

## ArevaEPRDCPEm Resource

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**From:** WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]  
**Sent:** Friday, June 28, 2013 7:41 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); CORNELL Veronica (EXTERNAL AREVA); LOSEKE Brian (AREVA); ALCHAAR Nawar (AREVA)  
**Subject:** Advanced Response to U.S. EPR Design Certification Application RAI No. 335, FSAR Ch. 3, Question 03.08.04-10  
**Attachments:** RAI 335 Advanced Response Question 03.08.04-10 - US EPR DC .pdf

Amy,

Attached is an Advanced Response to RAI No.335, Question 03.08.04-10, in support of the final response date of August 30, 2013.

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 this response 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](mailto:Dennis.Williford@areva.com)

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**From:** WILLIFORD Dennis (RS/NB)  
**Sent:** Friday, June 28, 2013 6:57 PM  
**To:** [Amy.Snyder@nrc.gov](mailto:Amy.Snyder@nrc.gov)  
**Cc:** [Michael.Miernicki@nrc.gov](mailto:Michael.Miernicki@nrc.gov); ANDERSON Katherine (External AREVA NP INC.); DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)  
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 335, FSAR Ch. 3, Supplement 20

Amy,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10. AREVA NP submitted Supplement 7 on February 11, 2011, to provide a revised schedule for Question 03.08.04-09 and Question 03.08.04-10. On March 3, 2011, AREVA NP submitted Supplement 8 to provide a revised schedule for Question 03.08.01-44. On April 8, 2011, AREVA NP submitted Supplement 9 to provide a revised schedule for

Question 03.08.04-10. On April 28, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for Question 03.08.04-09. On May 2, 2011, AREVA NP submitted Supplement 11 to provide a revised schedule for Question 03.08.01-44. On May 12, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.08.04-10. On May 25, 2011, AREVA NP submitted Supplement 13 to provide a final response for Question 03.08.04-10. On June 15, 2011, AREVA NP submitted Supplement 14 to provide a final response for Question 03.08.04-9. On July 7, 2011, AREVA NP submitted Supplement 15 to provide a revised schedule for Question 03.08.01-44. On July 12, 2011, AREVA NP submitted Supplement 16 to provide a final response for Question 03.08.01-44. On March 7, 2013, AREVA NP submitted Supplement 17 to provide a schedule for a revised final response to Question 03.08.01-44. On April 10, 2013, AREVA NP submitted Supplement 18 to provide a final response for Question 03.08.01-44. On June 12, 2013, AREVA NP submitted Supplement 19 to provide a revised final response to Question 03.08.04-9.

As discussed with NRC staff during a conference call on June 11, 2013, AREVA NP committed to provide a revised schedule and response for Question 03.08.04-10.

The schedule for a technically correct and complete revised response to Question 03.08.04-10 is provided below.

Question #	Advanced Response Date	NRC Comment Request Date	Final Response Date
RAI 335 — 03.08.04-10	June 28, 2013	August 15, 2013	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](mailto:Dennis.Williford@areva.com)

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**From:** RYAN Tom (RS/NB)  
**Sent:** Wednesday, June 12, 2013 12:53 PM  
**To:** [Amy.Snyder@nrc.gov](mailto:Amy.Snyder@nrc.gov)  
**Cc:** WILLIFORD Dennis (RS/NB); ANDERSON Katherine (External AREVA NP INC.); DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); Miernicki, Michael  
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 335, FSAR Ch. 3, Supplement 19

Amy,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10. AREVA NP submitted Supplement 7 on February 11, 2011, to provide a revised schedule for Question 03.08.04-09 and Question 03.08.04-10. On March 3, 2011, AREVA NP submitted Supplement 8 to provide a revised schedule for Question 03.08.01-44. On April 8, 2011, AREVA NP submitted Supplement 9 to provide a revised schedule for Question 03.08.04-10. On April 28, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for Question 03.08.04-09. On May 2, 2011, AREVA NP submitted Supplement 11 to provide a revised

schedule for Question 03.08.01-44. On May 12, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.08.04-10. On May 25, 2011, AREVA NP submitted Supplement 13 to provide a final response for Question 03.08.04-10. On June 15, 2011, AREVA NP submitted Supplement 14 to provide a final response for Question 03.08.04-9. On July 7, 2011, AREVA NP submitted Supplement 15 to provide a revised schedule for Question 03.08.01-44. On July 12, 2011, AREVA NP submitted Supplement 16 to provide a final response for Question 03.08.01-44. On March 7, 2013, AREVA NP submitted Supplement 17 to provide a schedule for a revised final response to Question 03.08.01-44. On April 10, 2013, AREVA NP submitted Supplement 18 to provide a final response for Question 03.08.01-44.

The attached file, "RAI 335 Supplement 19 Response US EPR DC.pdf" provides a technically correct and complete revised final response to Question 03.08.04-9, as committed to NRC during a conference call on June 11, 2013. The following table indicates the pages in the response document, "RAI 335 Supplement 19 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 335 — 03.08.04-9	2	3

This concludes the formal AREVA NP response to RAI 335, and there are no questions from this RAI for which AREVA NP has not provided responses.

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](mailto:Dennis.Williford@areva.com)

---

**From:** WILLIFORD Dennis (RS/NB)  
**Sent:** Wednesday, April 10, 2013 4:29 PM  
**To:** [Amy.Snyder@nrc.gov](mailto:Amy.Snyder@nrc.gov)  
**Cc:** [Michael.Miernicki@nrc.gov](mailto:Michael.Miernicki@nrc.gov); DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); WILLS Tiffany (CORP/QP); HONMA George (EXT)  
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 335, FSAR Ch. 3, Supplement 18

Amy,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10. AREVA NP submitted Supplement 7 on February 11, 2011, to provide a revised schedule for Question 03.08.04-09 and Question 03.08.04-10. On March 3, 2011, AREVA NP submitted Supplement 8 to provide a revised schedule for Question 03.08.01-44. On April 8, 2011, AREVA NP submitted Supplement 9 to provide a revised schedule for Question 03.08.04-10. On April 28, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for Question 03.08.04-09. On May 2, 2011, AREVA NP submitted Supplement 11 to provide a revised schedule for Question 03.08.01-44. On May 12, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.08.04-10. On May 25, 2011, AREVA NP submitted Supplement 13 to

provide a final response for Question 03.08.04-10. On June 15, 2011, AREVA NP submitted Supplement 14 to provide a final response for Question 03.08.04-9. On July 7, 2011, AREVA NP submitted Supplement 15 to provide a revised schedule for Question 03.08.01-44. On July 12, 2011, AREVA NP submitted Supplement 16 to provide a final response for Question 03.08.01-44. On March 7, 2013, AREVA NP submitted Supplement 17 to provide a schedule for a revised final response to Question 03.08.01-44.

The attached file, "RAI 335 Supplement 18 Response US EPR DC.pdf" provides a technically correct and complete revised final response to Question 03.08.01-44, as committed. The following table indicates the pages in the response document, "RAI 335 Supplement 18 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 335 — 03.08.01-44	2	46

This concludes the formal AREVA NP response to RAI 335, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

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

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Charlotte, NC 28262  
Phone: 704-805-2223  
Email: [Dennis.Williford@areva.com](mailto:Dennis.Williford@areva.com)

---

**From:** WILLIFORD Dennis (RS/NB)  
**Sent:** Thursday, March 07, 2013 9:26 AM  
**To:** [Amy.Snyder@nrc.gov](mailto:Amy.Snyder@nrc.gov)  
**Cc:** [Michael.Miernicki@nrc.gov](mailto:Michael.Miernicki@nrc.gov); DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); WILLS Tiffany (CORP/QP)  
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 335, FSAR Ch. 3, Supplement 17

Amy,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10. AREVA NP submitted Supplement 7 on February 11, 2011, to provide a revised schedule for Question 03.08.04-09 and Question 03.08.04-10. On March 3, 2011, AREVA NP submitted Supplement 8 to provide a revised schedule for Question 03.08.01-44. On April 8, 2011, AREVA NP submitted Supplement 9 to provide a revised schedule for Question 03.08.04-10. On April 28, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for Question 03.08.04-09. On May 2, 2011, AREVA NP submitted Supplement 11 to provide a revised schedule for Question 03.08.01-44. On May 12, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.08.04-10. On May 25, 2011, AREVA NP submitted Supplement 13 to provide a final response for Question 03.08.04-10. On June 15, 2011, AREVA NP submitted Supplement 14 to provide a final response for Question 03.08.04-9. On July 7, 2011, AREVA NP submitted Supplement 15 to provide a revised schedule for Question 03.08.01-44. On July 12, 2011, AREVA NP submitted Supplement 16 to provide a final response for Question 03.08.01-44.

