

ArevaEPRDCPEm Resource

From: WELLS Russell (AREVA) [Russell.Wells@areva.com]
Sent: Friday, July 29, 2011 4:59 PM
To: Tesfaye, Getachew
Cc: ROMINE Judy (AREVA); LENTZ Tony (EXTERNAL AREVA); WILLIFORD Dennis (AREVA); BENNETT Kathy (AREVA); DELANO Karen (AREVA); RYAN Tom (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 371, FSAR Ch. 3, Supplement 23
Attachments: RAI 371 Supplement 23 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to question 03.07.01-28. On January 20, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for a response to questions 03.07.02-67, 03.07.02-68, and 03.07.02-69. AREVA NP submitted Supplement 11 to the response on February 11, 2011 to provide a revised schedule for a response to question 03.07.02-66. On February 28, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.07.01-28 and Question 03.07.02-69. AREVA NP submitted Supplement 13 on March 8, 2011, to provide an INTERIM response to Question 03.07.02-69. On March 24, 2011, AREVA NP submitted Supplement 14 to provide a revised schedule for Question 03.07.02-66. AREVA NP submitted Supplement 15 on April 1, 2011, to provide a revised schedule for Question 03.07.02-68. On April 27, 2011, AREVA NP submitted Supplement 16 to provide a revised schedule for Questions 03.07.02-67 and 03.07.02-69. AREVA NP submitted Supplement 17 on May 2, 2011, to provide a revised schedule for Question 03.07.02-68. On May 20, 2011, AREVA NP submitted Supplement 18 to provide a revised schedule for Question 03.07.02-66. AREVA NP submitted Supplement 19 on June 17, 2011, to provide a final response to Question 03.07.02-68 and a revised schedule for Question 03.07.01-28. On June 23, 2011, AREVA NP submitted Supplement 20 to provide a final response to Question 03.07.02-69. On June 24, 2011, AREVA NP submitted Supplement 20 and Supplement 21 to provide a final response to Question 03.07.02-69 and INTERIM responses to Questions 03.07.02-66 and 03.07.02-67, respectively. On July 6, 2011, AREVA NP submitted Supplement 22 to provide a final response to Question 03.07.01-28.

The attached file, "RAI 371 Supplement 23 Response US EPR DC.pdf" provides a REVISED technically correct and final response to Question 03.07.02-68 to address NRC comments. 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 371 Question 03.07.02-68.

The following table indicates the respective pages in the response document, "RAI 371 Supplement 23 Response US EPR DC.pdf," that contains AREVA NP's response to the subject question.

Question #	Start Page	End Page
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The schedule for technically correct and complete responses to the remaining questions is unchanged as provided below.

Question #	Interim Response Date	Response Date
RAI 371-03.07.02-66	July 29, 2010 (Actual) June 24, 2011 (Actual)	October 10, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual) June 24, 2011 (Actual)	September 14, 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 06, 2011 9:26 AM
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. 371, FSAR Ch. 3, Supplement 22

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to question 03.07.01-28. On January 20, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for a response to questions 03.07.02-67, 03.07.02-68, and 03.07.02-69. AREVA NP submitted Supplement 11 to the response on February 11, 2011 to provide a revised schedule for a response to question 03.07.02-66. On February 28, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.07.01-28 and Question 03.07.02-69. AREVA NP submitted Supplement 13 on March 8, 2011, to provide an INTERIM response to Question 03.07.02-69. On March 24, 2011, AREVA NP submitted Supplement 14 to provide a revised schedule for Question 03.07.02-66. AREVA NP submitted Supplement 15 on April 1, 2011, to provide a revised schedule for Question 03.07.02-68. On April 27, 2011, AREVA NP

submitted Supplement 16 to provide a revised schedule for Questions 03.07.02-67 and 03.07.02-69. AREVA NP submitted Supplement 17 on May 2, 2011, to provide a revised schedule for Question 03.07.02-68. On May 20, 2011, AREVA NP submitted Supplement 18 to provide a revised schedule for Question 03.07.02-66. AREVA NP submitted Supplement 19 on June 17, 2011, to provide a final response to Question 03.07.02-68 and a revised schedule for Question 03.07.01-28. On June 24, 2011, AREVA NP submitted Supplement 20 to provide a final response to Question 03.07.02-69. Supplement 21 was submitted also on June 24, 2011 to provide revised INTERIM responses to Questions 03.07.02-66 and 03.07.02-67 and a revised schedule for final responses to these 2 questions.

The attached file, "RAI 371 Supplement 22 Response US EPR DC.pdf" provides a technically correct and complete final response to Question 03.07.01-28. 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 371 Question 03.07.01-28.

The following table indicates the respective pages in the response document, "RAI 371 Supplement 22 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 371 — 03.07.01-28	2	22

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

Question #	Interim Response Date	Response Date
RAI 371-03.07.02-66	July 29, 2010 (Actual) June 24, 2011 (Actual)	October 10, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual) June 24, 2011 (Actual)	September 14, 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, June 24, 2011 9:40 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. 371, FSAR Ch. 3, Supplement 21

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to

address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to question 03.07.01-28. On January 20, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for a response to questions 03.07.02-67, 03.07.02-68, and 03.07.02-69. AREVA NP submitted Supplement 11 to the response on February 11, 2011 to provide a revised schedule for a response to question 03.07.02-66. On February 28, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.07.01-28 and Question 03.07.02-69. AREVA NP submitted Supplement 13 on March 8, 2011, to provide an INTERIM response to Question 03.07.02-69. On March 24, 2011, AREVA NP submitted Supplement 14 to provide a revised schedule for Question 03.07.02-66. AREVA NP submitted Supplement 15 on April 1, 2011, to provide a revised schedule for Question 03.07.02-68. On April 27, 2011, AREVA NP submitted Supplement 16 to provide a revised schedule for Questions 03.07.02-67 and 03.07.02-69. AREVA NP submitted Supplement 17 on May 2, 2011, to provide a revised schedule for Question 03.07.02-68. On May 20, 2011, AREVA NP submitted Supplement 18 to provide a revised schedule for Question 03.07.02-66. AREVA NP submitted Supplement 19 on June 17, 2011, to provide a final response to Question 03.07.02-68 and a revised schedule for Question 03.07.01-28. On June 24, 2011, AREVA NP submitted Supplement 20 to provide a final response to Question 03.07.02-69.

