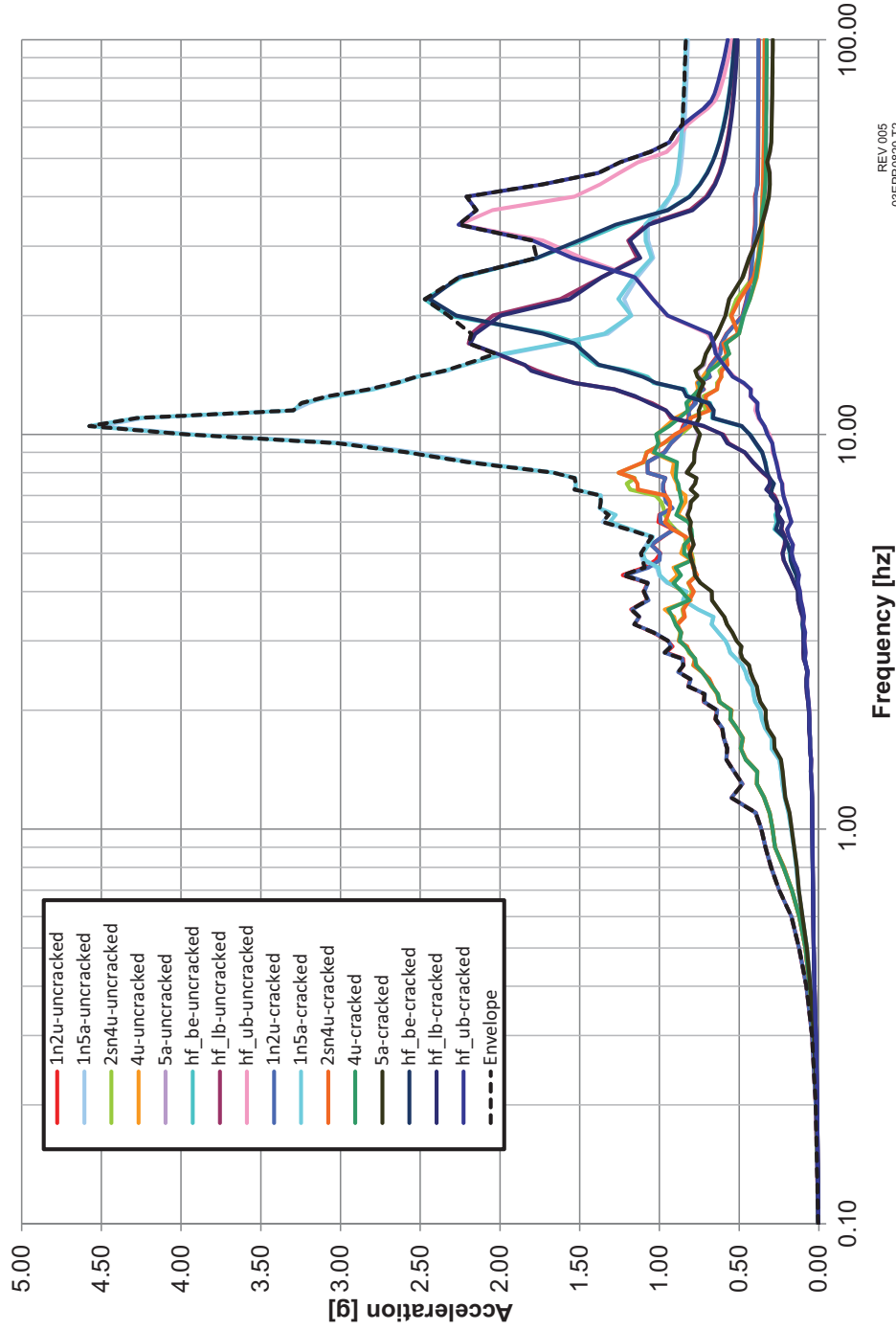


Note:

Plots include the soil profiles in Table 3.7.1-6 for the footprint locations of both EPGBs with cracked and un-cracked properties.



Figure 3.7.2-73—Soil Model Surface Response Spectra at Centers of Footprint of EPGB - 5% Damping, Z-Direction

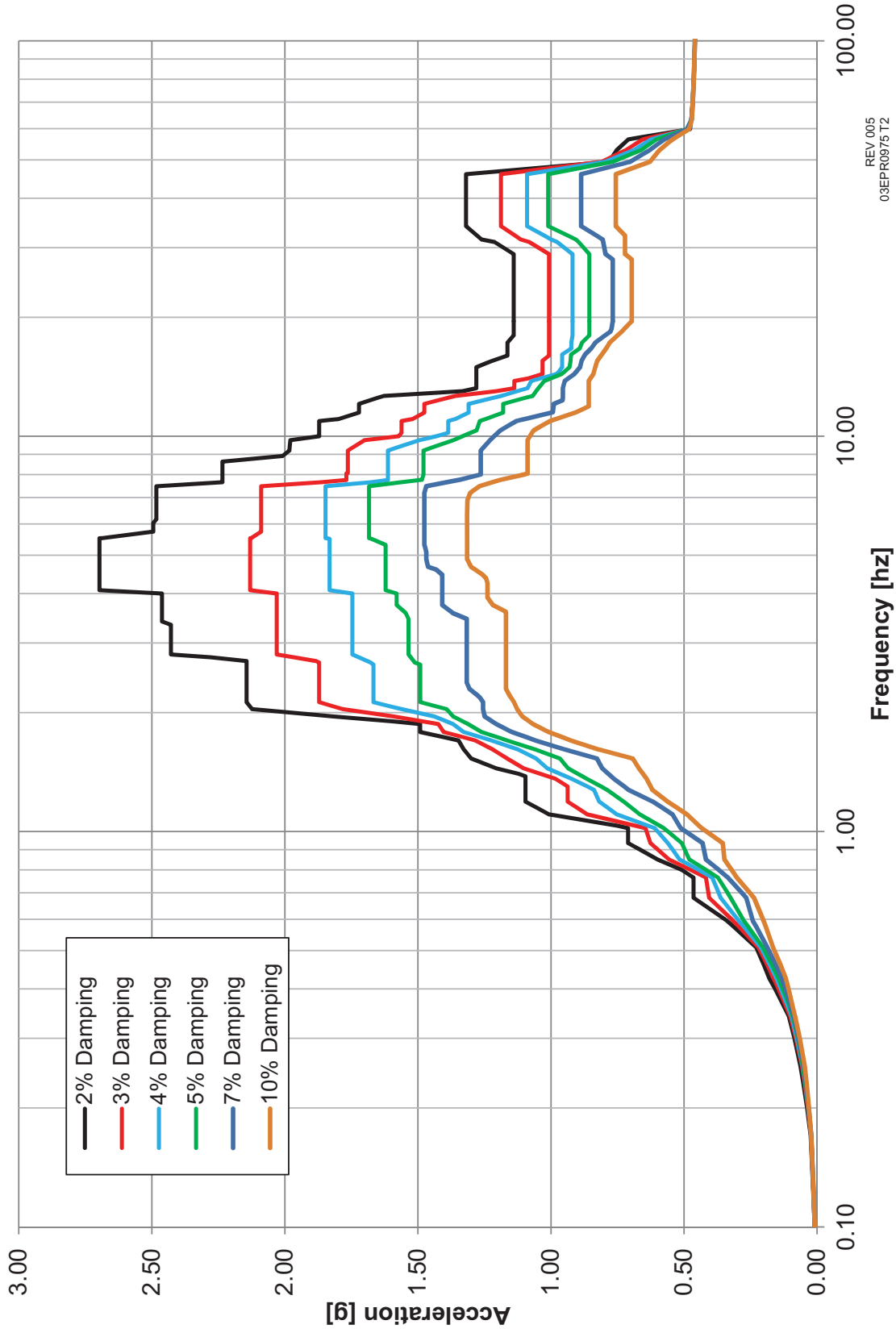


Note:

Plots include the soil profiles in Table 3.7.1-6 for the footprint locations of both EPGBs with cracked and un-cracked properties.