Due to changes impacting U.S. EPR FSAR Sections 3.7 and 3.8 and as discussed with NRC staff and communicated in the Revised Closure Plan for U.S. EPR Civil/Structural Open Items (NRC:12:072), a schedule for a revised final response to Question 03.08.01-44 is provided below.

Question #	Final Response Date
RAI 335 — 03.08.01-44	April 15, 2013

Sincerely,

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

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 Charlotte, NC 28262  
 Phone: 704-805-2223  
 Email: [Dennis.Williford@areva.com](mailto:Dennis.Williford@areva.com)

---

**From:** WILLIFORD Dennis (RS/NB)  
**Sent:** Tuesday, July 12, 2011 2:38 PM  
**To:** 'Tefaye, 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. 335, FSAR Ch. 3, Supplement 16

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10. AREVA NP submitted Supplement 7 on February 11, 2011, to provide a revised schedule for Question 03.08.04-09 and Question 03.08.04-10. On March 3, 2011, AREVA NP submitted Supplement 8 to provide a revised schedule for Question 03.08.01-44. On April 8, 2011, AREVA NP submitted Supplement 9 to provide a revised schedule for Question 03.08.04-10. On April 28, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for Question 03.08.04-09. On May 2, 2011, AREVA NP submitted Supplement 11 to provide a revised schedule for Question 03.08.01-44. On May 12, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.08.04-10. On May 25, 2011, AREVA NP submitted Supplement 13 to provide a final response for Question 03.08.04-10. On June 15, 2011, AREVA NP submitted Supplement 14 to provide a final response for Question 03.08.04-9. On July 7, 2011, AREVA NP submitted Supplement 15 to provide a revised schedule for Question 03.08.01-44.

The attached file, "RAI 335 Supplement 16 Response US EPR DC.pdf" provides a technically correct and complete final response to Question 03.08.01-44, as committed. The following table indicates the pages in the response document, "RAI 335 Supplement 16 Response US EPR DC.pdf" that contain AREVA NP's response to the subject question. 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 335 Question 03.08.01-44.

Question #	Start Page	End Page
RAI 335 — 03.08.01-44	2	46



This completes the formal AREVA NP response to RAI 335, and there are no questions from this RAI for which AREVA NP has not provided responses.

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](mailto:Dennis.Williford@areva.com)

---

**From:** WILLIFORD Dennis (RS/NB)  
**Sent:** Thursday, July 07, 2011 4:20 PM  
**To:** Tesfaye, Getachew  
**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. 335, FSAR Ch. 3, Supplement 15

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10. AREVA NP submitted Supplement 7 on February 11, 2011, to provide a revised schedule for Question 03.08.04-09 and Question 03.08.04-10. On March 3, 2011, AREVA NP submitted Supplement 8 to provide a revised schedule for Question 03.08.01-44. On April 8, 2011, AREVA NP submitted Supplement 9 to provide a revised schedule for Question 03.08.04-10. On April 28, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for Question 03.08.04-09. On May 2, 2011, AREVA NP submitted Supplement 11 to provide a revised schedule for Question 03.08.01-44. On May 12, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.08.04-10. On May 25, 2011, AREVA NP submitted Supplement 13 to provide a final response for Question 03.08.04-10. On June 15, 2011, AREVA NP submitted Supplement 14 to provide a final response for Question 03.08.04-9.

The schedule for a technically correct and complete response to the remaining question has been changed as provided below.

Question #	Interim Response Date	Final Response Date
RAI 335 — 03.08.01-44	July 21, 2010 (Actual)	July 15, 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

---

**From:** RYAN Tom (RS/NB)  
**Sent:** Wednesday, June 15, 2011 10:55 AM  
**To:** 'Tefaye, Getachew'  
**Cc:** BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); CORNELL Veronica (External RS/NB); WILLIFORD Dennis (RS/NB)  
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 335, FSAR Ch. 3, Supplement 14

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10. AREVA NP submitted Supplement 7 on February 11, 2011, to provide a revised schedule for Question 03.08.04-09 and Question 03.08.04-10. On March 3, 2011, AREVA NP submitted Supplement 8 to provide a revised schedule for Question 03.08.01-44. On April 8, 2011, AREVA NP submitted Supplement 9 to provide a revised schedule for Question 03.08.04-10. On April 28, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for Question 03.08.04-09. On May 2, 2011, AREVA NP submitted Supplement 11 to provide a revised schedule for Question 03.08.01-44. On May 12, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.08.04-10. On May 25, 2011, AREVA NP submitted Supplement 13 to provide a final response for Question 03.08.04-10.

The attached file, "RAI 335 Supplement 14 Response US EPR DC.pdf" provides a technically correct and complete final response to Question 03.08.04-9, as committed. The following table indicates the pages in the response document, "RAI 335 Supplement 14 Response US EPR DC.pdf" that contains AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 335 — 03.08.04-9	2	4

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

Question #	Interim Response Date	Final Response Date
RAI 335 — 03.08.01-44	July 21, 2010 (Actual)	July 8, 2011

Sincerely,

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

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

---

**From:** WILLIFORD Dennis (RS/NB)  
**Sent:** Wednesday, May 25, 2011 9:01 AM  
**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. 335, FSAR Ch. 3, Supplement 13

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10. AREVA NP submitted Supplement 7 on February 11, 2011, to provide a revised schedule for Question 03.08.04-09 and Question 03.08.04-10. On March 3, 2011, AREVA NP submitted Supplement 8 to provide a revised schedule for Question 03.08.01-44. On April 8, 2011, AREVA NP submitted Supplement 9 to provide a revised schedule for Question 03.08.04-10. On April 28, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for Question 03.08.04-09. On May 2, 2011, AREVA NP submitted Supplement 11 to provide a revised schedule for Question 03.08.01-44. On May 12, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.08.04-10.

The attached file, "RAI 335 Supplement 13 Response US EPR DC.pdf" provides a technically correct and complete final response to Question 03.08.04-10, as committed. Appended to this file are the affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 335 Question 03.08.04-10.

The following table indicates the pages in the response document, "RAI 335 Supplement 13 Response US EPR DC.pdf" that contain AREVA NP's response to the subject question.

<b>Question #</b>	<b>Start Page</b>	<b>End Page</b>
RAI 335 — 03.08.04-10	2	8

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

<b>Question #</b>	<b>Interim Response Date</b>	<b>Final Response Date</b>
RAI 335 — 03.08.01-44	July 21, 2010 (Actual)	July 8, 2011
RAI 335 — 03.08.04-09	July 21, 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](mailto:Dennis.Williford@areva.com)



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**From:** WELLS Russell (RS/NB)  
**Sent:** Thursday, May 12, 2011 4:28 PM  
**To:** 'Tsfaye, 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. 335, FSAR Ch. 3, Supplement 12

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10. AREVA NP submitted Supplement 7 on February 11, 2011, to provide a revised schedule for Question 03.08.04-09 and Question 03.08.04-10. On March 3, 2011, AREVA NP submitted Supplement 8 to provide a revised schedule for Question 03.08.01-44. On April 8, 2011, AREVA NP submitted Supplement 9 to provide a revised schedule for Question 03.08.04-10. On April 28, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for Question 03.08.04-09. On May 2, 2011, AREVA NP submitted Supplement 11 to provide a revised schedule for Question 03.08.01-44.

The schedule for Question 03.08.04-10 is being revised. The schedule for the remaining questions is unchanged.