The attached file, "RAI 371 Supplement 21 Response US EPR DC - INTERIM.pdf" provides revised INTERIM responses to Question 03.07.02-66 and Question 03.07.02-67. 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 371 Question 03.07.02-66.

The following table indicates the respective pages in the response document, "RAI 371 Supplement 21 Response US EPR DC - INTERIM.pdf," that contains AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 371 — 03.07.02-66	2	9
RAI 371 — 03.07.02-67	10	10

The schedule for final responses to Question 03.07.02-66 and Question 03.07.02-67 is being revised. The schedule for the remaining question is unchanged.

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

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	July 22, 2011
RAI 371-03.07.02-66	July 29, 2010 (Actual) June 24, 2011 (Actual)	October 10, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual) June 24, 2011 (Actual)	September 14, 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: WILLIFORD Dennis (RS/NB)
Sent: Friday, June 24, 2011 9:08 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. 371, FSAR Ch. 3, Supplement 20

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to question 03.07.01-28. On January 20, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for a response to questions 03.07.02-67, 03.07.02-68, and 03.07.02-69. AREVA NP submitted Supplement 11 to the response on February 11, 2011 to provide a revised schedule for a response to question 03.07.02-66. On February 28, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.07.01-28 and Question 03.07.02-69. AREVA NP submitted Supplement 13 on March 8, 2011, to provide an INTERIM response to Question 03.07.02-69. On March 24, 2011, AREVA NP submitted Supplement 14 to provide a revised schedule for Question 03.07.02-66. AREVA NP submitted Supplement 15 on April 1, 2011, to provide a revised schedule for Question 03.07.02-68. On April 27, 2011, AREVA NP submitted Supplement 16 to provide a revised schedule for Questions 03.07.02-67 and 03.07.02-69. AREVA NP submitted Supplement 17 on May 2, 2011, to provide a revised schedule for Question 03.07.02-68. On May 20, 2011, AREVA NP submitted Supplement 18 to provide a revised schedule for Question 03.07.02-66. AREVA NP submitted Supplement 19 on June 17, 2011, to provide a final response to Question 03.07.02-68 and a revised schedule for Question 03.07.01-28.

The attached file, "RAI 371 Supplement 20 Response US EPR DC.pdf" provides a technically correct, complete and final response to Question 03.07.02-69, 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 371 Question 03.07.02-69.

The following table indicates the respective pages in the response document, "RAI 371 Supplement 20 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 371 — 03.07.02-69	2	31

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

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	July 22, 2011
RAI 371-03.07.02-66	July 29, 2010 (Actual)	July 8, 2011
RAI 371-03.07.02-67	July 29, 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: RYAN Tom (RS/NB)
Sent: Friday, June 17, 2011 3:36 PM
To: 'Tesfaye, Getachew'
Cc: CORNELL Veronica (External RS/NB); WILLIFORD Dennis (RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); WILLIFORD Dennis (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 371, FSAR Ch. 3, Supplement 19

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to question 03.07.01-28. On January 20, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for a response to questions 03.07.02-67, 03.07.02-68, and 03.07.02-69. AREVA NP submitted Supplement 11 to the response on February 11, 2011 to provide a revised schedule for a response to question 03.07.02-66. On February 28, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.07.01-28 and Question 03.07.02-69. AREVA NP submitted Supplement 13 on March 8, 2011, to provide an INTERIM response to Question 03.07.02-69. On March 24, 2011, AREVA NP submitted Supplement 14 to provide a revised schedule for Question 03.07.02-66. AREVA NP submitted Supplement 15 on April 1, 2011, to provide a revised schedule for Question 03.07.02-68. On April 27, 2011, AREVA NP submitted Supplement 16 to provide a revised schedule for Questions 03.07.02-67 and 03.07.02-69. AREVA NP submitted Supplement 17 on May 2, 2011, to provide a revised schedule for Question 03.07.02-68. On May 20, 2011, AREVA NP submitted Supplement 18 to provide a revised schedule for Question 03.07.02-66.

The attached file, "RAI 371 Supplement 19 Response US EPR DC.pdf" provides a technically correct, complete and final response to Question 03.07.02-68, 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 371 Question 03.07.02-68.

The following table indicates the respective pages in the response document, "RAI 371 Supplement 19 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 371 — 03.07.02-68	2	27

In addition, the schedule for Question 03.07.01-28 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 provided below.