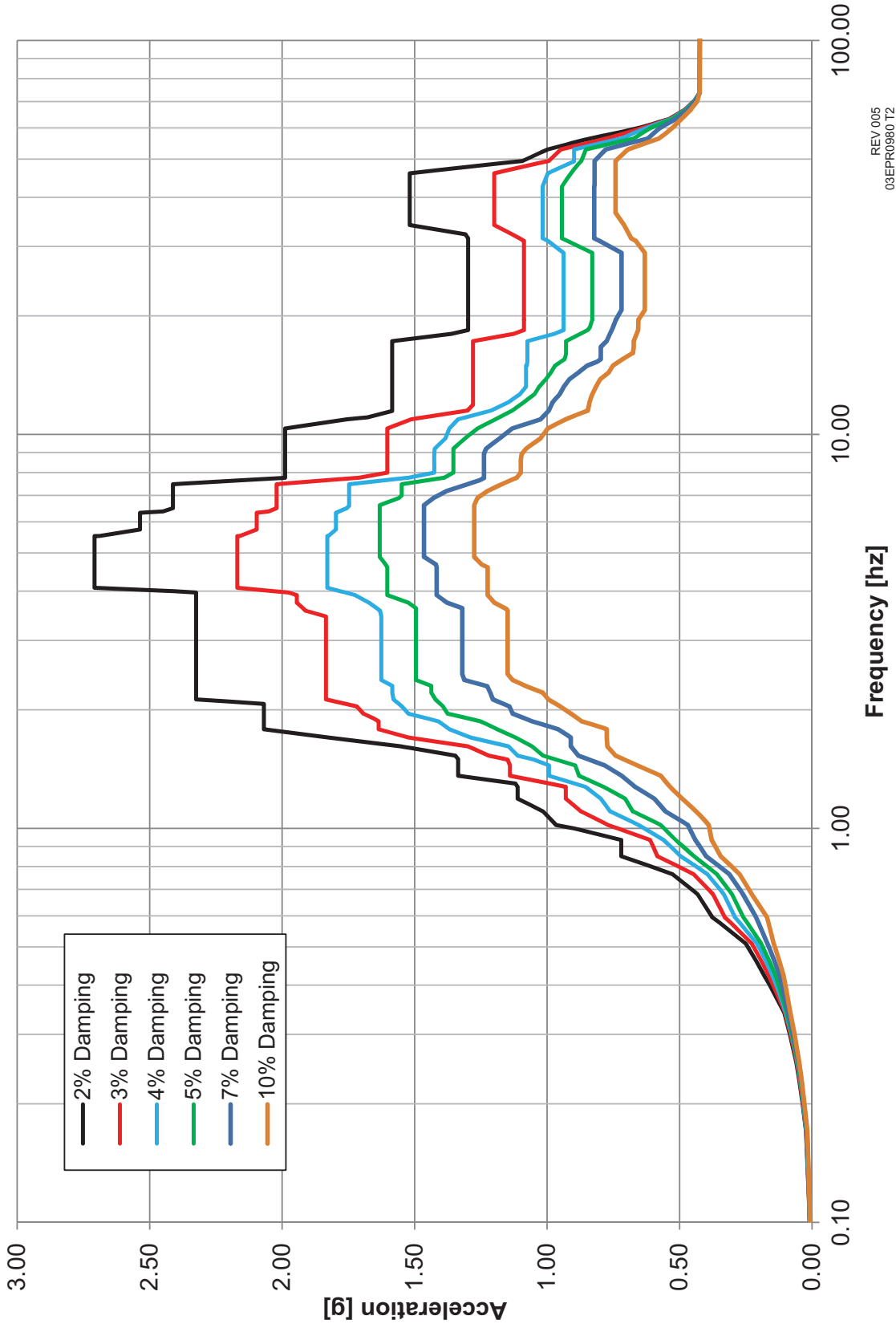


Figure 3.7.2-101—Spectrum Envelope of EPGB at the Center of Basemat -
2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction



REV 005
03EPR0975T2

**Figure 3.7.2-102—Spectrum Envelope of EPGB at the Center of Basemat -
2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction**



REV 005
03EPR0980 T2



Figure 3.7.2-103—Spectrum Envelope of EPGB at the Center of Basemat -
2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction

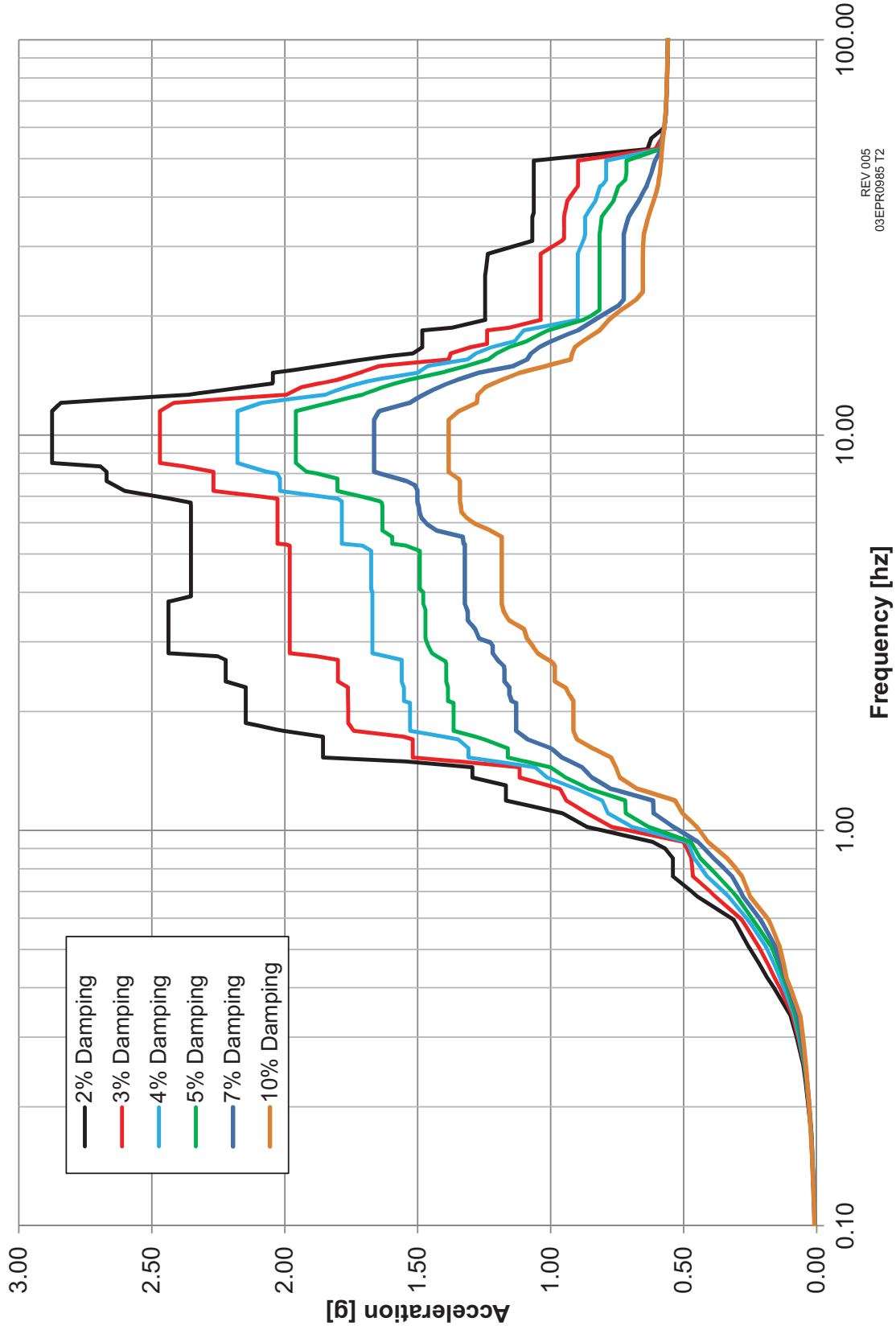
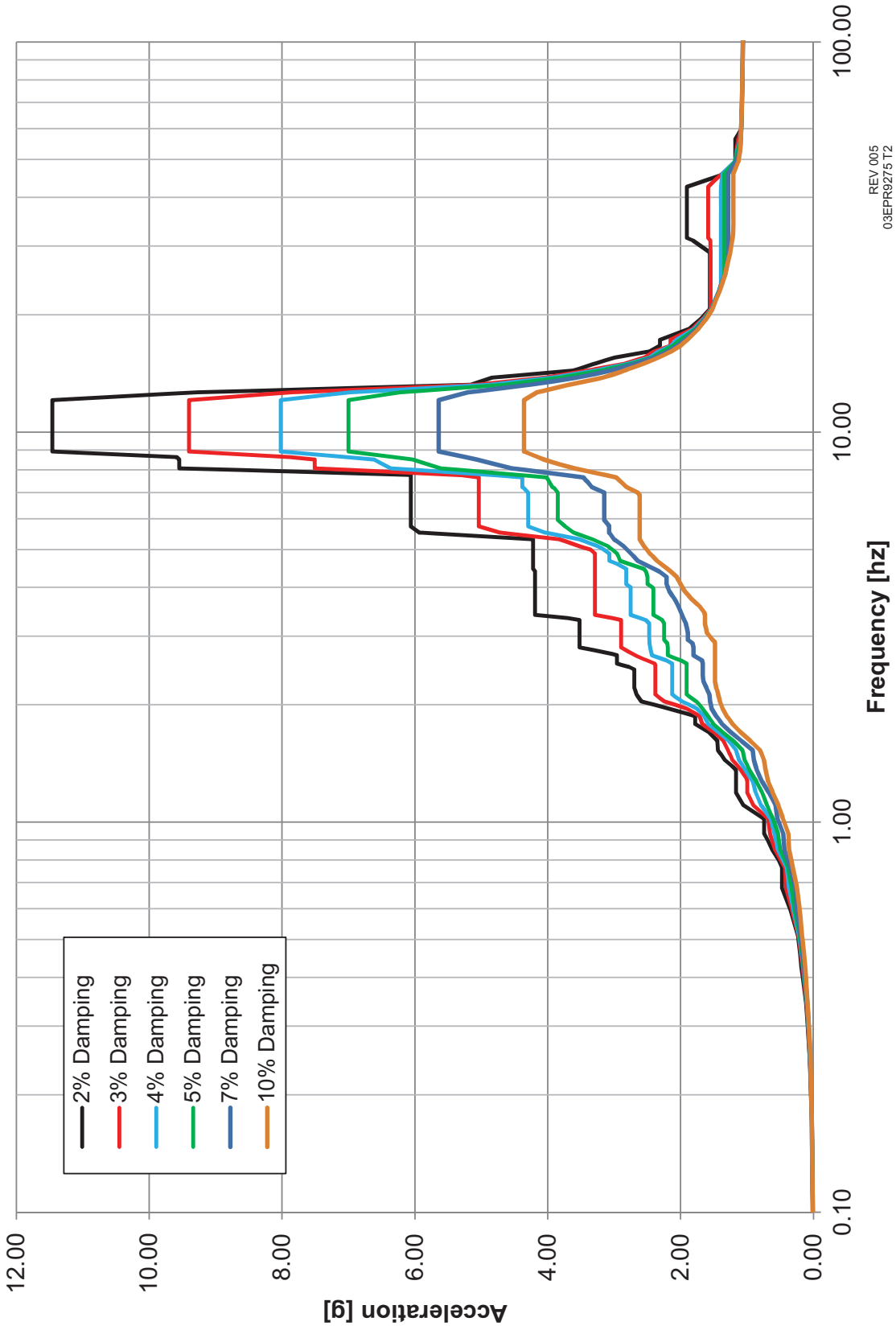