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

<b>Question #</b>	<b>Interim Response Date</b>	<b>Final Response Date</b>
RAI 335 — 03.08.01-44	July 21, 2010 (Actual)	July 8, 2011
RAI 335 — 03.08.04-09	July 21, 2010 (Actual)	July 8, 2011
RAI 335 — 03.08.04-10	August 20, 2010 (Actual)	<b>July 8, 2011</b>

*Sincerely,*

*Russ Wells*  
*U.S. EPR Design Certification Licensing Manager*  
*AREVA NP, Inc.*  
*3315 Old Forest Road, P.O. Box 10935*  
*Mail Stop OF-57*  
*Lynchburg, VA 24506-0935*  
*Phone: 434-832-3884 (work)*  
*434-942-6375 (cell)*  
*Fax: 434-382-3884*  
[\*Russell.Wells@Areva.com\*](mailto:Russell.Wells@Areva.com)

---

**From:** WELLS Russell (RS/NB)  
**Sent:** Monday, May 02, 2011 10:30 AM  
**To:** Tsfaye, 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. 335, FSAR Ch. 3, Supplement 11

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10. AREVA NP submitted Supplement 7 on February 11, 2011, to provide a revised schedule for Question 03.08.04-09 and Question 03.08.04-10. On March 3, 2011, AREVA NP submitted Supplement 8 to provide a revised schedule for Question 03.08.01-44. On April 8, 2011, AREVA NP submitted Supplement 9 to provide a revised schedule for Question 03.08.04-10. On April 28, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for Question 03.08.04-09.

Due to changes in the schedule for FSAR Sections 3.7 and 3.8 as discussed with NRC, the schedule for Question 03.08.01-44 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:

<b>Question #</b>	<b>Interim Response Date</b>	<b>Final Response Date</b>
RAI 335 — 03.08.01-44	July 21, 2010 (Actual)	<b>July 8, 2011</b>
RAI 335 — 03.08.04-09	July 21, 2010 (Actual)	July 8, 2011
RAI 335 — 03.08.04-10	August 20, 2010 (Actual)	May 12, 2011

Sincerely,

*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*

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*434-942-6375 (cell)*

*Fax: 434-382-3884*

*[Russell.Wells@Areva.com](mailto:Russell.Wells@Areva.com)*

---

**From:** WELLS Russell (RS/NB)

**Sent:** Thursday, April 28, 2011 4:53 PM

**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. 335, FSAR Ch. 3, Supplement 10

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10. AREVA NP submitted Supplement 7 on February 11, 2011, to provide a revised schedule for Question 03.08.04-09 and Question 03.08.04-10. On March 3, 2011, AREVA NP submitted Supplement 8 to provide a revised schedule for Question 03.08.01-44. On April 8, 2011, AREVA NP submitted Supplement 9 to provide a revised schedule for Question 03.08.04-10.

The schedule for Question 03.08.04-09 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	Final Response Date
RAI 335 — 03.08.01-44	July 21, 2010 (Actual)	June 14, 2011
RAI 335 — 03.08.04-09	July 21, 2010 (Actual)	<b>July 8, 2011</b>
RAI 335 — 03.08.04-10	August 20, 2010 (Actual)	May 12, 2011

*Sincerely,*

*Russ Wells*

*U.S. EPR Design Certification Licensing Manager*

**AREVA NP, Inc.**

*3315 Old Forest Road, P.O. Box 10935*

*Mail Stop OF-57*

*Lynchburg, VA 24506-0935*

*Phone: 434-832-3884 (work)*

*434-942-6375 (cell)*

*Fax: 434-382-3884*

[Russell.Wells@Areva.com](mailto:Russell.Wells@Areva.com)

---

**From:** WELLS Russell (RS/NB)

**Sent:** Friday, April 08, 2011 11:30 AM

**To:** 'Teskfaye, Getachew'

**Cc:** 'Miernicki, Michael'; 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. 335, FSAR Ch. 3, Supplement 9

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to

provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10. AREVA NP submitted Supplement 7 on February 11, 2011, to provide a revised schedule for Question 03.08.04-09 and Question 03.08.04-10. On March 3, 2011, AREVA NP submitted Supplement 8 to provide a revised schedule for Question 03.08.01-44.

The schedule for Question 03.08.04-10 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	Final Response Date
RAI 335 — 03.08.01-44	July 21, 2010 (Actual)	June 14, 2011
RAI 335 — 03.08.04-09	July 21, 2010 (Actual)	April 28, 2011
RAI 335 — 03.08.04-10	August 20, 2010 (Actual)	<b>May 12, 2011</b>

*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*

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*434-942-6375 (cell)*

*Fax: 434-382-3884*

*[Russell.Wells@Areva.com](mailto:Russell.Wells@Areva.com)*

---

**From:** WELLS Russell (RS/NB)

**Sent:** Thursday, March 03, 2011 6:04 PM

**To:** 'Tesfaye, Getachew'

**Cc:** BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); CORNELL Veronica (External RS/NB)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 335, FSAR Ch. 3, Supplement 8

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10. AREVA NP submitted Supplement 7 on February 11, 2011, to provide a revised schedule for Question 03.08.04-09 and Question 03.08.04-10.

The schedule for Question 03.08.01-44 is being revised to allow AREVA NP additional time to address NRC audit 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	Final Response Date
RAI 335 — 03.08.01-44	July 21, 2010 (Actual)	<b>June 14, 2011</b>
RAI 335 — 03.08.04-09	July 21, 2010 (Actual)	April 28, 2011
RAI 335 — 03.08.04-10	August 20, 2010 (Actual)	April 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](mailto:Russell.Wells@Areva.com)*

---

**From:** BRYAN Martin (External RS/NB)

**Sent:** Friday, February 11, 2011 1:14 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. 335, FSAR Ch. 3, Supplement 7

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10. AREVA NP submitted Supplement 6 on January 13, 2011, to provide a revised schedule for Question 03.08.01-44 and Question 03.08.04-10.

The schedule for Question 03.08.04-09 and Question 03.08.04-10 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	Final Response Date
RAI 335 — 03.08.01-44	July 21, 2010 (Actual)	March 3, 2011
RAI 335 — 03.08.04-09	July 21, 2010 (Actual)	April 28, 2011
RAI 335 — 03.08.04-10	August 20, 2010 (Actual)	April 8, 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](mailto:Martin.Bryan.ext@areva.com)

---

**From:** BRYAN Martin (External RS/NB)  
**Sent:** Thursday, January 13, 2011 5:09 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. 335, FSAR Ch. 3, Supplement 6, Interim

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09. AREVA NP submitted Supplement 5 on August 20, 2010, to provide an INTERIM response to Question 03.08.04-10.

The schedule for Question 03.08.01-44 is being revised to allow AREVA NP additional time for to address NRC feedback. The schedule for Question 03.08.04-10 is being revised to allow additional time for AREVA NP to interact with the NRC.

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

Question #	Interim Response Date	Final Response Date
RAI 335 — 03.08.01-44	July 21, 2010 (Actual)	March 3, 2011
RAI 335 — 03.08.04-09	July 21, 2010 (Actual)	February 15, 2011
RAI 335 — 03.08.04-10	August 20, 2010 (Actual)	March 3, 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](mailto:Martin.Bryan.ext@areva.com)

---

**From:** BRYAN Martin (External RS/NB)  
**Sent:** Friday, August 20, 2010 3:31 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. 335, FSAR Ch. 3, Supplement 5, Interim

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 and Supplement 3 to the response on June 4, 2010, and June 24, 2010, respectively, to provide a revised schedule for responding to the remaining 3 questions. AREVA NP submitted Supplement 4 on July 20, 2010, to provide INTERIM responses to Question 03.08.01-44 and Question 03.08.04-09.

The attached file, "RAI 335 Supplement 5 US EPR DC – INTERIM.pdf" provides technically correct and complete INTERIM response to Question 03.08.04-10, as committed.

The following table indicates the respective pages in the response document, "RAI 335 Supplement 5 US EPR DC – INTERIM.pdf," that contain AREVA NP's INTERIM response to Question 03.08.04-10.