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	July 22, 2011
RAI 371-03.07.02-66	July 29, 2010 (Actual)	July 8, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	July 8, 2011
RAI 371-03.07.02-69	October 18, 2010 (Actual) March 21, 2011 March 8, 2011 (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

From: WELLS Russell (RS/NB)
Sent: Friday, May 20, 2011 7:43 AM
To: Tesfaye, Getachew
Cc: CORNELL Veronica (External RS/NB); WILLIFORD Dennis (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. 371, FSAR Ch. 3, Supplement 18

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4,

2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to question 03.07.01-28. On January 20, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for a response to questions 03.07.02-67, 03.07.02-68, and 03.07.02-69. AREVA NP submitted Supplement 11 to the response on February 11, 2011 to provide a revised schedule for a response to question 03.07.02-66. On February 28, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.07.01-28 and Question 03.07.02-69. AREVA NP submitted Supplement 13 on March 8, 2011, to provide an INTERIM response to Question 03.07.02-69. On March 24, 2011, AREVA NP submitted Supplement 14 to provide a revised schedule for Question 03.07.02-66. AREVA NP submitted Supplement 15 on April 1, 2011, to provide a revised schedule for Question 03.07.02-68. On April 27, 2011, AREVA NP submitted Supplement 16 to provide a revised schedule for Questions 03.07.02-67 and 03.07.02-69. AREVA NP submitted Supplement 17 on May 2, 2011, to provide a revised schedule for Question 03.07.02-68.

The schedule for Question 03.07.02-66 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 provided below.

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	June 21, 2011
RAI 371-03.07.02-66	July 29, 2010 (Actual)	July 8, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	July 8, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	July 8, 2011
RAI 371-03.07.02-69	October 18, 2010 (Actual) March 21, 2011 March 8, 2011 (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*](mailto:Russell.Wells@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. 371, FSAR Ch. 3, Supplement 17

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to question 03.07.01-28. On January 20, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for a response to questions 03.07.02-67, 03.07.02-68, and 03.07.02-69. AREVA NP submitted Supplement 11 to the response on February 11, 2011 to provide a revised schedule for a response to question 03.07.02-66. On February 28, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.07.01-28 and Question 03.07.02-69. AREVA NP submitted Supplement 13 on March 8, 2011, to provide an INTERIM response to Question 03.07.02-69. On March 24, 2011, AREVA NP submitted Supplement 14 to provide a revised schedule for Question 03.07.02-66. AREVA NP submitted Supplement 15 on April 1, 2011, to provide a revised schedule for Question 03.07.02-68. On April 27, 2011, AREVA NP submitted Supplement 16 to provide a revised schedule for Questions 03.07.02-67 and 03.07.02-69.

Due to changes in the schedule for FSAR Sections 3.7 and 3.8 as discussed with NRC, the schedule for Question 03.07.02-68 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 provided below.

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	June 21, 2011
RAI 371-03.07.02-66	July 29, 2010 (Actual)	May 26, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	July 8, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	July 8, 2011
RAI 371-03.07.02-69	October 18, 2010 (Actual) March 21, 2011 March 8, 2011 (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: Wednesday, April 27, 2011 8:25 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. 371, FSAR Ch. 3, Supplement 16

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to question 03.07.01-28. On January 20, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for a response to questions 03.07.02-67, 03.07.02-68, and 03.07.02-69. AREVA NP submitted Supplement 11 to the response on February 11, 2011 to provide a revised schedule for a response to question 03.07.02-66. On February 28, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.07.01-28 and Question 03.07.02-69. AREVA NP submitted Supplement 13 on March 8, 2011, to provide an INTERIM response to Question 03.07.02-69. On March 24, 2011, AREVA NP submitted Supplement 14 to provide a revised schedule for Question 03.07.02-66. AREVA NP submitted Supplement 15 on April 1, 2011, to provide a revised schedule for Question 03.07.02-68.

The schedule for Questions 03.07.02-67 and 03.07.02-69 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 provided below.

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	June 21, 2011
RAI 371-03.07.02-66	July 29, 2010 (Actual)	May 26, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	July 8, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	May 26, 2011
RAI 371-03.07.02-69	October 18, 2010 (Actual) March 21, 2011 March 8, 2011 (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: Friday, April 01, 2011 2:23 PM

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. 371, FSAR Ch. 3, Supplement 15

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to question 03.07.01-28. On January 20, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for a response to questions 03.07.02-67, 03.07.02-68, and 03.07.02-69. AREVA NP submitted Supplement 11 to the response on February 11, 2011 to provide a revised schedule for a response to question 03.07.02-66. On February 28, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.07.01-28 and Question 03.07.02-69. AREVA NP submitted Supplement 13 on March 8, 2011, to provide an INTERIM response to Question 03.07.02-69. On March 24, 2011, AREVA NP submitted Supplement 14 to provide a revised schedule for Question 03.07.02-66.

The schedule for Question 03.07.02-68 is being revised to allow AREVA NP additional time to address NRC comments. The schedule for the remaining questions is unchanged.

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

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	June 21, 2011
RAI 371-03.07.02-66	July 29, 2010 (Actual)	May 26, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	April 28, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	May 26, 2011
RAI 371-03.07.02-69	October 18, 2010 (Actual) March 21, 2011 March 8, 2011 (Actual)	April 28, 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: Thursday, March 24, 2011 1:11 PM

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. 371, FSAR Ch. 3, Supplement 14

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to question 03.07.01-28. On January 20, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for a response to questions 03.07.02-67, 03.07.02-68, and 03.07.02-69. AREVA NP submitted Supplement 11 to the response on February 11, 2011 to provide a revised schedule for a response to question 03.07.02-66. On February 28, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.07.01-28 and Question 03.07.02-69. AREVA NP submitted Supplement 13 on March 8, 2011, to provide an INTERIM response to Question 03.07.02-69.

The schedule for Question 03.07.02-66 is being revised. In addition, the schedule for Question 03.07.01-28 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 the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	June 21, 2011
RAI 371-03.07.02-66	July 29, 2010 (Actual)	May 26, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	April 28, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	April 5, 2011
RAI 371-03.07.02-69	October 18, 2010 (Actual) March 21, 2011	April 28, 2011

March 8, 2011 (Actual)

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, March 08, 2011 3:45 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. 371, FSAR Ch. 3, Supplement 13

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to question 03.07.01-28. On January 20, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for a response to questions 03.07.02-67, 03.07.02-68, and 03.07.02-69. AREVA NP submitted Supplement 11 to the response on February 11, 2011 to provide a revised schedule for a response to question 03.07.02-66. On February 28, 2011, AREVA NP submitted Supplement 12 to provide a revised schedule for Question 03.07.01-28 and Question 03.07.02-69.