Figure 3.7.2-148—Spectrum Envelope of EPGB at Elev. +50⁴ ft, 6 in - 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction



REV.005
03EPR0275TZ



Figure 3.7.2-149—Spectrum Envelope of EPGB at Elev. +504 ft, 6 in - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction

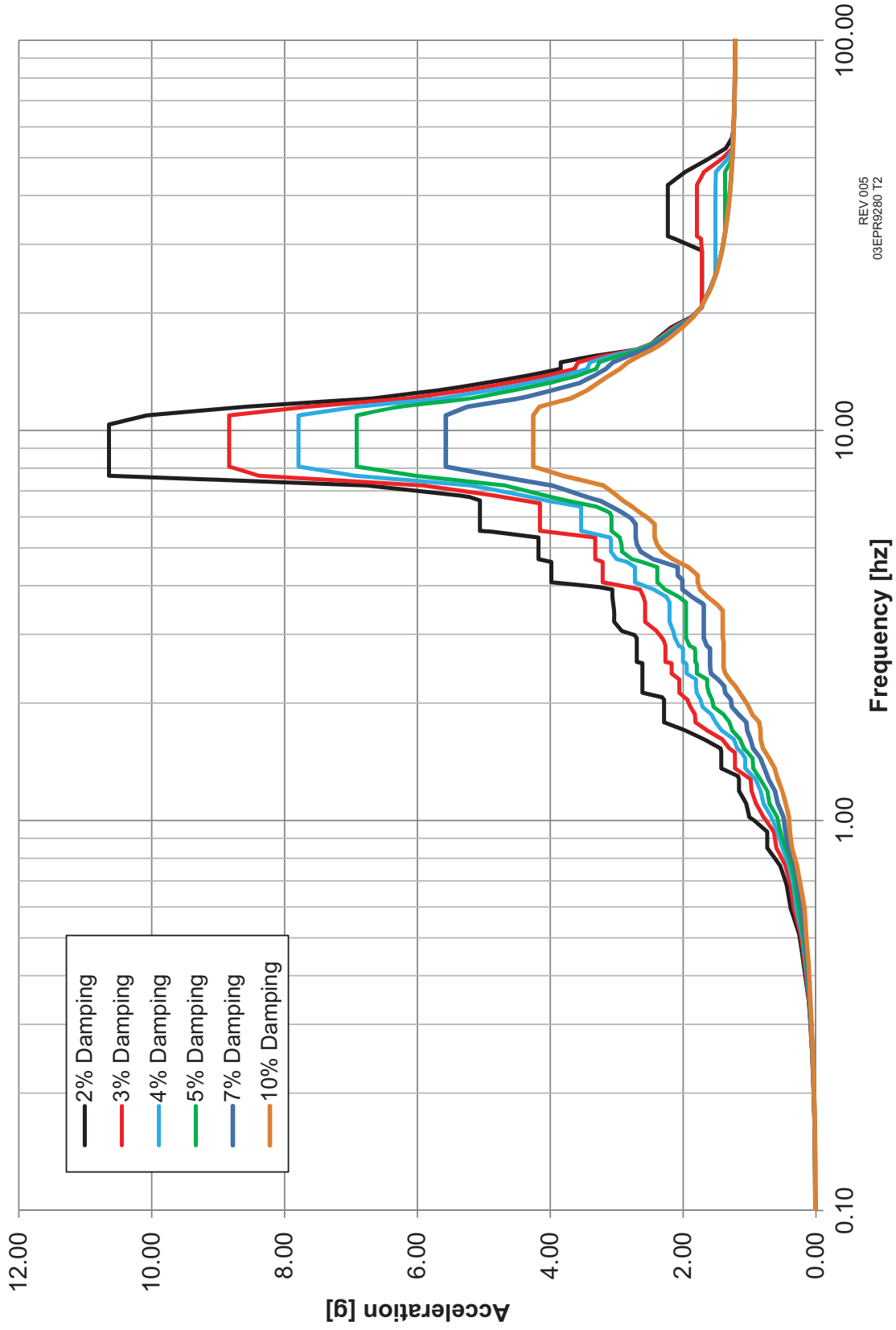
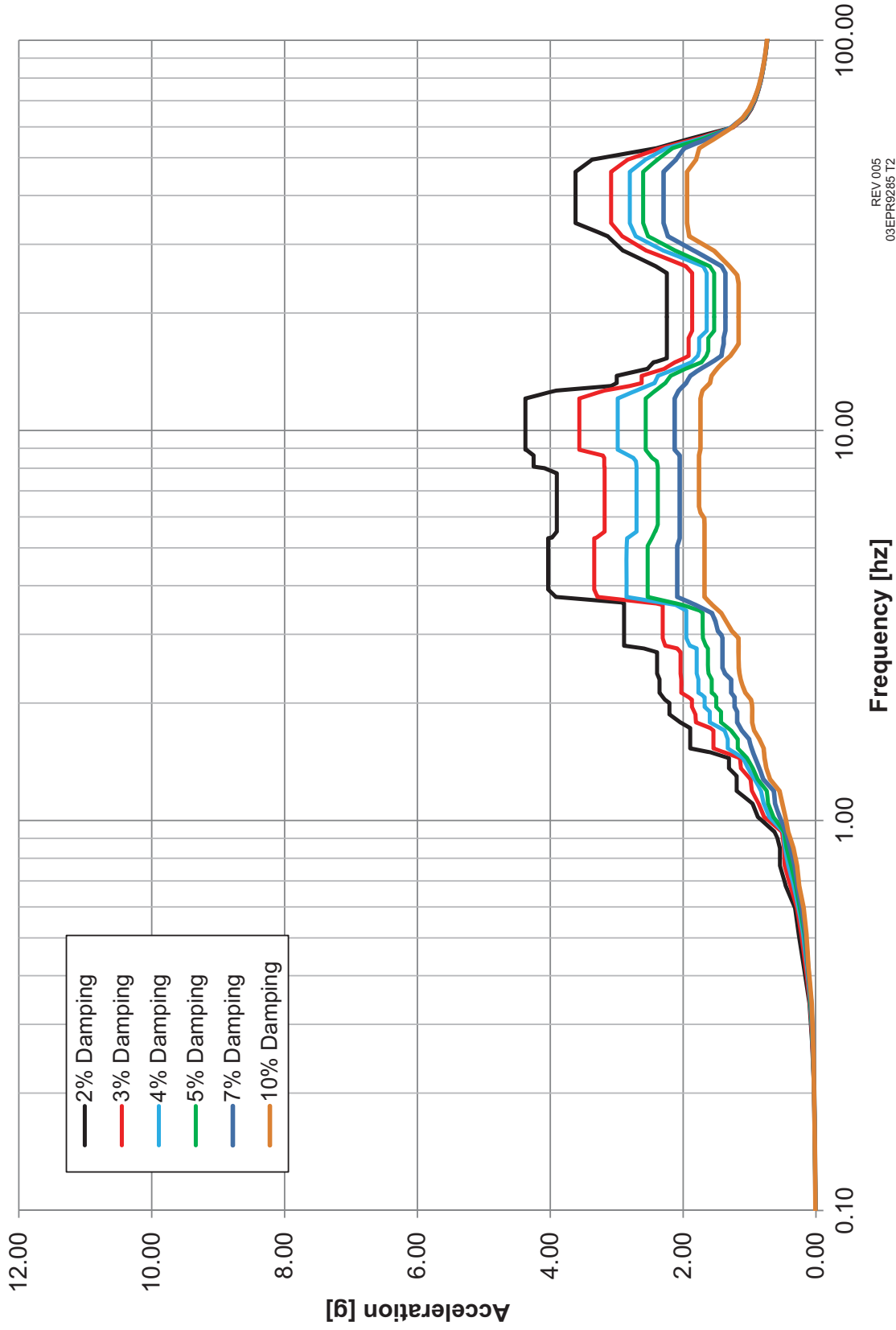




Figure 3.7.2-150—Spectrum Envelope of EPGB at Elev. +50⁴ ft, 6 in - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction



REV.005
03EPR285 T2

Figure 3.8-64—Safeguard Buildings 2 and 3 Plan Elevation -31 Feet, Figure 3.8-65—Safeguard Buildings 2 and 3 Plan Elevation -16 Feet, Figure 3.8-66—Safeguard Buildings 2 and 3 Plan Elevation 0 Feet, Figure 3.8-67—Safeguard Buildings 2 and 3 Plan Elevation +15 Feet, Figure 3.8-68—Safeguard Buildings 2 and 3 Plan Elevation +27 Feet, Figure 3.8-69—Safeguard Buildings 2 and 3 Plan Elevation +39 Feet, Figure 3.8-70—Safeguard Buildings 2 and 3 Plan Elevation +53 Feet, Figure 3.8-71—Safeguard Buildings 2 and 3 Plan Elevation +69 Feet, Figure 3.8-72—Safeguard Buildings 2 and 3 Plan Elevation +79 Feet, Figure 3.8-73—Safeguard Buildings 2 and 3 Plan Elevation +94 Feet, Figure 3.8-74—Safeguard Buildings 2 and 3 Section B-B show the arrangements of SBs 2 and 3.