Question #	Start Page	End Page
RAI 335 — 03.08.04-10	2	3

The schedule for technically correct and complete FINAL responses to the remaining 3 questions is unchanged and provided below:

Question #	Interim Response Date	Final Response Date
RAI 335 — 03.08.01-44	July 21, 2010 (Actual)	January 13, 2011
RAI 335 — 03.08.04-09	July 21, 2010 (Actual)	February 15, 2011
RAI 335 — 03.08.04-10	August 20, 2010 (Actual)	January 21, 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](mailto:Martin.Bryan.ext@areva.com)

---

**From:** BRYAN Martin (EXT)  
**Sent:** Tuesday, July 20, 2010 5:17 PM  
**To:** 'Tsfaye, 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. 335, FSAR Ch. 3, Supplement 4, Interim

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 to the response on June 4, 2010, to provide a schedule for the remaining 3 questions that were affected by the work underway to address NRC comments from the April 26, 2010, audit. AREVA NP submitted Supplement 3 to the response on June 24, 2010, to provide a revised schedule for responding to the remaining 3 questions based on the June 9, 2010, NRC public meeting with AREVA.

The attached file, "RAI 335 Supplement 4 US EPR DC – INTERIM.pdf" provides technically correct and complete INTERIM response to Question 03.08.01-44 and Question 03.08.04-09, as committed.

The following table indicates the respective pages in the response document, "RAI 335 Supplement 4 US EPR DC – INTERIM.pdf," that contain AREVA NP's INTERIM response to Question 03.08.01-44 and Question 03.08.04-09.

Question #	Start Page	End Page
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RAI 335 — 03.08.01-44	2	8
RAI 335 — 03.08.04-09	9	11

The schedule for technically correct and complete FINAL response to the remaining 3 questions is unchanged and provided below:

Question #	Interim Response Date	Final Response Date
RAI 335 — 03.08.01-44	July 21, 2010 ( <b>Actual</b> )	January 13, 2011
RAI 335 — 03.08.04-09	July 21, 2010 ( <b>Actual</b> )	February 15, 2011
RAI 335 — 03.08.04-10	August 23, 2010	January 21, 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](mailto:Martin.Bryan.ext@areva.com)

---

**From:** BRYAN Martin (EXT)  
**Sent:** Thursday, June 24, 2010 12:27 PM  
**To:** 'Tefaye, Getachew'  
**Cc:** DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); CORNELL Veronica (EXT); VAN NOY Mark (EXT); RYAN Tom (AREVA NP INC); GARDNER George Darrell (AREVA NP INC)  
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 335, FSAR Ch. 3, Supplement 3

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions. AREVA NP submitted Supplement 2 to the response on June 4, 2010, to provide a schedule for the remaining 3 questions that 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 for the remaining three questions has been changed.

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	Final Response Date
RAI 335 — 03.08.01-44	July 21, 2010	January 13, 2011
RAI 335 — 03.08.04-09	July 21, 2010	February 15, 2011
RAI 335 — 03.08.04-10	August 23, 2010	January 21, 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](mailto:Martin.Bryan.ext@areva.com)

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**From:** BRYAN Martin (EXT)  
**Sent:** Friday, June 04, 2010 3:45 PM  
**To:** 'Tefaye, Getachew'  
**Cc:** DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); VAN NOY Mark (EXT); CORNELL Veronica (EXT)  
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 335, FSAR Ch. 3, Supplement 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. AREVA NP submitted Supplement 1 to the response on March 12, 2010, to address 3 of the remaining 6 questions.

The response to Question 03.08.04-09 is affected as a result of work currently underway to address NRC comments from the April 26, 2010, audit and a revised schedule is provided below. However, the response date for all three questions will be revised based on information presented at the June 9, 2010 public meeting and subsequent NRC feedback.

Question #	Response Date
RAI 335 — 03.08.01-44	August 13, 2010
RAI 335 — 03.08.04-09	August 13, 2010
RAI 335 — 03.08.04-10	August 13, 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](mailto:Martin.Bryan.ext@areva.com)

---

**From:** BRYAN Martin (EXT)  
**Sent:** Friday, March 12, 2010 5:06 PM  
**To:** 'Tefaye, Getachew'  
**Cc:** DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); ROMINE Judy (AREVA NP INC); VAN

NOY Mark (EXT); GARDNER George Darrell (AREVA NP INC)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 335, FSAR Ch. 3, Supplement 1

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to RAI No. 335 on January 18, 2010. The attached file, "RAI 335 Supplement 1 Response US EPR DC.pdf" provides technically correct and complete responses to 3 of the remaining 6 questions, as committed. The response to Question 03.08.04-10 is deferred due to its dependency on results of work currently underway to support other responses on related topics.

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 335 Questions 03.08.01-45, and 03.08.04-8.

The following table indicates the respective pages in the response document, "RAI 335 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 335 — 03.08.01-45	2	2
RAI 335 — 03.08.01-46	3	3
RAI 335 — 03.08.04-08	4	5

The schedule for technically correct and complete responses to the remaining 3 questions has been changed and is provided below:

Question #	Response Date
RAI 335 — 03.08.01-44	August 13, 2010
RAI 335 — 03.08.04-09	June 4, 2010
RAI 335 — 08.08.04-10	August 13, 2010

Sincerely,

Martin (Marty) C. Bryan  
Licensing Advisory Engineer  
AREVA NP Inc.  
Tel: (434) 832-3016  
[Martin.Bryan.ext@areva.com](mailto:Martin.Bryan.ext@areva.com)

---

**From:** DUNCAN Leslie E (AREVA NP INC)

**Sent:** Monday, January 18, 2010 3:24 PM

**To:** 'Tesfaye, Getachew'

**Cc:** BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 335, FSAR Ch. 3

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 335 Response US EPR DC.pdf" provides a schedule since technically correct and complete responses to the 6 questions are not provided.



The following table indicates the respective pages in the response document, "RAI 335 Response US EPR DC.pdf" that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 335 - 03.08.01-44	2	3
RAI 335 - 03.08.01-45	4	4
RAI 335 - 03.08.01-46	5	5
RAI 335 - 03.08.04-08	6	6
RAI 335 - 03.08.04-09	7	7
RAI 335 - 03.08.04-10	8	9

A complete answer is not provided for 6 of the 6 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 335 - 03.08.01-44	August 13, 2010
RAI 335 - 03.08.01-45	March 12, 2010
RAI 335 - 03.08.01-46	March 12, 2010
RAI 335 - 03.08.04-08	March 12, 2010
RAI 335 - 03.08.04-09	June 4, 2010
RAI 335 - 03.08.04-10	March 12, 2010

Sincerely,

Les Duncan  
 Licensing Engineer  
**AREVA NP Inc.**  
 An AREVA and Siemens Company  
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**Sent:** Saturday, December 05, 2009 6:52 AM  
**To:** ZZ-DL-A-USEPR-DL  
**Cc:** Xu, Jim; Hawkins, Kimberly; Patel, Jay; Miernicki, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource  
**Subject:** U.S. EPR Design Certification Application RAI No. 335 (4059, 4061),FSAR Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on November 30, 2009, and on December 4, 2009, 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 with the exception of typographical error correction in Draft RAI Question 03.08.04-8 identified by AREVA. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs, excluding the time period of **December 25, 2009 thru January 3, 2010, to account for the holiday season** as discussed with AREVA NP. For any RAIs that cannot be answered **within 40 days**, it is expected that a date for receipt of this information will be provided to the staff within the 40-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  
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**Hearing Identifier:** AREVA\_EPR\_DC\_RAIs  
**Email Number:** 4584

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**Advanced Response to**

**Request for Additional Information No. 335, Question 03.08.04-10**

**12/05/2009**

**U. S. EPR Standard Design Certification**

**AREVA NP Inc.**

**Docket No. 52-020**

**SRP Section: 03.08.01 - Concrete Containment**

**SRP Section: 03.08.04 - Other Seismic Category I Structures**

**Application Section: FSAR Section 3.8**

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

**Question 03.08.04-10:****Follow-up to RAI Question 03.08.04-5**

The staff notes that FSAR Section 9.1.2 (Revision 1) mentions that the design of the spent fuel storage racks is the responsibility of the COL applicant and makes only general statements regarding design loads, (Section 9.1.2.1 Item 10) and required dynamic and stress analyses (Section 9.1.2.3). Similarly, the response to RAI 155, Supplement 2, Question 3.8.1-7 makes only general statements regarding design load cases. Therefore, this information does not address the intent of the RAI.