The attached file, "RAI 371 Supplement 13 Response US EPR DC-INTERIM.pdf" provides a technically correct INTERIM response to the Question 03.07.02-69, as committed.

The following table indicates the page in the response document, "RAI 371 Supplement 13 Response US EPR DC-INTERIM.pdf" that contains AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 371 – 03.07.02-69	2	32

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

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	March 24, 2011
RAI 371-03.07.02-66	July 29, 2010 (Actual)	April 8, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	April 28, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	April 5, 2011
RAI 371-03.07.02-69	October 18, 2010 (Actual) March 21, 2011 March 8, 2011 (Actual)	April 28, 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: Monday, February 28, 2011 5:09 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. 371, FSAR Ch. 3, Supplement 12

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to question 03.07.01-28. On January 20, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for a response to questions 03.07.02-67, 03.07.02-68, and 03.07.02-69. AREVA NP submitted Supplement 11 to the response on February 11, 2011 to provide a revised schedule for a response to question 03.07.02-66.

The schedule for the FINAL response to Question 03.07.01-28 is being revised to allow additional time for AREVA NP to interact with the NRC. In addition, the schedule for the INTERIM response to Question 03.07.02-69 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 the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	March 24, 2011
RAI 371-03.07.02-66	July 29, 2010 (Actual)	April 8, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	April 28, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	April 5, 2011
RAI 371-03.07.02-69	October 18, 2010 (Actual) March 21 2011	April 28, 2011

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.

3315 Old Forest Road, P.O. Box 10935

Mail Stop OF-57

Lynchburg, VA 24506-0935

Phone: 434-832-3884 (work)

434-942-6375 (cell)

Fax: 434-382-3884

Russell.Wells@Areva.com

From: BRYAN Martin (External RS/NB)

Sent: Friday, February 11, 2011 1:55 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. 371, FSAR Ch. 3, Supplement 11

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to

question 03.07.01-28. On January 20, 2011, AREVA NP submitted Supplement 10 to provide a revised schedule for a response to questions 03.07.02-67, 03.07.02-68, and 03.07.02-69.

The schedule for Question 03.07.02-66 has changed. The schedule for the remaining questions is unchanged

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

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	February 28, 2011
RAI 371-03.07.02-66	July 29, 2010 (Actual)	April 8, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	April 28, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	April 5, 2011
RAI 371-03.07.02-69	October 18, 2010 (Actual) February 28, 2011	April 28, 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, January 20, 2011 6:53 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. 371, FSAR Ch. 3, Supplement 10

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69. On November 11, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for a response to question 03.07.01-28.

The schedule for the responses to Question 03.07.02-67 and Question 03.07.02-68 is being revised to allow additional time for AREVA NP to address NRC comments. The schedule for the response to

Question 03.07.02-69 is also being revised to allow additional time for AREVA NP to prepare and submit a revised INTERIM response. The schedule for the remaining questions is unchanged

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

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	February 28, 2011
RAI 371-03.07.02-66	July 29, 2010 (Actual)	February 17, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	April 28, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	April 5, 2011
RAI 371-03.07.02-69	October 18, 2010 (Actual) February 28, 2011	April 28, 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, November 11, 2010 11:24 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. 371, FSAR Ch. 3, Supplement 9

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29. On October 18, 2010, AREVA NP submitted Supplement 8 to provide an INTERIM response to question 03.07.02-69.

The schedule for the response to Question 03.07.01-28 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 the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	February 28, 2011

RAI 371-03.07.02-66	July 29, 2010 (Actual)	February 17, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	January 20, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	January 20, 2011
RAI 371-03.07.02-69	October 18, 2010 (Actual)	January 20, 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 18, 2010 4:30 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. 371, FSAR Ch. 3, Supplement 8

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29. On October 4, 2010, AREVA NP submitted Supplement 7 to provide a FINAL response to question 03.07.01-29.

The attached file, "RAI 371 Supplement 8 Response US EPR DC-INTERIM.pdf" provides a technically correct and complete INTERIM response to question 03.07.02-69, as committed.

The following table indicates the respective pages in the response document, "RAI 371 Supplement 8 Response US EPR DC-INTERIM.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 371 — 03.07.02-69	2	4

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

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	November 12, 2010
RAI 371-03.07.02-66	July 29, 2010 (Actual)	February 17, 2011

RAI 371-03.07.02-67	July 29, 2010 (Actual)	January 20, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	January 20, 2011
RAI 371-03.07.02-69	October 18, 2010 (Actual)	January 20, 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 04, 2010 4:57 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. 371, FSAR Ch. 3, Supplement 7

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to questions 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72. On September 9, 2010, AREVA NP submitted Supplement 6 to provide a revised schedule for a FINAL response to question 03.07.01-29.

The attached file, "RAI 371 Supplement 7 Response US EPR DC.pdf" provides technically correct and complete FINAL response to question 03.07.01-29, as committed.

The following table indicates the respective pages in the response document, "RAI 371 Supplement 7 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 371 — 03.07.01-29	2	5

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

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	November 12, 2010
RAI 371-03.07.02-66	July 29, 2010 (Actual)	February 17, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	January 20, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	January 20, 2011

Sincerely,

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

From: BRYAN Martin (External RS/NB)

Sent: Thursday, September 09, 2010 12:44 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. 371, FSAR Ch. 3, Supplement 6

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to question 03.07.02-66 through question 03.07.02-68. AREVA NP submitted Supplement 5 to the response on August 31, 2010, to provide technically correct and complete FINAL responses to questions 03.07.02-70 through 03.07.02-72.