Figure 3.8-75—Safeguard Building 4 Plan Elevation -31 Feet, Figure 3.8-76—Safeguard Building 4 Plan Elevation -16 Feet, Figure 3.8-77—Safeguard Building 4 Plan Elevation 0 Feet, Figure 3.8-78—Safeguard Building 4 Plan Elevation +15 Feet, Figure 3.8-79—Safeguard Building 4 Plan Elevation +26 Feet, Figure 3.8-80—Safeguard Building 4 Plan Elevation +39 Feet, Figure 3.8-81—Safeguard Building 4 Plan Elevation +55 Feet, Figure 3.8-82—Safeguard Building 4 Plan Elevation +69 Feet, Figure 3.8-83—Safeguard Building 4 Plan Elevation +81 Feet, Figure 3.8-84—Safeguard Building 4 Plan Elevation +96 Feet, and Figure 3.8-85—Safeguard Building 4 Section A-A show the arrangements of SB 4.

3.8.4.1.4 Emergency Power Generating Buildings

The EPGB 1 and 2 are housed in one building while EPGB 3 and 4 are housed in a separate building. These two buildings are identified hereafter as EPGBs.

The two EPGBs are located adjacent to the NI Common Basemat Structure and in the general vicinity of the ESWBs. As depicted in Figure 3B-1, each building is physically separated from the NI Common Basemat Structure and is located on the opposite sides to provide sufficient separation to protect against common external events (e.g., aircraft hazard).

The EPGBs are essentially identical but are mirror images of one another. Each EPGB is ~~approximately~~ 178 feet long by ~~94~~ 5 feet, ~~6 inches~~ wide. The height of the EPGBs varies from ~~approximately~~ 51 feet, 6 inches above the top of the basemat foundation in the areas of the diesel fuel storage tanks, to 68 feet for the remainder of the structure.

Each EPGB is primarily constructed of reinforced concrete and supported by its own independent reinforced concrete basemat foundation. Structural steel framing is limited to steel platforms and composite beams.

Each EPGB contains two main diesel generators, the supporting equipment, ~~and also contains~~ two fuel storage tanks, HVAC equipment, electrical equipment, and batteries.

Within each structure, reinforced concrete walls separate the two main diesels and the diesel fuel storage tanks to protect against internal hazards. External walls and slabs

are sized to protect against external hazards (e.g., wind, missile and explosion pressure wave).

Figure 3.8-89—Emergency Power Generating Buildings Plan Elevation 0'-0", Figure 3.8-90—Emergency Power Generating Buildings Plan Elevation 33'-4", Figure 3.8-91—Emergency Power Generating Buildings Plan Elevation 51'-6", Figure 3.8-92—Emergency Power Generating Buildings Plan Elevation 68'-0", Figure 3.8-93—Emergency Power Generating Buildings Section A-A, and Figure 3.8-94—Emergency Power Generating Buildings Section B-B provide the elevation and section views of the EPGBs.

3.8.4.1.5 Essential Service Water Buildings

The ESWBs house the ESWCTs and the ESWPBs. The function of the ESWBs is to house equipment and cooling water associated with the essential service water system (ESWS). This system provides a source of cooling water to the component cooling water system (CCWS) heat exchangers, the Emergency Power Generator heat exchangers, and Essential Service Water HVAC system to support the safe operation and orderly shutdown of the plant, during normal operation or under accident conditions. As depicted in Figure 3B-1 each of the four structures is located in the vicinity of the NI Common Basemat Structure, but ESWBs 1 and 2 are physically separated from ESWBs 3 and 4 by the NI Common Basemat Structure to provide sufficient protection against external events (e.g., aircraft hazard).

Each ESWB is a reinforced concrete, shear wall structure ~~approximately~~ 164 feet by 108 feet wide by ~~130~~¹⁸ feet high (i.e., from the bottom of the basemat to elevation 96 feet). Each structure is embedded ~~33~~²¹ feet ~~below grade~~. The primary portion of the structure is approximately 128 feet long by 108 feet wide, and houses two cooling towers, each with a water storage basin. On the side of the cooling towers facing the containment building, a structurally integrated pump house structure is located, enclosing primarily pumps and electrical equipment. The ESWPB is approximately 35 feet by 64 feet, with a roof at elevation 63 feet.

Exterior walls and slabs are sized for protection against external hazards, including tornado and hurricane-generated missiles and postulated blast loads. Two compartments are provided for air draft between elevation 14 feet and 43 feet, ~~7~~⁶ inches.

Figure 3.8-95—Essential Service Water Building Plan Elevation 0'-0", Figure 3.8-96—Essential Service Water Building Plan Elevation 14'-0", Figure 3.8-97—Essential Service Water Building Plan Elevation 47'-0", Figure 3.8-98—Essential Service Water Building Plan Elevation 63'-0", Figure 3.8-99—Essential Service Water Building Plan Elevation 80'-0", Figure 3.8-100—Essential Service Water Building Roof Plan Elevation 96'-0", Figure 3.8-101—Essential Service Water Building Section A-A, and

for additional descriptions of methods used for seismic analyses of distribution systems.

3.8.4.4.3 Emergency Power Generating Buildings

The EPGBs are reinforced concrete shear wall structures. Vertical loads transfer to the reinforced concrete foundation basemat through the reinforced concrete walls. Lateral loads transfer to the foundation basemat by diaphragm action of the reinforced concrete roof slabs to the reinforced concrete walls. Lateral loads from the foundation basemat are transferred to the supporting soil through bearing, friction, and passive earth pressure.

The reinforced concrete walls are designed as shear walls which are subjected to compression loads, in-plane and out-of-plane bending moments, and in-plane and out-of-plane shear. The floor slab at elevation 51 feet, 6 inches consists of a composite slab with composite structural steel beams. The roof slab at elevation +68 feet, zero inches is primarily designed as a one-way slab due to the relative aspect ratio between the lines of support.

The EPGBs are analyzed and designed using a 3D FEM representing the structure. The FEM is generated using the GT STRUDL computer code [\(Reference 74\)](#) to accomplish the following:

- Provide an accurate representation of the structure for translation to a soil structure interaction (SSI) model for seismic analysis (See Section 3.7.2 for information on the extrapolation of the GT STRUDL FEM for the seismic analysis).
- Conduct a static analysis of the EPGBs using equivalent static seismic loads; and other applicable design loads.
- Provide input for the design of reinforced concrete structural elements.

The FEM of the EPGBs consists of SBHQ6 and SBHT6 elements representing the load carrying reinforced concrete walls and slabs, as these element types are suitable for capturing both the in-plane and out-of-plane effects from the corresponding applied loads.

The EPGB is a surface-founded structure, with compression only spring boundary conditions utilized to represent the soil. Soil bearing pressures are determined from the SSI analysis.

For uniformity of site characteristics, the required bearing demand will be the same as for the NI.

The equivalent SSI model includes modifications to the stiffness of the various composite beams at elevation 51 feet, 6 inches, as well as modifications to account for

cracking. The stiffness of these composite beams is included in the model to capture out-of-plane response. Stiffness of the composite beams is not required in the static analysis model as only in-plane stresses in the concrete slab are determined.

For the composite beams and floor slab at elevation 51 feet, 6 inches, the corresponding floor accelerations from the **MTR/SASSI** analysis output are applied to tributary floor areas and walls to obtain the seismic loads associated with the out-of-plane loads. Dead load, live load, equipment loads, and piping loads are combined with the seismic loads. The composite beams are analyzed outside of the FEM. [*Structural design of the composite beams is in accordance with the provisions of ANSI/AISC N690-1994 (R2004).*]*

The in-plane and out-of-plane results from the GT STRUDL equivalent static analysis are extracted and used to design reinforced concrete shear walls and slabs according to provisions of ACI 349-01. The evaluation of walls and slabs for external hazards (e.g., hurricane- or tornado generated missiles and blast loads) is also performed by local wall and slab analyses. Structural element reinforcement is designed to provide sufficient ductility.

Additional information on the seismic analysis approach for the EPGBs is contained in Section 3.7.2.

For the design of the EPGBs, some details for the composite beams and slabs at elevation 51 feet, 6 inches, particularly changes in beam sizes and floor openings, as well as certain aspects of mechanical design layout, are not reflected in the **MTR/SASSI** FEM used for SSI analyses. Inclusion of these details in the **MTR/SASSI** FEM are not expected to have any significant impact on the seismic forces used in the design of the EPGBs, but may impact the in-structure response spectra. Therefore, a subsequent analysis will be performed with these details in the FEM to confirm the seismic responses and in-structure response spectra presented in Section 3.7.2. The design of the EPGBs will conform to the structural acceptance criteria described in Section 3.8.4.5.

3.8.4.4.4 Essential Service Water Buildings

Reinforced concrete elements for the four ESWBs consist of slabs, beams, shear walls, and foundation basemat to transfer imposed loads to the supporting soil. Structural steel framing is used to support the missile barriers protecting the safety-related fans.

~~Similar to the EPGBs, the~~ **The** ESWBs are analyzed and designed using a 3D FEM representing the structure. The FEM is generated using the GT STRUDL computer code ([Reference 74](#)). The use of the model for both static and dynamic analyses, including extraction of results for design, is **similar almost identical** to the methods presented in Section 3.8.4.4.3. ~~Similarly, t~~ **The** GT STRUDL model is used to provide

an accurate representation of the structure for translation to an SSI model (~~SASSI-2000~~) for seismic analysis. As such, only model variations are addressed below.

In addition to structural dead loads, slab live loads, piping loads and equipment loads, the GT STRUDL FEM for the ESWBs includes the weight of non-structural fill, hydrostatic loads, hydrodynamic loads, and soil pressures (including surcharge pressures). The appropriate accelerations from the SSI analysis are applied to the tributary floor areas and walls to obtain the equivalent static seismic loads.