Since the spent fuel storage racks are free-standing, and their analysis and design is deferred to the COL application, AREVA at this stage needs to clarify how they determined the loads imposed on the spent fuel pool. Both the procedure to determine the loads and the magnitude of these loads (e.g., sliding, rocking, twisting, impact on the pool walls and slabs) need to be described. This information should be included in the relevant sections of the FSAR so that, when the detailed design of the storage racks is actually carried out, the COL applicant can perform the necessary comparison between the assumed loads and the loads obtained from the detailed analysis. The applicant is requested to describe the analysis and procedures for the spent fuel pool and racks, and explain how they compare to the criteria in Appendix D to SRP Section 3.8.4, "Guidance on Spent Fuel Pool Racks." Include this information in the FSAR.

In addition, describe the specific procedures used to determine the seismic forces on walls and slabs due to water in the pool. In this regard, FSAR Section 3.8.4.4.1, item "Hydrodynamic Loads" states that for the static FE model of the Nuclear Island structure:

"Hydrodynamic loads are applied to the walls and floors of the spent fuel pool and liquid storage tanks in the SBs and in the ESWBs to account for the impulsive and impactive effects of the water moving and sloshing in the tanks as a result of seismic excitation. These loads are considered as part of the seismic SSE loads, and components of these loads in the three orthogonal directions are combined in the same manner as other seismic loads. The requirements of ASCE 4-98, "Seismic Analysis of Safety-Related Nuclear Structures," ASCE Manual No. 58, USAEC TID-7024, and other proven methods are used to determine hydrodynamic loadings. The effect of tank structure flexibility on spectral acceleration is included when determining the hydrodynamic pressure on the tank wall for the impulsive mode."

Elaborate on how the hydrodynamic loads are determined and provide a summary of the relevant calculations for the spent fuel pool. This summary should include the magnitude of convective and impulsive masses, corresponding frequencies, and a description of the methodology used to convert the dynamic effects of these water masses to loads applied to the static FE model. Confirm if the same methodology is used for the other seismic Category I pools in the U.S. EPR.

Finally, since FSAR Appendix 3E will be revised according to the resolution of RAI 155, Questions 03.08.01-20 and 03.08.04-6, confirm that the spent fuel pool will be included as a Critical Section under one of the three critical section selection criteria (qualitative, quantitative, or supplemental).



**Response to Question 03.08.04-10:**

The Response to RAI 335, Question 03.08.04-10 is being resubmitted in its entirety. The revised response incorporates operating basis earthquake (OBE) structural damping for the generation of in-structure response spectra (ISRS) for the nuclear island (NI) as described in the Response to RAI 370, Question 03.07.01-27. In addition, the revised response incorporates soil-structure interaction (SSI) analysis direct method results as described in the Response to RAI 320, Question 03.07.02-63.

The design of the spent fuel storage racks is incorporated in U.S. EPR FSAR Tier 2, Section 9.1.2. The new and spent fuel pool (SFP) assemblies design and analysis are provided in Technical Report TN-Rack.0101, "U.S. EPR New and Spent Fuel Storage Rack Technical Report", submitted to the U.S. NRC Document Control Desk on December 8, 2009. The spent fuel racks (SFR) and fuel assemblies (FA) loads imposed on the SFP are provided in Technical Report TN-Rack.0101. Technical Report TN-Rack.0101, Chapter 3 provides weights, impact loads, and stuck fuel assembly loads. Technical Report, TN-Rack.0101, Appendix 3C provides rack sliding and uplift, rack foot, lateral, and vertical loads. Based on U.S. EPR FSAR Tier 2, Appendix 3C, the racks do not generate impact loads on the perimeter pool walls, and have a minimum safety factor against tipping of 1.1. Compliance with the rack design criteria of SRP 3.8.4, Appendix D is addressed in Technical Report TN-Rack.0101. Technical Report TN-Rack.0101 is incorporated by reference in U.S. EPR FSAR Tier 2, Section 9.1. The report contains specifics on the rack design, the methodology used to determine loads, and the magnitude of the loads on the pool walls and floor.

U.S. EPR FSAR Tier 2, Section 3.8.4.4.2 describes the SFP local analysis. As described in Technical Report TN-Rack.0101 and local SFP analysis, a whole pool dynamic LS-DYNA finite element model (FEM) is created that includes modeling of pool concrete walls (as rigid boundary), fuel racks, and water. The results of the whole pool multi-rack model analysis are used to determine the hydrodynamic loads (pressure, forces, and moments) exerted on the pool walls and floor from the water and racks during a seismic event, including horizontal displacement between racks and pool floor, and uplift of the fuel racks.

The equivalent static SFP loads applied in the NI analysis are not the Technical Report TN-Rack.0101 loads. The SFP design loads from racks and water in the pool are calculated separately and are applied in the overall ANSYS NI model as equivalent static pressures on SFP wall and slab. The rack equivalent static loads are based on estimated pool fuel capacity and previous nuclear plant rack analytical data, while the SFP water loads (and other NI pool loads) are determined following the methodology of the TID-7024, "Nuclear Reactors and Earthquakes." The methodology for calculating the SFP hydrodynamic loads is consistent with the method described in the Response to RAI 412, Question 03.07.02-74. The design loads used for SFP analysis are compared to the maximum wall pressures determined through post-processing of the whole pool multi-rack dynamic analysis results, and are verified as adequate. This response provides details on how the design loads are calculated for the NI Pools and the ESWB Pools. The hydrodynamic loads and analysis for the spent fuel pool and liquid storage tanks are described in U.S. EPR FSAR Tier 2, Sections 3.8.3.4.4 and Section 3.8.4.4.1, respectively.

The SFP rack loads used in the static analysis of the NI consist of rack, fuel weight and rack seismic forces, which are applied in the overall ANSYS model as pressure on the walls and pool slab. Rack loads are conservatively based on 1400 cells versus the planned capacity identified

in U.S. EPR FSAR Tier 2, Section 9.1.2.2.2. The rack loading includes the weight of the rack, 241 FA and 241 rod cluster control assemblies (RCCA). This combination of dead and live loads is converted to a uniform pressure on the slab of the SFP. The magnitude of this pressure is 2176 psf (15.11 psi) and consists of 100 percent dead and 25 percent live loads. The dead load pressure magnitude is 2079 psf (14.44 psi) and live load pressure magnitude is 390 psf (2.71 psi). The SFP rack dead and live loads are used to calculate the seismic loads on the SFP slab and walls, which include the following:

- Vertical seismic load on the SFP slab is based on an equivalent seismic load and rack weight. The loading calculation considers 100 percent dead and 25 percent live loads. The vertical seismic load is calculated using the static load plus a zero period acceleration (ZPA) based vertical load increased by a margin of two to account for unknown dynamic behavior. The vertical seismic load is applied as a uniform pressure on the entire SFP slab area. The magnitude of the vertical seismic load is 3699 psf and is derived from the vertical load considering the combined effects of seismic events in each of the three orthogonal directions (x, y, and z). The vertical seismic load considers:
  - SFP ZPA = 0.53g
  - ZPA based vertical load = 15.11 psi\*0.53 g = 8.01 psi = 1153 psf.
  - Rack vertical impact load = (15.11 psi + 8.01 psi)\*2 = 46.24 psi = 6658 psf.
  - Rack vertical impact load for earthquake in each of the orthogonal direction = 25.69 psi = 3699 psf.

When vertical impact loads from the three earthquake directions are combined using the square root of the sum of the squares (SRSS), the combined impact load is:

$$(3*25.69^2)^{0.5} = 44.5 \text{ psi} = 6407 \text{ psf.}$$

The 6407 psf is approximately four percent lower than the initially calculated value of 6658 psf. Because the applied SFP pressures envelop the Transnuclear pressures, this difference was determined to be acceptable.