The schedule for the FINAL response to Question 03.07.01-29 is being revised to allow time for AREVA NP to address NRC comments. The schedule for the remaining questions is unchanged.

The schedule for a technically correct and complete interim response and responses to the following questions is provided below.

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	November 12, 2010
RAI 371-03.07.01-29	N/A	October 5, 2010
RAI 371-03.07.02-66	July 29, 2010 (Actual)	February 17, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	January 20, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	January 20, 2011
RAI 371-03.07.02-69	October 18, 2010	January 20, 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, August 31, 2010 4:55 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. 371, FSAR Ch. 3, Supplement 5

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments. AREVA NP submitted Supplement 4 to the response on July 29, 2010, to provide INTERIM responses to question 03.07.02-66 through question 03.07.02-68.

The attached file, "RAI 371 Supplement 5 Response US EPR DC.pdf" provides technically correct and complete FINAL responses to 3 of the remaining 9 questions, as committed.

The following table indicates the respective pages in the response document, "RAI 371 Supplement 5 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 371 — 03.07.02-70	2	3
RAI 371 — 03.07.02-71	4	10
RAI 371 — 03.07.02-72	11	11

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

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	November 12, 2010
RAI 371-03.07.01-29	N/A	September 17, 2010
RAI 371-03.07.02-66	July 29, 2010 (Actual)	February 17, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	January 20, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	January 20, 2011
RAI 371-03.07.02-69	October 18, 2010	January 20, 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 8:08 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. 371, 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. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a revised schedule for question 03.07.01-29. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities. AREVA NP provided Supplement 3 to the response on July 8, 2010, to provide a revised date for submittal of a FINAL response to question 03.07.01-29 to allow time to address NRC comments.

The attached file, "RAI 371 Supplement 4 Response US EPR DC.pdf" provides technically correct and complete INTERIM responses to 3 of the remaining 10 questions, as committed.

The following table indicates the respective pages in the response document, "RAI 371 Supplement 4 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 371 — 03.07.02-66	2	2
RAI 371 — 03.07.02-67	3	3
RAI 371 — 03.07.02-68	4	8

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

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	November 12, 2010
RAI 371-03.07.01-29	N/A	September 17, 2010
RAI 371-03.07.02-66	July 29, 2010 (Actual)	February 17, 2011
RAI 371-03.07.02-67	July 29, 2010 (Actual)	January 20, 2011
RAI 371-03.07.02-68	July 29, 2010 (Actual)	January 20, 2011
RAI 371-03.07.02-69	October 18, 2010	January 20, 2011
RAI 371-03.07.02-70	N/A	September 3, 2010
RAI 371-03.07.02-71	N/A	September 3, 2010
RAI 371-03.07.02-72	N/A	September 3, 2010

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 08, 2010 4:02 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. 371, FSAR Ch. 3, Supplement 3

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to the 9 questions of RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 on June 7, 2010, to provide a revised date for 1 of the questions (03.07.01-29) on June 7, 2010. On June 24, 2010, AREVA provided a revised response schedule in Supplement 2 for the other 8 questions based on the information presented at the June 9, 2010 public meeting on civil/structural replanning activities.

To provide for further interaction with the NRC on the response for question 03.07.01-29, a revised schedule is provided below. Dates for the other 8 questions remain unchanged.

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

Question #	Interim Response Date	Response Date
RAI 371-03.07.01-28	N/A	November 12, 2010
RAI 371-03.07.01-29	N/A	September 17, 2010
RAI 371-03.07.02-66	July 29, 2010	February 17, 2011
RAI 371-03.07.02-67	July 29, 2010	January 20, 2011
RAI 371-03.07.02-68	July 29, 2010	January 20, 2011
RAI 371-03.07.02-69	October 18, 2010	January 20, 2011
RAI 371-03.07.02-70	N/A	September 3, 2010
RAI 371-03.07.02-71	N/A	September 3, 2010
RAI 371-03.07.02-72	N/A	September 3, 2010

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

From: BRYAN Martin (EXT)
Sent: Thursday, June 24, 2010 12:58 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); RYAN Tom (AREVA NP INC); GARDNER George Darrell (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 371, FSAR Ch. 3, Supplement 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010. AREVA NP submitted Supplement 1 to the response on June 7, 2010, to provide a schedule for the remaining 9 questions, 8 of 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 03.07.01-29 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 371-03.07.01-28	N/A	November 12, 2010
RAI 371-03.07.01-29	N/A	July 8, 2010
RAI 371-03.07.02-66	July 29, 2010	February 17, 2011
RAI 371-03.07.02-67	July 29, 2010	January 20, 2011
RAI 371-03.07.02-68	July 29, 2010	January 20, 2011
RAI 371-03.07.02-69	October 18, 2010	January 20, 2011
RAI 371-03.07.02-70	N/A	September 3, 2010
RAI 371-03.07.02-71	N/A	September 3, 2010
RAI 371-03.07.02-72	N/A	September 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: Monday, June 07, 2010 5:07 PM
To: 'Tesyfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); CORNELL Veronica (EXT); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 371, FSAR Ch. 3, Supplement 1

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 371 on April 26, 2010.

As agreed with NRC, AREVA NP is providing a revised date for RAI 371 Supplement 1 Question 03.07.01-29 to allow time to interact with the NRC on the response.

The schedule for technically correct and complete responses to the remaining question has been changed and is provided below. The dates for questions 03.07.02-66 through 03.03.02-69 will be revised based on the information that will be presented at the June 9, 2010 public meeting and subsequent NRC feedback.