*[Dead load, live load, equipment loads, and piping loads are combined with the equivalent static seismic loads for structural design in accordance with the provisions of ACI 349-01, with supplemental guidance of RG 1.142, ACI 350-06, and ACI 350.3-06.]** The evaluation of walls and slabs for external hazards (e.g., hurricane- or tornado-generated missiles) is performed by local analyses, including ductility evaluations. The elastic solution methodology of ASCE 4-98, Section 3.5.3.2 is used for the dynamic soil pressures associated with the 3321 feet embedment of the ESWBs.

Seismic induced lateral soil pressure on below grade walls are evaluated considering the following cases:

- The seismic soil pressure as equal to the sum of the static earth pressure plus the dynamic earth pressure calculated in accordance with ASCE 4-98, Section 3.5.3.2.
- The seismic soil pressure as equal to the passive earth pressure.

Additional information on the seismic analysis approach for the ESWBs is contained in Section 3.7.2.

3.8.4.4.5 Buried Conduit and Duct Banks, and Buried Pipe and Pipe Ducts

The design of buried conduit and duct banks, and buried pipe and pipe ducts is site-specific. Buried Seismic Category I conduit, electrical duct banks, pipe, and pipe ducts will be analyzed and designed in accordance with the specific requirements of the systems. In addition, these items will be designed for the effects of soil overburden, surcharge, groundwater, flood, seismic soil interaction, and other effects of burial. *[Concrete components of buried items will be designed in accordance with ACI 349-2001, including the exceptions specified in RG 1.142. Steel components of buried items will be designed in accordance with ANSI/AISC N690-1994 (R2004), including Supplement 2.]**

Static and long-term analyses of buried items will be based on soil properties under consolidated drained conditions of the soil. Buried items will be designed for soil loads corresponding to the weight of the overlying soil prism.

Live loads will be applied, such as those imposed by truck and rail traffic and by construction equipment and activities. Where buried items are vulnerable to highway

wide by 18 feet high, including an approximately 72 inch thick foundation slab under the gallery structure. The tendon gallery, which is integrally cast with the basemat, acts as a shear key and transfers lateral and vertical loads from the basemat into the soil. [*The walls and slab of the tendon access gallery are designed according to ACI 349.*]*

Sections 3.8.1 and 3.8.3 describe the interface of the RCB containment liner plate and upper internal basemat above the liner for supporting the RB internal structures. Sections 3.8.4 describes the interface of the RSB, FB, and SBs with the NI Common Basemat Structure foundation basemat. Concrete walls and columns of these NI Common Basemat Structure Seismic Category I structures are anchored into the NI Common Basemat Structure foundation basemat with reinforcing bars to transmit vertical, horizontal, and bending moment loads into the basemat and to enhance the rigidity of the basemat.

Horizontal shear loads are transferred from the NI Common Basemat Structure foundation basemat to the underlying soil by friction between the bottom of the basemat, mud mat (or both), and the soil, and by passive earth pressure on the below-grade walls of the NI Common Basemat Structure Seismic Category I structures. In addition, the tendon gallery is classified as a Seismic Category I structure and analyzed as a shear key to transfer loads to the soil. Section 2.5.4.2 describes the friction coefficient properties of soil addressed for the U.S. EPR.

Buildings adjacent to the NI Common Basemat Structure are separated from the NI Common Basemat Structure foundation basemat to allow for differential seismic movements between buildings. Refer to Figure 3B-1, which illustrates the gaps between buildings.

3.8.5.1.2 Emergency Power Generating Buildings Foundation Basemats

Each EPGB foundation basemat supports a building superstructure and associated equipment. At the super-structure and foundation basemat interface, heavily reinforced concrete shear walls function as bearing walls to transfer loads from floors and the roof. Each foundation basemat is embedded approximately five feet into the supporting soil and has overall dimensions of **approximately** 178 feet long by 94.5 feet, **6 inches** wide by 6 feet thick. Each foundation also has a system of shear keys as shown in Figure 3B-63—Emergency Power Generating Buildings Dimensional Plan Elevation 0 m (0 ft). In the areas of the two diesel fuel oil storage tanks, the foundation basemat reduces in width from 94.5 feet, **6 inches** to 42 feet.

Figure 3.8-89 illustrates the general arrangement plan, which also shows the primary shear walls at column lines A, C, E, G and J in the east-west direction, and column lines 11, 13, 17 and 19 in the north-south direction. Additional figures, provided in

Appendix 3E, illustrate both the shear walls at the super-structure and foundation basemat interface and the foundation basemat reinforcement.

Figures 3.8-93 and 3.8-94 provide section views of the EPGB structure, which further clarify the relationship between the superstructure and the foundation basemat. Isometric views of the GT STRUDL model representing the overall structure are provided in Section 3.7.2.

3.8.5.1.3 Essential Service Water Buildings Foundation Basemats

The reinforced concrete foundation basemat for each ESWB supports the superstructure and water basin. At the super-structure and foundation basemat interface, heavily reinforced concrete shear walls function as bearing walls to transfer loads from the floors and the roof. EachThe foundation basemat for each ESWB is embedded approximately 3321 feet into the supporting soil and has overall dimensions of approximately 19664 feet by 1408 feet wide (at the bottom of the basemat) by 16 feet thick.

Figures 3.8-101 and 3.8-102 provide cross-sections of the ESWB in each direction, illustrating the superstructure which bears on the foundation basemat. Figure 3.8-95 provides the general arrangement plan, which also illustrates the primary shear walls at column lines A, B, D and F in the east-west direction, and column lines 1, 2, 4 and 5 in the north-south direction. Additional figures provided in Appendix 3E illustrates both the shear walls at the super-structure and foundation basemat interface and the foundation basemat reinforcement. Isometric views of the GT STRUDL model representing the overall structure are provided in Section 3.7.2.

3.8.5.2 Applicable Codes, Standards, and Specifications

Applicable codes, standards, specifications, design criteria, regulations, and regulatory guides that are used for the design, fabrication, construction, testing, and inservice inspection of Seismic Category I foundations are the same as those in Section 3.8.4.2 (GDC 1, GDC 2, GDC 4 and GDC 5).

In addition, [*the portion of the NI Common Basemat Structure foundation basemat under the RCB/RSB is designed in accordance with the ASME Code, Section III, Division 2 for support and anchorage of the concrete RCB.*]*

3.8.5.3 Loads and Load Combinations

Loads and load combinations for Seismic Category I foundations are the same as those in Section 3.8.4.3.

In addition to the loads addressed in Section 3.8.4.3, the NI Common Basemat Structure foundation basemat is designed for the loads and load combinations from the

D-1557 (Reference 66)). For rock sites, controlled low strength material, as described by ACI-229R (Reference 65), is specified on the faces of below grade walls. The tendon gallery acting as a shear key is backfilled with lean concrete. Cohesive materials will be addressed on a site-specific basis.

The wall pressures calculated from SSI analysis, elastic solution by Wood, and those required for sliding stability are considered in the design of embedded walls. Each soil case is analyzed, dynamically and statically, and design loads and controlling loads for each wall are used in the design.

The estimated maximum sidewall movement into the soil that results in the highest K_p value may not necessarily occur when the minimum factor of safety is calculated. Therefore, the minimum factor of safety is investigated using appropriate sidewall movements (using corresponding K_p) at the time of minimum sliding factor of safety.

Design and analysis procedures for Seismic Category I foundations are the same as those described in Sections 3.8.1.4 and 3.8.4.4 for the respective structures that apply loads on the foundations.

[Seismic Category I concrete foundations are designed in accordance with ACI 349-01 and its appendices] (GDC 1). Exceptions to code requirements specified in RG 1.142 are incorporated into the design and are accommodated in the loading combinations described in Section 3.8.5.3. [In addition, the portion of the NI Common Basemat Structure foundation basemat that supports the RCB/RSB is designed in accordance with the ASME Code, Section III, Division 2 for support and anchorage of the concrete RCB]* as described in Section 3.8.1.*

*[The design of concrete foundations for Seismic Category I structures is performed using the strength-design methods described in ACI 349-01.]** The ductility provisions of ACI 349-01 are satisfied to provide a steel reinforcing failure mode and to prevent concrete failure for design basis loadings.

Foundation design is performed for the spectrum of soil cases described in Section 3.7.1. Section 2.5 and Section 3.7 describe seismic parameters and design methods used for analyzing and designing Seismic Category I structures.

Soil-structure interaction and structure-soil-structure interaction effects are considered in the seismic analyses of Seismic Category I structures as described in Section 3.7.2. Figure 3B-1 illustrates separation distances between Seismic Category I structures upon which these interaction evaluations are based.

Dynamic bearing pressures are obtained from the MTR/SASSI analysis. Dynamic bearing pressures are calculated at each time step in the x and y input motion to satisfy the equilibrium of vertical forces and moments as a result of dead, live, buoyancy,

precipitation, and seismic loads acting on the foundation for each soil case. Dead load pressures account for the deformation effect at the center and/or edges of the basemat.

The NI Common Basemat Structure, ~~and EPGB~~, ~~and ESWB~~ are designed for the static soil bearing pressures and dynamic bearing pressures in Sections 3.8.5.5.1, ~~and 3.8.5.5.2~~, ~~and 3.8.5.5.3~~. Accordingly, Seismic Category I foundations are sized and reinforced to accommodate these bearing pressure values.

The following criteria apply for load combinations for concrete and steel Seismic Category I foundations:

- Where any load reduces the effects of other loads, the corresponding coefficient for that load is 0.9 if it can be demonstrated that the load is always present or occurs simultaneously with other loads.
- For load combinations in which a reduction of the maximum design live load (L) has the potential to produce higher member loads and stresses, multiple cases are considered where the live load (L) is varied between its maximum design value and zero.
- For load combinations that include a tornado load (W_t), the tornado load parameter combinations described in Section 3.3 are used.