The lateral loading due to the racks on the pool walls and floor include the following:

- Lateral seismic load on the SFP slab is calculated based on the rack static load, ZPA based vertical load, and rack vertical seismic load multiplied by a 0.6 friction coefficient. The lateral seismic load is applied as a uniform pressure on the SFP slab with a magnitude of 5993 psf for seismic events in the two horizontal directions. The horizontal friction force is equal to:

$$(\text{Vertical seismic rack load} + \text{gravity load}) * \text{friction coefficient} = [15.11 \text{ psi} + 8.01 \text{ psi} + 46.24 \text{ psi}] * 0.6 = 41.62 \text{ psi} = 5993 \text{ psf}$$

- Lateral seismic load on the SFP walls, resulting from rack horizontal movement during a seismic event, is calculated and applied on the SFP walls up to an elevation corresponding to assumed height of the racks. A hydrodynamic pressure of 12.08 psi and based 0.3 g acceleration is selected using previous nuclear plant rack analytical data. The hydrodynamic pressure is increased with the seismic acceleration along the height of the racks on 3.28 ft (1m) increments. The seismic acceleration used is linearly increased between the top and bottom of the racks using the peak acceleration from the in-structure response spectra (ISRS) at the SFP slab (four percent damping curve), and acceleration from the next available ISRS. The pressure magnitude changes from 17,021 psf at the rack

bottom (first increment) to 28,056 psf at the rack top (last increment). The loads from each increment are averaged and applied as uniform pressures on each wall for the two horizontal seismic events corresponding to the direction of the earthquake.

The lateral pressure near the bottom of rack is the equivalent static pressure\*seismic acceleration ( $12.08 \text{ psi} * 2.94 \text{ g} / 0.3 \text{ g} = 118.2 \text{ psi} = 17,021 \text{ psf}$ ). The lateral pressure near the top of rack is the equivalent static pressure\*seismic acceleration ( $12.08 \text{ psi} * 4.84 \text{ g} / 0.3 \text{ g} = 194.83 \text{ psi} = 28,056 \text{ psf}$ ). The height of racks is assumed to be 15.94 ft (4.86 m).

SFP pressures described in this response (in this section and the following “NI Pools” section) are used for global loading and static analysis of the NI Common Basemat Structure. U.S. EPR FSAR Tier 2, Table 03.08.04-10-1 provides the Transnuclear whole pool seismic analysis average maximum wall and slab pressures and compares to the average SFP static analysis pressures. The Transnuclear whole pool analysis values reported in U.S. EPR FSAR Tier 2, Table 03.08.04-10-1 correspond to the maximum pressures on each wall and slab from a set of analytical cases. The SFP pressures used for the NI Common Basemat Structure analysis were reconciled and found to envelope the pressures identified in the Transnuclear whole pool seismic load analysis, except for the floor slab. As part of the reconciliation of the Transnuclear loads as explained below, it was determined that higher pressures were acceptable due to their application.

While the applied pressure determined by Transnuclear may be higher for the floor slab, a more detailed approach was used to more accurately determine the stress in the floor slab. Due to modeling simplifications within the static analysis of the NI Common Basemat Structure, the overall area of the SFP is considerably larger than what was analyzed by Transnuclear. This creates a comparison of a lower applied pressure over a larger slab area (NI Global Model) to a higher applied pressure over a smaller slab area (Transnuclear). The results showed that the lower pressure application in the NI common basemat structure generates a higher stress and displacement than the Transnuclear values. Therefore, the pressure applied in the static analysis is still bounding.

The overall design of the SFP uses the results from the global analysis. However, impact loads from rack and fuel drop identified in the whole multi-rack fuel pool analysis are used in the SFP design for local effects, such as bending and punching shear checks.

The Fuel Building SFP walls and slab are selected as a critical section and will be included in U.S. EPR FSAR Tier 2, Appendix 3E, in the Response to RAI 155, Question 03.08.04-06.

The ISRS curves are based on the envelope of cracked and uncracked concrete ISRS.

### **NI Pools**

The SFP water loads used in the NI static analysis consist of hydrostatic and hydrodynamic forces applied in the ANSYS model as pressure on the walls and pool slab. The hydrostatic pressure on the pool slab is 2932 psf. The hydrostatic pressure on the walls is gradually increased to a maximum of 2837 psf at the bottom of the SFP. The hydrostatic pressure on the slab is applied as uniform load, while the hydrostatic pressure on the walls is applied as triangular pressure load. The hydrodynamic loads on the SFP walls and slab are:

- Hydrodynamic pressure on SFP walls and slab resulting from seismic load in Z (vertical up and down) direction are calculated by multiplying the pool slab ZPA in the Z direction and

the mass of the fluid. The SFP floor ZPA is conservatively taken to be an envelope of the entire floor ZPAs in Z direction at elevation +13.78 ft (+4.20 m) and 0.45g. The magnitude of the calculated and applied uniform pressure on the pool slab is 1320 psf. The pressure on the walls is calculated using 3.28 ft (1m) increments and has a magnitude of 47 psf at the first increment near the water surface, and 1277 psf at the last increment at the bottom of the pool. The loads from each increment are separated into three bands, and the pressure is averaged over the band height, and applied as a uniform wall pressure over the band heights. U.S. EPR FSAR Tier 2, Figure 03.08.04-10-1 shows the application of the uniform pressure on the walls in the static model.

- Hydrodynamic pressure on SFP walls and slab resulting from seismic load in the X (East-West) direction have convective and impulsive pressures that are calculated using the methodology described in TID-7024, Chapter 6 and Appendix F (including ZPA for impulsive loading and natural frequency for convective loading). The previous revision to this RAI response utilized the natural frequency for NI Pool Impulsive X and Y direction load determination. This revision to the response uses the zero period acceleration (ZPA) for consistency with TID-7024.

For the impulsive pressures, the maximum ZPA of the east and west walls obtained from the in-structure response spectra (ISRS) is 0.84g. This is determined at elevation +48.56 (+14.80 m), which is near mid-height of pool wall. The highest seismic amplification is expected to occur at the middle of the walls, therefore, elevation +48.56 (+14.80 m) ISRS acceleration is appropriate. Detailed explanation of SFP ISRS accelerations is included in the Response to RAI 412, Question 03.07.02-74, Attachment 1.

For the convective pressures, the natural frequency of the sloshing fluid is 0.22 Hz, and the acceleration of 0.05g is obtained from the ISRS at elevation +48.56 (+14.80 m) using 0.5 percent damping.

Convective and impulsive pressures are calculated along the height of the walls and from the centerline of the pool slab using 3.28 ft (1m) increments. Convective and impulsive pressures are summed and applied as a triangular load on the pool slab with zero magnitude at the pool centerline, while the incremental wall pressures are further grouped to three bands. Pressures over the band heights are averaged for application in the NI analytical model as uniform pressure. The load magnitudes at the extremes of the wall are:

- 122 psf impulsive and 63 psf convective pressure at the top of the wall.
- 1395 psf impulsive and 9 psf convective pressure at the bottom of the wall.

For the pool slab, the maximum pressure at the slab ends is 1494 psf impulsive and 8 psf convective. On average, the convective pressure is approximately 2 percent of the total calculated pressure for the walls and approximately 1 percent for the slab. Figure 03.08.04-10-2 illustrates the uniform pressures and magnitudes applied in the static model. An example of how convective and impulsive pressures are calculated is provided in the Response to RAI 412, Question 03.07.02-74.

- Hydrodynamic pressure on SFP walls and slab resulting from the seismic load in the Y (North-South) direction are calculated the same as in the X direction, except pressure is applied to the north and south walls. The ZPA is again used for the impulsive loading

and for the convective loading. The sloshing fluid natural frequency is 0.3 Hz. The load magnitudes at the extremes of the wall are:

- ◆ 133 psf impulsive and 59 psf convective pressure at the top of the wall.
- ◆ 887 psf impulsive and 1 psf convective pressure at the bottom of the wall.

For the pool slab, the maximum pressure at the slab ends is 1138 psf impulsive and 1 psf convective. On average, the convective pressure is approximately 2 percent of the total calculated pressure for the walls and less than 1 percent for the slab. Figure 03.08.04-10-3 illustrates the uniform pressures and magnitudes applied in the static model.

The directional seismic rack and water loads in the SFP are combined consistent with the methodology described in the Response to RAI 376, Question 03.08.03-24.