Question #	Response Date
RAI 371-03.07.01-28	August 3, 2010
RAI 371-03.07.01-29	July 8, 2010
RAI 371-03.07.02-66	July 27, 2010
RAI 371-03.07.02-67	July 27, 2010
RAI 371-03.07.02-68	August 3, 2010
RAI 371-03.07.02-69	August 3, 2010
RAI 371-03.07.02-70	August 3, 2010
RAI 371-03.07.02-71	August 3, 2010
RAI 371-03.07.02-72	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: Monday, April 26, 2010 12:45 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); ROMINE Judy (AREVA NP INC); VAN NOY Mark (EXT); RYAN Tom (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 371, FSAR Ch. 3

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 371 Response US EPR DC.pdf" provides a schedule since a technically correct and complete response to the 9 questions is not provided.

The following table indicates the respective pages in the response document, "RAI 371 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 371-03.07.01-28	2	3
RAI 371-03.07.01-29	4	4
RAI 371-03.07.02-66	5	5
RAI 371-03.07.02-67	6	6
RAI 371-03.07.02-68	7	7
RAI 371-03.07.02-69	8	9
RAI 371-03.07.02-70	10	10
RAI 371-03.07.02-71	11	11

RAI 371-03.07.02-72	12	12
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A complete answer is not provided for 9 of the 9 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 371-03.07.01-28	August 3, 2010
RAI 371-03.07.01-29	June 7, 2010
RAI 371-03.07.02-66	July 27, 2010
RAI 371-03.07.02-67	July 27, 2010
RAI 371-03.07.02-68	August 3, 2010
RAI 371-03.07.02-69	August 3, 2010
RAI 371-03.07.02-70	August 3, 2010
RAI 371-03.07.02-71	August 3, 2010
RAI 371-03.07.02-72	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: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Thursday, March 25, 2010 2:05 PM
To: ZZ-DL-A-USEPR-DL
Cc: Chakravorty, Manas; Hawkins, Kimberly; Miernicki, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 371 (4273,4271,4280), FSAR Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on February 25, 2010, and on March 24, 2010, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
 Getachew Tesfaye
 Sr. Project Manager
 NRO/DNRL/NARP
 (301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 3291

Mail Envelope Properties (1F1CC1BBDC66B842A46CAC03D6B1CD4104ACAF8C)

Subject: Response to U.S. EPR Design Certification Application RAI No. 371, FSAR Ch. 3, Supplement 23
Sent Date: 7/29/2011 4:59:04 PM
Received Date: 7/29/2011 4:59:23 PM
From: WELLS Russell (AREVA)

Created By: Russell.Wells@areva.com

Recipients:

"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>
Tracking Status: None
"LENTZ Tony (EXTERNAL AREVA)" <Tony.Lentz.ext@areva.com>
Tracking Status: None
"WILLIFORD Dennis (AREVA)" <Dennis.Williford@areva.com>
Tracking Status: None
"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>
Tracking Status: None
"DELANO Karen (AREVA)" <Karen.Delano@areva.com>
Tracking Status: None
"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>
Tracking Status: None
"Tsfaye, Getachew" <Getachew.Tsfaye@nrc.gov>
Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	Size	Date & Time
MESSAGE	78110	7/29/2011 4:59:23 PM
RAI 371 Supplement 23 Response US EPR DC.pdf		2957344

Options

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

Response to

Request for Additional Information No. 371, Supplement 23

3/25/2010

U.S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 03.07.01 - Seismic Design Parameters

SRP Section: 03.07.02 - Seismic System Analysis

Application Section: 03.07

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

Question 03.07.02-68:

RAI from Public Meeting 12/14-15, 2009

The frequency transmission characteristics of the Nuclear Island seismic model using a finite element model to represent the common basemat structures needs to be evaluated. The criterion of DC/COL-ISG-1 (Seismic Issues of High Frequency Ground Motion) states that information should be provided to demonstrate that the SSI and structural models are of adequate refinement to assure that the high frequency components of the horizontal and vertical GMRS/FIRS of interest are properly transmitted through both segments of the computer model. For the soft soil case(s), the transmission characteristics are limited by the transmission capability of the site soils, which are softer than the concrete structural elements. The applicant is requested to describe how the problems used for SSI analyses were modeled such that the subgrade is capable of transmitting the highest frequency of interest for each of the CSDRS time histories and to present the results of any sensitivity studies that were performed to assure that the seismic models meet the frequency criterion of the ISG and include this information in the FSAR. If sensitivity studies were not performed, the applicant should provide technical justification as to why this was not done.

Response to Question 03.07.02-68:

Frequency transmission characteristics of the MTR/SASSI Nuclear Island (NI) seismic model are evaluated by reviewing the frequency content of the ground motion and basemat motion, dominant building frequency and the modal mass participation, soil shear (and compression) wave velocity, soil layer thickness, and element size of the excavated soil. Table 3.7.2-68-1 summarizes the transmission characteristics, as measured by the passing frequency, for the U.S. EPR design, including information regarding the shear wave velocity of the soil, soil layer thickness, and excavated soil elements horizontal dimensions.

Figure 3.7.2-68-1 shows the MTR/SASSI excavated soil model. The model shows element sizes for the Reactor Building Internal Structures (RBIS), Safeguard Buildings (SB), and Fuel Building (FB). The RBIS mesh is coarser than the mesh for the SB and FB structures. The RBIS mesh governing element size is approximately 3.0 m. Table 3.7.2-2 and Figure 3.7.2-68-2 summarize the cumulative modal mass participation for the fixed base NI finite element model from ANSYS.