Loads and load combinations defined in Section 3.8.5.3 are used to determine strength requirements of members and elements of Seismic Category I foundations. Concrete and steel structural elements and members are designed for axial tension and compression forces, bending moments, torsion, and in-plane and out-of-plane shear forces for the controlling loading combinations that are determined from analysis. Concrete and steel members and elements remain elastic for loadings other than impact. Local yielding is permitted for localized areas subjected to hurricane- or tornado-generated missile loads, pipe break accident loadings, and beyond design basis loadings. The structural integrity of members and elements is maintained for the loading combinations described in Section 3.8.5.3.

For the loading combinations identified in Section 3.8.5.3, the minimum factors of safety required to prevent sliding and overturning are specified in Table 3.8-11—Minimum Required Factors of Safety Against Overturning, Sliding, and Flotation for Foundations.

Normal lateral earth pressure loads consider saturated soil up to a groundwater elevation of -3.3 feet relative to site finished grade. Lateral soil loads due to external floods consider saturated soil up to elevation -1.0 feet relative to site finished grade. Seismic loads from all three components of the earthquake motion are combined using the SRSS method. The SSE components of soil loads are determined using densities for saturated soil to account for the weight of the soil plus the weight of either normal or flood water levels. Earthquake-induced lateral soil pressures are obtained from SSI

which is capable of idealizing the different force-deflection curves on the active and passive side. The pressures at a sidewall node are multiplied by the tributary area of the sidewall node to define the sidewall force versus the deflection behavior of a particular sidewall spring.

Linear bi-directional static springs that have a stiffness of one-half the dynamic springs as specified in Table 3.8-13 are applied to the base of the NI Common Basemat Structure. Sliding and uplift are not modeled in the static analysis. Figure 3.8-108—Elastic Displacement for Soil Case 1n2u, Figure 3.8-110—Elastic Displacement for Soil Case 4u, Figure 3.8-111—Elastic Displacement for Soil Case 5ae, Figure 3.8-112—Elastic Displacement for Soil Case 1n5a, and Figure 3.8-113—Elastic Displacement for Soil Case 2sn4u illustrate elastic displacements, from dead load + 0.25* live load + 0.75* precipitation load + hydrostatic forces and at-rest earth pressure, using the springs listed in Table 3.8-13.

Analysis

The ANSYS basemat model is loaded statically by accelerating the lumped and distributed masses described in Section 3.7.2.3.1.2 before a nonlinear time-history analysis is performed. The initial conditions (dead load, 25% live load, 75% precipitation load, hydrostatic forces and at-rest earth pressures) to the basemat foundation model (nonlinear) are input by performing multiple static analysis load steps prior to the start of the dynamic load. Static load steps are performed in a transient analysis by turning off the transient time integration effects. The static analysis time-steps are performed at solution times less than 0.005sec. The transient itself is started by turning on the time integration effects at time = 0.005sec to the end of the acceleration time-history input.

The seismic input motions are in-column ground motions obtained from SHAKE91 analysis runs at the bottom of the NI Common Basemat foundation level in the three translational directions derived using the NEI approach in Section 2.5.2.6.

The seismic time-history analysis starts from time = 0.005 sec. Thus, effects of the seismic loads are obtained by subtracting the results at time-history data points with the static analysis baseline results. The maximum seismic loads are obtained by determining the maximum/minimum design load values for basemat and tendon gallery for each of the elements/nodes over all time points of the transient analysis.

In addition to the seismic load, the basemat foundation model is analyzed (with static soil springs) for various static load cases **such as:** normal loads (e.g., dead, live, soil/lateral earth pressure, thermal load, pipe reaction, post-tension loads, relief valve loads), construction loads, test loads for reactor containment building, severe environmental loads (e.g., wind), extreme environmental loads (e.g., tornado and hurricane), abnormal loads (e.g., internal flood, buoyant pressure, accident pressure).

Design Considerations

Section 3.8.1, Section 3.8.3, and Section 3.8.4 provide descriptions of interfacing structures that induce loads on the NI Common Basemat Structure foundation basemat. The figures in those sections illustrate the concrete shear walls and columns that transfer loads to the NI Common Basemat Structure foundation basemat. The tendon gallery beneath the NI Common Basemat Structure foundation basemat is relied upon as a shear key to aid in resisting lateral forces on the basemat.

The SSI analysis, described in Section 3.7.2.4, is a frequency domain linear seismic analysis. The additional loads due to the nonlinearities of basemat uplift and sliding obtained in the 3D basemat FEM is considered for the design of the tendon gallery and NI embedded walls. The additional (Δ) loads, generated on the tendon gallery walls due to sliding, are calculated by performing additional analyses without allowing for sliding and uplift behavior and comparing the results (sidewall pressures and design forces and moments) to the analysis that includes the nonlinear effects. When nonlinear responses are observed in the model, the increase in loading is added to the SSI results described in Section 3.7.2.4 for the design of tendon gallery and NI embedded walls.

In the design of the NI embedded walls and tendon gallery, the static soil pressure (earth pressure at rest) and effects of surcharge due to the weight of adjacent buildings (NI for the case of the tendon gallery) are applied as a separate load case. The dynamic load case corresponds to the passive pressures generated on the walls during the SSE condition.

The passive soil pressures on the NI embedded walls (excluding the tendon gallery) are calculated using the results from the SSI analysis (see Section 3.7.2.4). The SSE wall pressures are scaled up such that the maximum pressure on each wall is, at least, equal to the passive earth pressure obtained with $K_p = 3$. The dynamic load case corresponding to scaled SSI pressures and Δ pressures due to uplift and sliding of the basemat is applied as a separate load case. The static and dynamic load cases are then combined in the appropriate load combinations to arrive at the design forces and moments of the walls. The above procedure is used for all soil cases except 5ae. For 5ae (rock case), the nodes in contact with the excavation are laterally constrained to obtain design forces and moments of the walls.

The passive soil pressures and seismic design loads on the tendon gallery walls for all cases including the 5ae case are directly obtained from the nonlinear analysis of finite element model for NI Common Basemat Foundation described in Section 3.7.2.3.1.4. These loads include the sidewall and Δ pressures due to uplifting and sliding of the basemat. The seismic loads are combined with other static analysis load cases as described in Section 3.8.1 through Section 3.8.4 to obtain the design forces and moments for the tendon gallery.

~~For a given soil case, a comparison is made with the basemat forces and moments from the elastic soil spring case, and the forces and moments from the settlement springs at each of the 11 construction steps to develop a differential set of forces and moments in the basemat for each step. An enveloping differential load file is created which consists of the maximum differential forces and moments in each basemat element from each construction steps.~~

~~Following this same approach, an enveloping differential load file is created for each soil case and added to the elastic soil spring analysis results in the load combinations with a dead load (i.e., the load factor used corresponds to the dead load factor).~~

The basemat design includes symmetrical main reinforcing steel in each direction and on each face to control development of any large cracks in the basemat.

Relative differential settlement contours are developed for each construction step using the second set of soil springs. The contours are relative to the minimum settlement value determined under the NI common basemat structure, and are shown in Figure 3.8-124 through Figure 3.8-134.

Detailed analysis and design procedures are described in the critical sections presented in Appendix 3E.

Section 3.8.3 provides a description of analysis and design of the RB internal structures basemat, which is located above the containment liner plate.

Stability Evaluation

The NI stability analysis using seismic reaction forces from the SSI model addressed in Section 3.7.2 considers the soil cases in Table 3.7.1-6. The soil bearing pressures directly beneath the foundation basemat are based on the MTR/SASSI analysis described in Section 3.7.2.4 and reported in Appendix 3E Table 3E.1-5.

3.8.5.4.3 Emergency Power Generating Buildings Foundation Basemats

Shear loads are transferred from the EPGB foundation basemat to the underlying soil by friction between the bottom of the basemat, mud mat, and the soil, and by passive earth pressure.

The EPGB foundation basemat is analyzed and designed using the GT STRUDL v.3229-1 finite element analysis code (Reference 74). The FEM contains both the building superstructure (i.e., reinforced concrete walls and elevated slabs) as well as the foundation basemat. Analysis of the EPGB includes all applicable design loads and design load combinations described in Section 3.8.4.3. Figure 3.8-104—Emergency Power Generating Building Foundation Basemat Model illustrates the foundation basemat portion of the overall EPGB FEM.

The GT STRUDL FEM representing the EPGB foundation basemat consists of four node SBMITCSBHQ6 rectangular elements, ~~each~~ with six degrees of freedom per node. This element type is capable of capturing both in-plane and out-of-plane behavior. Elastic boundary conditions are included in the FEM in order to simulate the stiffness of the supporting soil. Basemat flexibility and SSI are addressed by inclusion of the basemat section properties and aforementioned soil spring boundary conditions in the FEM.

The foundation basemat is included in the overall GT STRUDL FEM used for static analysis of the foundation basemat, along with compression-only soil springs representing static soil stiffness properties in Table 3.8-19. Soil spring development and distribution methodologies are the same as those used for the NI soil cases and are described in Section 3.8.5.4.2. Compression-only effects are included in the boundary conditions in order to capture uplift effects induced by extreme event loading (e.g., SSE). Illustrations of the complete FEM representing the EPGB are provided in Section 3.7.2.

The effect of settlement on the EPGB considers a soft soil site consistent with a soft soil case as shown in Table 3.7.1-8~~Table 3.7.1-6~~. Soil springs are developed to consider both short term (elastic) and long term (heave and consolidation) effects. The 3D finite element models of the EPGB basemat and superstructure are used in a static structural analysis with elastic soil springs applied in an elliptical distribution. The consolidation effects are approximated by further softening the elastic soil spring stiffness by a factor of two. A settlement load file is created considering 100 percent of the dead load, 25 percent of the live load, and 75 percent of the precipitation loads to determine locked-in forces and moments for all structural elements. The full E_c and section modulus is used in the EPGB settlement analysis. ~~A check is conducted to determine if the basemat concrete has cracked during development of the load file. If the basemat concrete has cracked, a cracked section modulus is used to develop the forces and moments.~~ The basemat design includes symmetrical main reinforcing steel in each direction and on each face to account for any additional lateral variability in the soil properties and to control development of any large cracks in the basemat.