The methodology for calculating the SFP hydrodynamic loads is consistent with the method described in the Response to RAI 412, Question 03.07.02-74.

### **ESWB Pools**

The The Essential Service Water Building (ESWB) water storage basin includes seven separate compartments and three different compartment types. U.S. EPR FSAR Tier 2, Figure 03.08.04-10-4 shows the three compartment types and locations. Compartment Type I is open with the exception of a perimeter slab. Compartment Types II and III are enclosed. Hydrodynamic pressures on each compartment are calculated for the following two water inventory scenarios under safe shutdown earthquake (SSE) conditions:

1. High water level (HWL): Occurs under normal operating conditions with the water height at 28.00 feet from the top of the basemat.
2. Low water level (LWL): The required height for minimum pump submergence in which the water height is 9.92 feet from the top of the basemat.

Impulsive mass frequencies were obtained from the ESWB GTSTRUDL model analysis. Convective mass frequencies were determined using ACI 350.3 method. The mass on each wall was obtained for both the HWL and LWL scenarios, in addition to the wall inertia due to concrete. A summary of the frequencies are shown in U.S. EPR FSAR Tier 2, Table 03.08.04-10-2.

Boundary conditions of the tank walls (HWL and LWL) consist of fixed restraint at the bottom of the wall (i.e., top of basemat) and pinned on the other edges of the wall to account for the stiffness of framing walls and slabs. The top of the tank is considered to be restrained by the slab at Elevation 14ft 0in.

The methodology in TID-7024 is used to determine the impulsive and convective mass distributions for the ESWB HWL and LWL. ISRS damping of 5 percent was used for impulsive masses and 0.5 percent damping was used for the convective masses. ISRS at mid-depth of the HWL (14ft) and LWL (4ft) and mid-length of each compartment are considered. For the wall pressure, the mass distribution was multiplied by the ISRS acceleration corresponding to the impulsive or convective wall frequencies and damping ratios. For the vertical excitation, the entire mass of the water is multiplied by the envelope of vertical ZPAs to determine the vertical



pressure on top of the basemat. Also, due to the horizontal excitation, the top of the basemat is subjected to a linearly varying pressure. The hydrodynamic loads are included in the SSE loading (E').

Sloshing height is calculated for Compartment Type I-x, Compartment Type III-x and Compartment Type II-z that are representative of the sloshing mode for all ESWB compartments. Sloshing height for HWL is calculated in accordance with TID-7024 and compared with available freeboard in the ESWB pools. The sloshing height is approximately 1.4ft, 1.7ft and 1.9ft for Compartment Type I-x, Compartment Type III-x and Compartment Type II-z, respectively. The available freeboard is 2ft.; therefore, there is no hydrodynamic pressure impact on the ceiling or overspill.

The hydrodynamic wall pressures are shown in U.S. EPR FSAR Tier 2, Table 03.08.04-10-3. Only impulsive mass distributions are considered since the convective frequencies are low and considered negligible for dynamic analysis. The hydrodynamic basemat pressures are shown in U.S. EPR FSAR Tier 2, Table 03.08.04-10-4. The impulsive and convective pressures applied to the basemat are variable across the bottom of the tank to cause the overturning moment. As a result, the pressure on one side of the tank has the same magnitude but with reverse sign compared to the other side. The vertical pressure applied to the basemat is uniform across the bottom of the basemat.

U.S. EPR FSAR Tier 2, Section 3.8.3.4.4 and Section 3.8.4.4.1 were revised in the Response to RAI 412, Question 03.07.02-74 to clarify the hydrodynamic loads for the NI and ESWB pools.

**FSAR Impact:**

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

**Table 03.08.04-10-1—Transnuclear Whole Pool Analysis and U.S. EPR  
 Maximum Wall/Slab Average Pressures**

<b>West Wall</b>	<b>North Wall</b>	<b>East Wall</b>	<b>South Wall</b>	<b>Slab</b>
<b>Transnuclear Whole Pool Analysis</b>				
46.6 psi	52.7 psi	37.2 psi	34.4 psi	119.41 psi
<b>SFP Static Analysis</b>				
74.57 psi	72.65 psi	74.57 psi	72.65 psi	91.15 psi



**Table 03.08.04-10-2—Frequencies of Tank Walls – Impulsive and Convective**

ESWB	Basin Size (wall thickness = 3ft)			Hydrodynamic Mode	Frequency of Convective/Impulsive Mass  (Hz)	
	X (ft)	Z (ft)	h (ft)		X	Z
	<b>High Water Level</b>					
Compartment Type I	60.5	60	28	Impulsive	14.7	11.9
				Convective	0.19	0.19
Compartment Type II	60.5	18	28	Impulsive	32.2	14.7
				Convective	0.19	0.38
Compartment Type III	14	60	28	Impulsive	14.7	44.2
				Convective	0.43	0.19
<b>Low Water Level</b>						
Compartment Type I	60.5	60	9.92	Impulsive	22.5	21.5
				Convective	0.14	0.14
Compartment Type II	60.5	18	9.92	Impulsive	50.4	22.5
				Convective	0.14	0.37
Compartment Type III	14	60	9.92	Impulsive	22.5	66.5
				Convective	0.42	0.14

**Table 03.08.04-10-3 – ESWB Hydrodynamic Wall Pressures**

Wall	Between Gridlines	High Water Hydrodynamic Wall Pressure			Low Water Hydrodynamic Wall Pressure		
		Max Impulsive Pressure (ksf)	Max Convective Pressure (ksf)	Max Total Pressure (ksf)	Max Impulsive Pressure (ksf)	Max Convective Pressure (ksf)	Max Total Pressure (ksf)
F	2-4	2.130	0.062	2.192	2.130	0.062	2.192
D	2-4	4.260	0.124	4.384	4.260	0.124	4.384
B	2-4	2.743	0.055	2.798	2.743	0.055	2.798
B & F	1-2	1.549	0.062	1.611	1.549	0.062	1.611
B & F	4-5	1.549	0.062	1.611	1.549	0.062	1.611
D	1-2	3.098	0.124	3.222	3.098	0.124	3.222
D	4-5	3.098	0.124	3.222	3.098	0.124	3.222
B.5	ALL	0.613	-0.007	0.606	0.613	-0.007	0.606
1 & 5	ALL	1.102	-0.011	1.091	1.102	-0.011	1.091
2 & 4	F-B	3.232	0.051	3.283	3.232	0.051	3.283
2 & 4	B-B.5	1.01	0.062	1.072	1.01	0.062	1.072

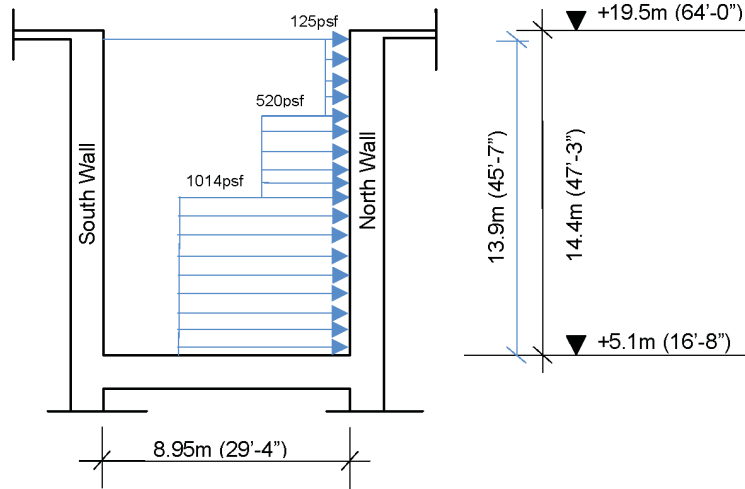
**Table 03.08.04-10-4 – ESWB Hydrodynamic Basemat Pressures**