Based on information provided in the tables and figures, the following observations are made:

1. Soil profiles associated with the European Utility Requirements (EUR)-based ground motions require a passing frequency of 33 Hz for EUR soft and medium motions and 40 Hz for the EUR hard soil motion. These frequencies correspond to the rigid range frequency of these motions.
2. Shear wave velocities of soil cases 5ae-h, 4ue-m, and 2sn4ue-m are sufficiently high for the passing frequency to be beyond the range of interest.
3. For soil cases 1n2ue-s and 1n5ae-h, the soil layer thicknesses are sufficiently fine for passing a frequency of 37 Hz and 38 Hz, respectively. These passing frequencies slightly exceed the 33 Hz for the EUR motion for soft soils, and are close to the 40 Hz rigid range frequency for the hard soil case. The excavated soil elements will only pass a frequency of 14 Hz. This is considered acceptable in the case of softer soils for the following reasons:

- For soil case 1n2ue-s (very soft soil case), the frequency range of interest is below 3 Hz as shown in the NI basemat in-structure response spectra (ISRS), as shown in Figure 3.7.2-68-3 through Figure 3.7.2-68-5. As a result, the dominant soil-structure frequency is well below 14 Hz, and no significant structural response is associated with a frequency beyond 14 Hz. Table 3.7.2-68-2 shows the mass participation for the fixed base case. In the two horizontal directions, a mass ratio of approximately 80 percent is considered with the fixed-base model modes up to 14 Hz. A greater mass ratio is considered for the relatively soft soil case 1n2ue-s.
 - The NI Basemat Structure for soil case 1n5ae-h (stiff soil with soft backfill) is founded on stiff soil with a high passing frequency. As previously addressed, the dominant structural modes are well below the passing frequency of 14 Hz, as shown in Table 3.7.2-68-1. Additionally, the response of soil case 1n5ae-h is similar to the response of the 5ae-h soil case (Figures 3.7.2-68-3 through 3.7.2-68-5) indicating that the response is governed by the stiff soil and relatively unaffected by the soft backfill..
4. Because Bell Bend soil cases have high frequency (HF) ground motion inputs, a passing frequency up to 50 Hz is desired. The sensitivity studies described in Appendix A of this response show that the ISRS for the upper bound HF soil case bounds the response of the lower bound soil cases in the HF range. For this study a simplified, embedded ESWB model with a coarse and refined mesh size was used as a surrogate for the NI. Although the NI is founded on relatively stiff material, the passing frequency for the excavated soil elements of the backfill (in the vicinity of the RBIS) is approximately 29 Hz, which is less than the desired 50 Hz. A confirmatory analysis was performed and is summarized in Appendix B. The mesh study in Appendix B analyzes the current and the partially refined NI FE model. The ISRS from the refined FE model, which have a passing frequency of 49 Hz, match or are less than those of the current model. Therefore, the current soil discretization is acceptable.

The U.S. EPR seismic analysis models are adequate to develop the seismic demand. The soil cases subjected to EUR soft input motions govern the design response spectra up to a frequency that is well below the calculated passing frequency of the subgrade. The subsequent medium and hard soil cases transmit frequencies up to the input motion frequency of interest. The upper bound HF soil case bounds the ISRS responses in the high frequency range.

U.S. EPR FSAR Tier 2, Section 3.7.2.4.3 will be revised to include the sensitivity study description and conclusions that show that the seismic models meet the frequency criterion of ISG-1.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 3.7.2.4.3 will be revised as described in the response and indicated on the enclosed markup.

Table 3.7.2-68-1—NI Calculated Soil Passing Frequencies for U.S. EPR Soil Cases

Soil Case	Location	Shear Wave Velocity V_s in [m/s]	Element Length L_e in [m]	Passing Frequency F_{max} in [Hz]
1n2ue	Backfill	274.1	1.500	37
	Soil	293.8	1.000	59
	Exc. Elements	213.4	3.000	14
1n5ae	Backfill	213.4	1.125	38
	Soil	2012.0	1.000	402
	Exc. Elements	213.4	3.000	14
2sn4ue	Backfill	500.0	1.500	67
	Soil	500.0	1.000	100
	Exc. Elements	500.0	3.000	33
4ue	Backfill	1200.0	1.500	160
	Soil	1200.0	1.000	240
	Exc. Elements	1200.0	3.000	80
5ae	Backfill	4000.0	1.500	533
	Soil	4000.0	1.000	800
	Exc. Elements	4000.0	3.000	267
Bell Bend BE	Backfill	176.3	0.900	39
	Soil	2026.0	1.000	405
	Exc. Elements	176.3	3.000	12
Bell Bend LB	Backfill	143.3	0.9	32
	Soil	1654.0	1.000	331
	Exc. Elements	143.3	3.000	10
Bell Bend UB	Backfill	429.3	0.975	88
	Soil	2482.0	1.000	496
	Exc. Elements	429.3	3.000	29

Note:

The criterion used to assess frequency transmission when using the MTR/SASSI subtraction method is based on $f_{max} = V_s / (5 L_e)$,

where

L_e = the largest layer thickness or element dimension,

V_s = the corresponding shear wave velocity.