The total differential settlement contour is developed for the EPGB as shown in Figure 3.8-135.

Detailed analysis and design procedures are described in the critical sections presented in Appendix 3E for the EPGBs.

3.8.5.4.4 Essential Service Water Building Foundation Basemats

Horizontal shear loads are transferred from the ESWB foundation basemat to the underlying soil by friction between the bottom of the basemat, mud mat, and the soil.

In addition, dynamic soil pressure and passive earth pressure have been considered for the below-grade walls, reflecting the total embedment depth of nominally ~~332~~¹ feet.

Similar to the approach for the EPGB, the foundation basemat is analyzed and designed using the GT STRUDL ~~v.29.1~~ finite element analysis code ([Reference 74](#)). Soil springs development and distribution methodologies are the same as the NI. The ESWB soil springs stiffness properties are shown in Table 3.8-20. The FEM contains both the building superstructure (i.e., reinforced concrete walls, slabs, and beams) and the foundation basemat. Analysis of the ESWB includes ~~all~~ applicable design loads and design load combinations described in Section 3.8.4.3. Figure 3.8-105—Essential Service Water Building Foundation Basemat Model illustrates the foundation basemat portion of the overall ESWB FEM.

The GT STRUDL FEM representing the ESWB foundation basemat consists of tridimensional elements (IPSLIM, TRIP) ~~SBHQ6 rectangular elements, each~~ with three ~~six~~ degrees of freedom per node. This element type is capable of capturing both in-plane and out-of-plane behavior. Elastic boundary conditions are included in the FEM in order to simulate the stiffness of the supporting soil. Basemat flexibility and SSI are addressed by inclusion of the basemat section properties and aforementioned soil spring boundary conditions in the FEM. Illustrations of the complete FEM representing the ESWB are provided in Section 3.7.2.

The effect of settlement on the ESWB structure considers a soft soil site consistent with a soft soil case as shown in Table 3.7.1-9. Soil springs are developed to consider both short term (elastic) and long term (heave and consolidation) effects. The 3D FEM of the ESWB basemat and superstructure are used in a static structural analysis with elastic soil springs applied in an elliptical distribution. The consolidation effects are approximated by further softening the elastic soil spring stiffness by a factor of two. A settlement load file is created considering 100 percent of the dead load, 25 percent of the live load, and 75 percent of the precipitation loads to determine locked-in forces and moments for all structural elements. The full E_c and section modulus is used in the ESWB settlement analysis. ~~A check is conducted to determine if the basemat concrete has cracked during development of the load file. If the basemat concrete has cracked, a cracked section modulus is used to develop the forces and moments.~~ The basemat design includes symmetrical main reinforcing steel in each direction and on each face to account for any additional lateral variability in the soil properties and to control development of any large cracks in the basemat.

The total differential settlement contour is developed for the ESWB as shown in Figure 3.8-136.

Detailed analysis and design procedures are described in the critical sections presented in Appendix 3E for the ESWBs.

structure is less than the angular distortion shown for each of the construction steps, the site is considered acceptable. Otherwise, further analysis will be required to demonstrate that the structural design is adequate.

For worst-case loading combinations on the RB internal structures basemat above the containment liner, the minimum safety factor against sliding is 2.8 and the minimum safety factor against overturning is 1.9.

3.8.5.5.2 Emergency Power Generating Buildings Foundation Basemats

Appendix 3E.2 provides details of the design of the EPGB foundation basemats critical sections.

The static and dynamic bearing pressures for the EPGB foundation basemat are provided in Table 3E.2-2. The factors of safety against overturning, sliding, and flotation are each greater than or equal to 1.1. The factors of safety for each analysis case are provided in Table 3E.2-1.

A differential settlement evaluation is performed for the EPGB structure considering both short term (elastic) and long term (heave and consolidation) effects.

A COL applicant that references the U.S. EPR design certification will compare the EPGB site-specific predicted angular distortion to the angular distortion in the total differential settlement contours in Figure 3.8-135, using methods described in U.S. Army Engineering Manual 1110-1-1904. The comparison is made throughout the basemat in both the east-west and north-south directions. If the predicted angular distortion of the basemat of EPGB structures is less than the angular distortion shown, the site is considered acceptable. Otherwise, further analysis will be required to demonstrate that the structural design is adequate.

3.8.5.5.3 Essential Service Water Building Foundation Basemats

Appendix 3E provides details of the design of the ESWB foundation basemats critical sections.

The static and dynamic bearing pressures for the ESWB foundation basemat are provided in Table 3E.3-2. ~~Maximum soil bearing pressures under the ESWB foundation basemat are 17,800 pounds per square foot for static loading conditions, and 28,200 pounds per square foot for dynamic loading conditions.~~ For uniformity of site characteristics, the required bearing capacity is ~~will be~~ the same as for the NI. The factors of safety against overturning, sliding, and flotation are each greater than or equal to 1.1. The factors of safety for each analysis case is provided in Table 3E.3-1.

A differential settlement evaluation is performed for the ESWB structure considering both short term (elastic) and long term (heave and consolidation) effects.



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65. ACI 229R-99, "Controlled Low-Strength Materials," American Concrete Institute, 1999.
66. ASTM D-1557-09, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort," American Society for Testing and Materials, 2009.
67. EM 1110-1-1904, "Settlement Analysis," U.S. Army Engineering Manual, 1990.
68. Bechtel Power Corporation Topical Report, BC-TOP-1, Containment Building Liner Plate Design Report, Revision 1, December 1972.
69. CRD C36-73, "Method of Test for Thermal Diffusivity of Concrete," U.S. Army Engineer Research and Development Center, December 1973.
70. CRD C44-63, "Method for Calculation of Thermal Conductivity of Concrete," U.S. Army Engineer Research and Development Center, June 1963.
71. ASTM C1260-01, "Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)," American Society for Testing and Materials, 2001.
72. ASTM C1293-01, "Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction," American Society for Testing and Materials, 2001.
73. ASME Boiler and Pressure Vessel Code, Section III, Division 1, "Rules for Construction of Nuclear Facility Components," The American Society of Mechanical Engineers, [*2004 Edition*]*.
74. [GTSTRUDL Version 32.](#)

Table 3.8-20—Static Foundation Modulus Values for ESWB Soil Cases

Soil Case	K_0 (k/ft ³)	Springs and Distribution	MIN/MAX Springs
		Distribution (b=70 ft, l=98.25 ft)	
<u>4u</u>	<u>750</u>	$K(x, y) = K_0 \left[3.46 - 3.08 \sqrt{1 - \frac{x^2}{2l^2} - \frac{y^2}{2b^2}} \right]$	<u>0.38 K_0 2.81 K_0</u>
<u>5a</u>	<u>9262</u>	$K(x, y) = K_0 \left[2.44 - 1.80 \sqrt{1 - \frac{x^2}{2l^2} - \frac{y^2}{2b^2}} \right]$	<u>0.64 K_0 2.06 K_0</u>
<u>1n5a</u>	<u>2401</u>	$K(x, y) = K_0 \left[2.76 - 2.20 \sqrt{1 - \frac{x^2}{2l^2} - \frac{y^2}{2b^2}} \right]$	<u>0.56 K_0 2.29 K_0</u>
<u>1n2u</u>	<u>108</u>	$K(x, y) = K_0 \left[4.12 - 3.90 \sqrt{1 - \frac{x^2}{2l^2} - \frac{y^2}{2b^2}} \right]$	<u>0.22 K_0 3.29 K_0</u>
<u>2sn4u</u>	<u>561</u>	$K(x, y) = K_0 \left[2.64 - 2.06 \sqrt{1 - \frac{x^2}{2l^2} - \frac{y^2}{2b^2}} \right]$	<u>0.58 K_0 2.20 K_0</u>
<u>4URB-UB</u>	<u>867</u>	$K(x, y) = K_0 \left[0.80 + .25 \sqrt{1 - \frac{x^2}{2l^2} - \frac{y^2}{2b^2}} \right]$	<u>0.85 K_0 1.05 K_0</u>
<u>12URB-UB</u>	<u>5389</u>	$K(x, y) = K_0 \left[2.58 - 1.98 \sqrt{1 - \frac{x^2}{2l^2} - \frac{y^2}{2b^2}} \right]$	<u>0.60 K_0 2.16 K_0</u>

Figure 3.8-111—Elastic Displacement for Soil Case 5a

```

STEP=9
SUB =1
TIME=.700E-04
UZ
TOP
RSYS=0
DMX =.027794
SEPC=26.8744
SMN =-.027715
SMX =-.001001
    
```