Compartment	Hydrodynamic Pressure Applied to Basemat (HWL)				Hydrodynamic Pressure Applied to Basemat (LWL)			
	Max Impulsive Pressure (ksf) <sup>(1)</sup>	Max Convective Pressure (ksf) <sup>(1)</sup>	Max Total Pressure (ksf) <sup>(1)</sup>	Constant Vertical Pressure (ksf) <sup>(2)</sup>	Max Impulsive Pressure (ksf) <sup>(1)</sup>	Max Convective Pressure (ksf) <sup>(1)</sup>	Max Total Pressure (ksf) <sup>(1)</sup>	Constant Vertical Pressure (ksf) <sup>(2)</sup>
Type I - X direction	1.825	0.0794	1.904	0.874	0.499	0.1588	0.658	0.310
Type II - X direction	1.328	0.0794	1.407		0.376	0.1588	0.535	
Type III - X direction	0.738	0.0004	0.738		0.394	0.0230	0.417	
Type I - Z direction	1.825	0.0794	1.904		0.499	0.1588	0.658	
Type II - Z direction	1.249	0.0020	1.251		0.565	0.0457	0.611	
Type III - Z direction	0.863	0.0794	0.942		0.265	0.1588	0.424	

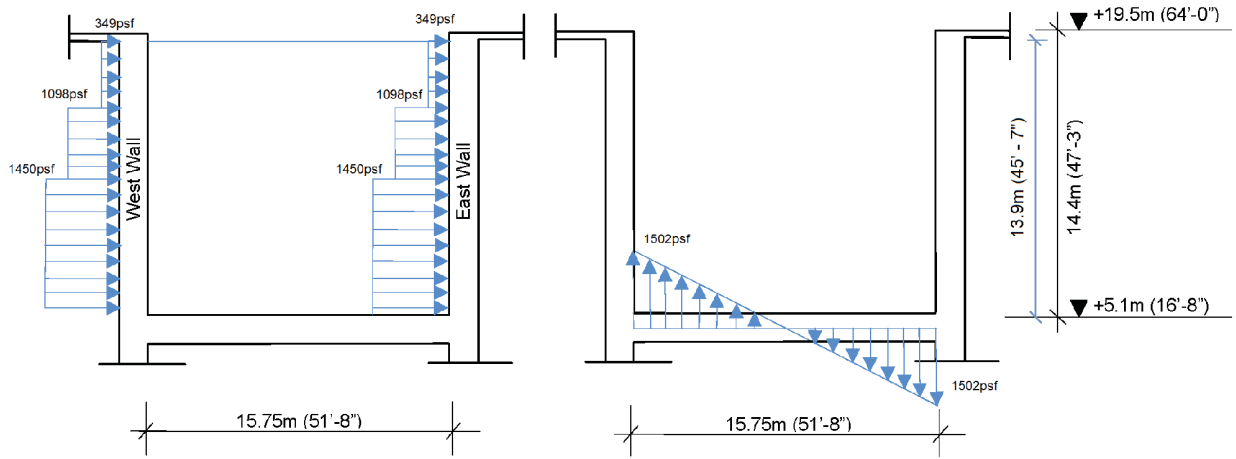
Note 1: The impulsive and convective pressures applied to the basemat are variable across the bottom of the tank.

Note 2: The vertical pressures applied to the basemat are uniform across the bottom of the basemat.

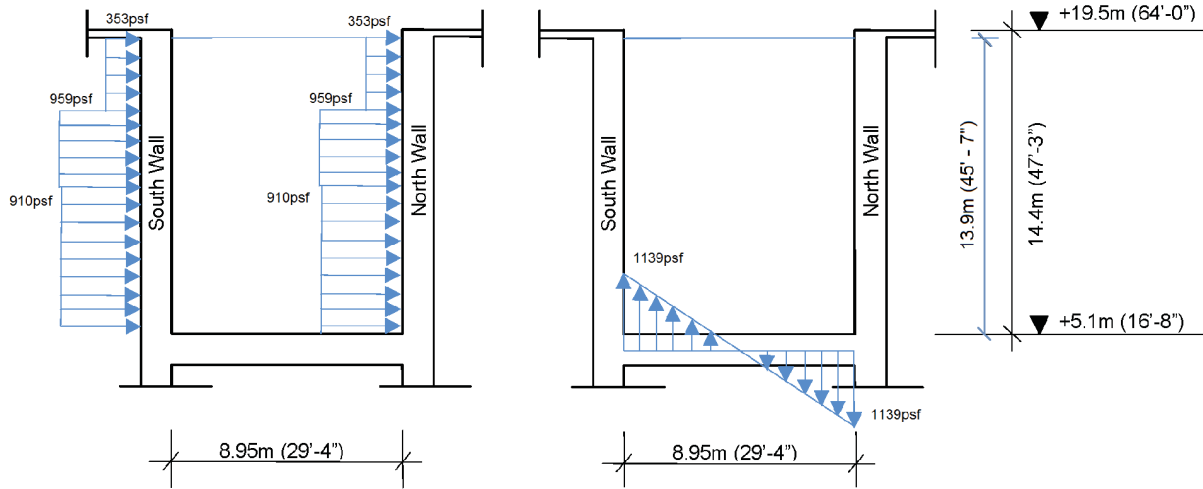
**Figure 03.08.04-10-1—Hydrodynamic Pressure on SFP Walls due to Seismic Load in -Z (vertical down) Direction**



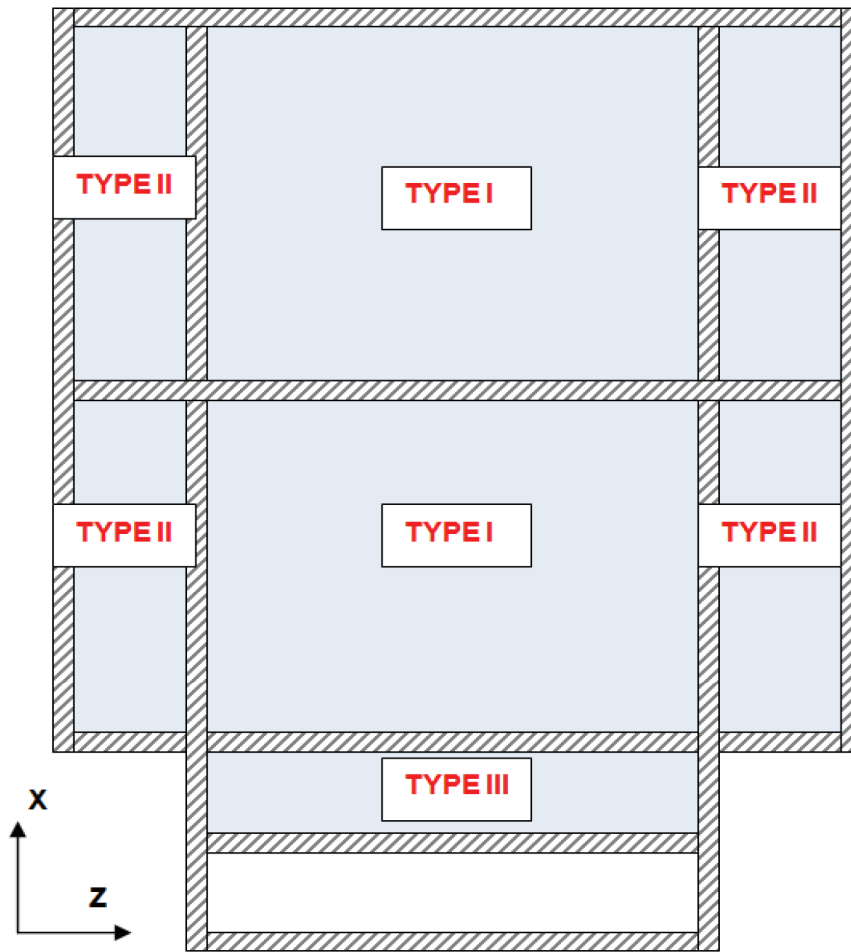
**Figure 03.08.04-10-2—Hydrodynamic Pressure on SFP East and West Walls and Slab due to Seismic Load in +X (East) Direction**



**Figure 03.08.04-10-3—Hydrodynamic Pressure on SFP North and South Walls and Slab due to Seismic Load in +Y (North) Direction**



**Figure 03.08.04-10-4—ESWB Basin Compartment Types and Locations**



**Figure 2-2: ESWB Basin – Compartment Types and Locations**