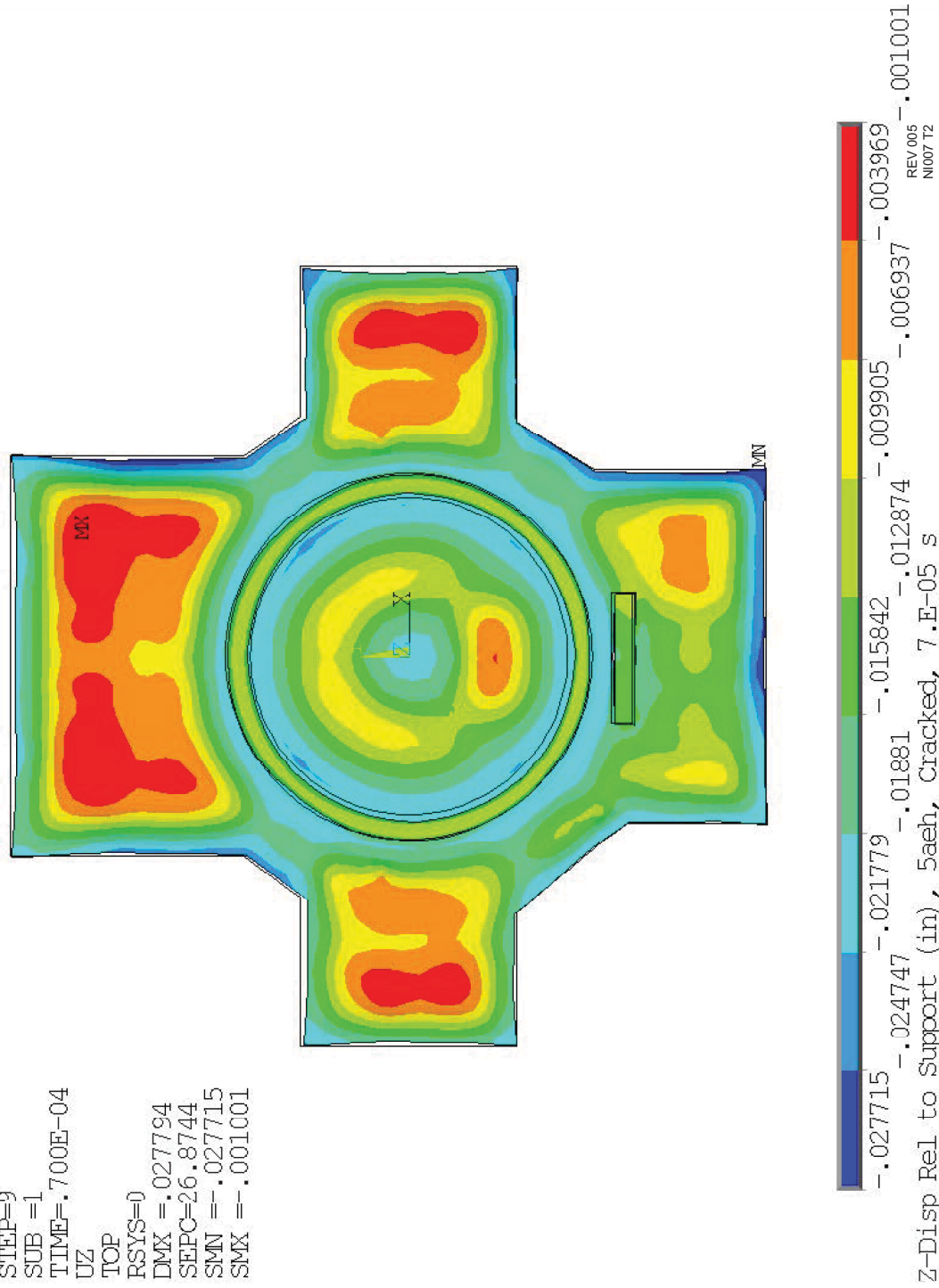




Table 3E.1-4—Minimum Factors of Safety for the Nuclear Island Common Basemat Structure

Analysis Case	Sliding			Overturning			Flotation	
	Required	Calculated X-DIR	Calculated Y-DIR	Required	Calculated X-DIR	Calculated Y-DIR	Required	Calculated
5ae-h	1.1	1.1	1.1	1.1	1.7	2.0	1.1	5.0
4ue-m	1.1	1.1	1.1	1.1	1.7	1.9	1.1	5.0
1n2ue-s	1.1	1.9	1.9	1.1	2.6	2.9	1.1	5.0
1n5ae-h	1.1	1.2	1.1	1.1	1.7	2.0	1.1	5.0
hfub	1.1	3.8	3.7	1.1	5.6	5.3	1.1	5.0
hflb	1.1	4.1	4.0	1.1	6.7	7.7	1.1	5.0
hfbe	1.1	3.6	3.8	1.1	6.0	6.7	1.1	5.0

force (F_b). It is conservatively assumed that (E') and (F_b) occur simultaneously. The floatation factor of safety is determined based on dead load (D) and buoyant force (F_b). For uniformity of site characteristics, the minimum static and dynamic bearing capacity of the foundation soil is will be the same as the NI. The static and dynamic bearing pressure demands for the EPGB are listed in Table 3E.2-2.

Design Criteria

SSI analysis using MTR/SASSI is used to determine enveloping structural response accelerations for development of equivalent static SSE loads for the GT STRUDL FEM.

The use of GT STRUDL for the design of the critical sections is described in Sections 3.8.4.4.3 and Sections 3.8.5.4.3. Design forces and moments are extracted from GT STRUDL analyses for basemat foundation and superstructure component design.

All applicable loads used for the design of the critical sections located within the EPGBs are described in Sections 3.8.4.3.1 and 3.8.5.3; the applicable loading combinations are described in Sections 3.8.4.3.2 and 3.8.5.3. The design also accommodates the soil analysis cases shown in Table 3.7.1-8.

Reinforced concrete and structural steel components (including composite beams) are designed in accordance with the applicable codes, standards, and specifications described in Sections 3.8.4.2 and 3.8.5.2.



Table 3E.2-1—Minimum Factors of Safety for the Emergency Power Generating Building

Soil Case	Sliding		Overturning			Flotation		
	Required	Calculated X-DIR	Calculated Y-DIR	Required	Calculated X-DIR	Calculated Y-DIR	Required	Calculated
2sn4u	1.1	1.3	1.2	1.1	1.7	1.3	1.1	7.88-6
5a	1.1	1.2	1.1	1.1	1.5	1.6	1.1	
4u	1.1	1.1	1.1	1.1	1.7	1.2	1.1	
1n2u	1.1	1.4	1.6	1.1	1.9	1.6	1.1	
1n5a	1.1	1.2	1.1	1.1	1.6	1.4	1.1	
hf_c	1.1	1.6	1.1	1.1	2.7	2.5	1.1	
hf_s	1.1	2.6	2.9	1.1	3.1	2.9	1.1	

Notes:

1. hf_c is a high frequency profile with concrete.
2. hf_s is a high frequency profile with soil.
3. See Table 3.7.1-8 for more information.



- Walkways and access areas live load at El. 14'-0" = 100 psf.
- Steel beam and grating load at El. 80'-0" = 4.1 kip/ft.
- Missile shield load at El. 80'-0" = 4.5 kip/ft.

Equipment Loads

The weight of all major equipment is applied as point load throughout the building.

Equipment	Elevation	Weight (kips)
Fan	63'-0"	85.00 each
Fill	47'-0"	953.4 each
Eliminator	47'-0"	54.00 each
Equipment in pump area	14'-0"	41.50
Pumphouse platform	33'-0"	93.00
6.9KV Switchgear	33'-0"	10.00
6.9KV/480V Transformer	33'-0"	9.00
480V LC Switchgear	33'-0"	6.00
480V MCC	33'-0"	3.00

Foundation Stability

The ESWB is evaluated for stability against overturning, sliding, and floatation for the generic soil profiles used in establishing the certified plant design. The minimum and calculated factors of safety against overturning, sliding, and floatation are in Table 3E.3-1 and satisfy the acceptance criteria.

Minimum Factors of Safety					
Sliding		Overturning		Floatation	
Required	Calculated	Required	Calculated	Required	Calculated
1.10	1.42	1.10	1.71	1.10	2.28

The sliding and overturning factors are determined using load combination containing dead load (D), lateral earth pressure (H), SSE (E'), hydrostatic load (F), and buoyant force (F_b). It is conservatively assumed that the E' and F_b occur simultaneously. The floatation factor of safety is determined based on dead load (D) and buoyant force (F_b). The dead load used in the analysis includes 25 percent of the live load, which is consistent with the generation of total base shear resultants and total overturning moment due to SSE. For uniformity of site characteristics, the minimum static and dynamic bearing capacity of the foundation soil is the same as the NI. The static and dynamic bearing pressure demands for the ESWB are in Table 3E.3-2.



Table 3E.3-1—Minimum Factors of Safety for the Essential Service Water Building

Soil Case	Sliding			Overturning			Flotation	
	Required	Calculated X-DIR	Calculated Y-DIR	Required	Calculated X-DIR	Calculated Y-DIR	Required	Calculated
<u>2sn4u</u>	1.1	1.19	1.15	1.1	1.75	1.28	1.1	2.8
<u>5a</u>	1.1	1.10	1.15	1.1	1.79	1.33	1.1	2.8
<u>4u</u>	1.1	1.10	1.19	1.1	1.64	1.40	1.1	2.8
<u>1n2u</u>	1.1	1.18	1.19	1.1	1.89	1.46	1.1	2.8
<u>1n5a</u>	1.1	1.10	1.28	1.1	1.64	1.38	1.1	2.8
<u>hf c</u>	1.1	1.56	1.49	1.1	2.86	2.57	1.1	2.8
<u>hf s</u>	1.1	2.32	2.86	1.1	3.85	3.50	1.1	2.8

Notes:

hf c is a high frequency profile with concrete and

hf s is a high frequency profile with soil

See Table 3.7.1-9 for more information



Table 3E.3-2—Static and Dynamic Bearing Pressure Demands for the Essential Service Water Building

<u>Analysis Case</u>	<u>Dead Load plus Seismic Bearing Pressures (ksf)</u>
<u>1n2u</u>	<u>10.25</u>
<u>1n5a</u>	<u>11.88</u>
<u>2sn4u</u>	<u>11.08</u>
<u>4u</u>	<u>11.57</u>
<u>5a</u>	<u>11.82</u>
<u>HFS</u>	<u>8.79</u>
<u>HFC</u>	<u>10.36</u>