Table 3.7.2-68-2—Cumulative NI Modal Mass Participation for Fixed Base Case

Mode No.	Frequency (Hz)	Cumulative NI Modal Participating Mass Ratios (%)		
		X-Direction	Y-Direction	Z-Direction
187	13.98	82.9	81.2	46.5
775	29.46	90.0	89.8	80.1
987	33.22	90.0	89.9	80.5

**Figure 3.7.2-68-1—MTR/SASSI Excavated Soil Model
(Governing Element Lengths within RBIS)**

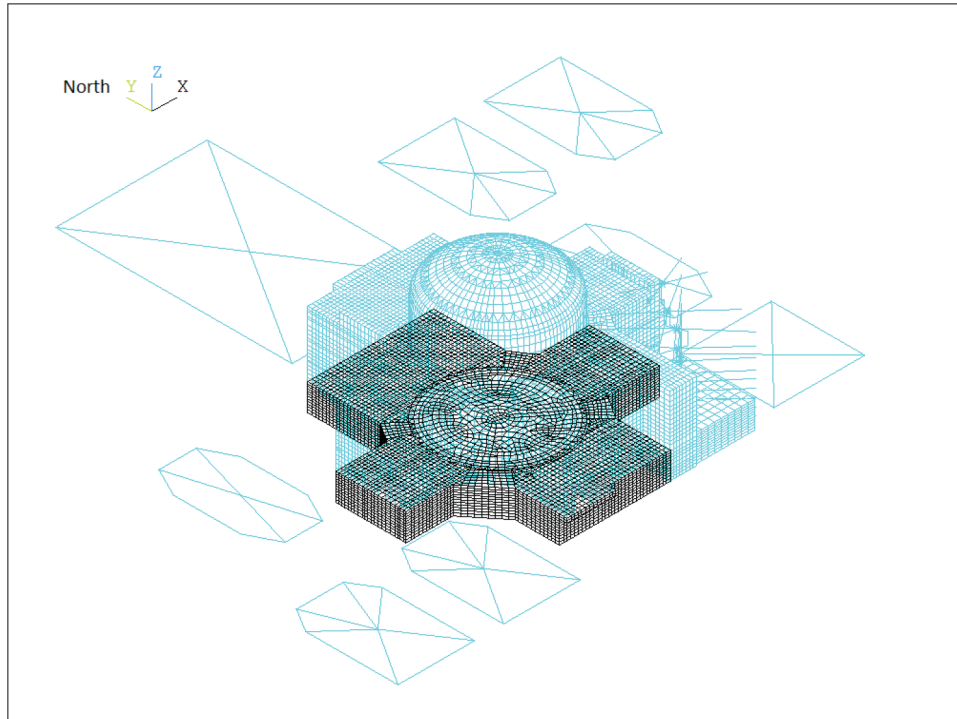


Figure 3.7.2-68-2—Cumulative Modal Participating Mass Ratios

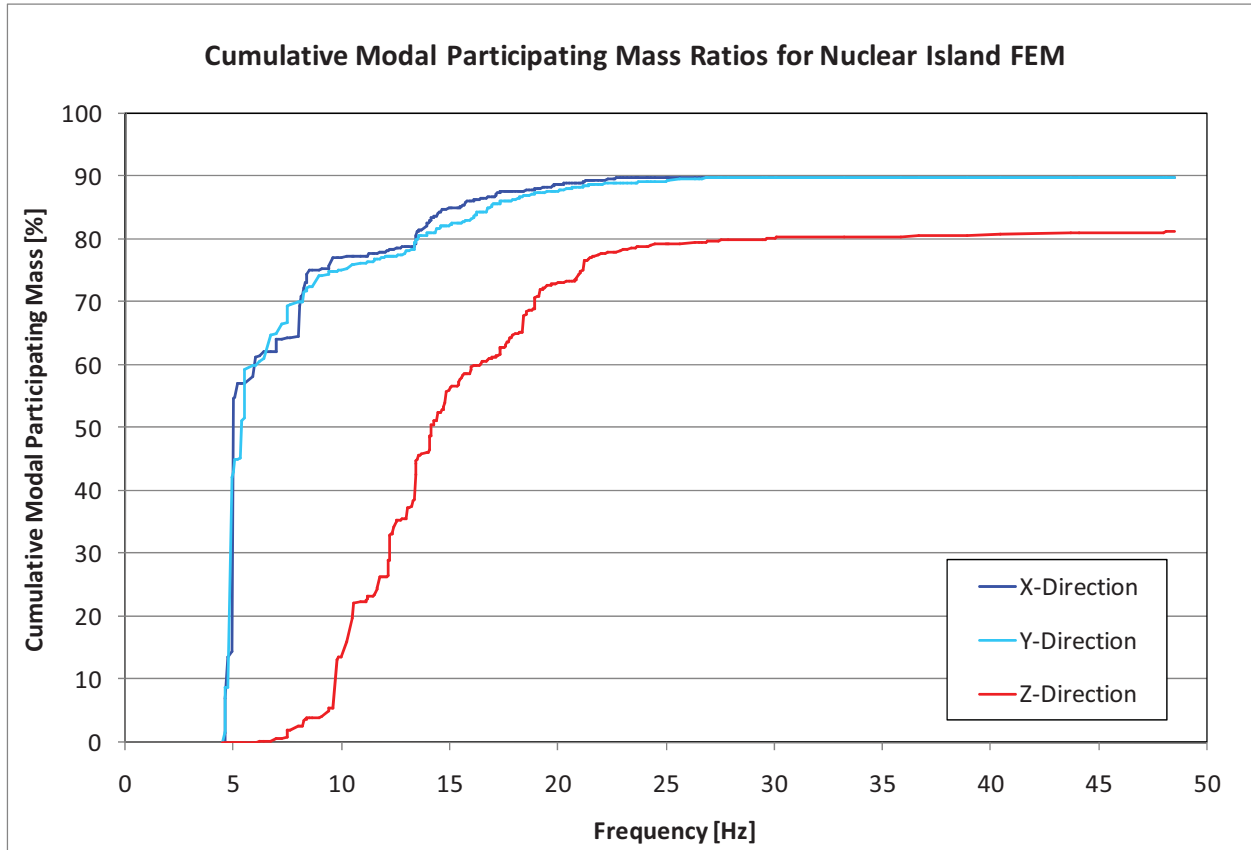


Figure 3.7.2-68-4—Center of Nuclear Island Basemat, In-Structure Response Spectra, Y-Direction, 5% Damping

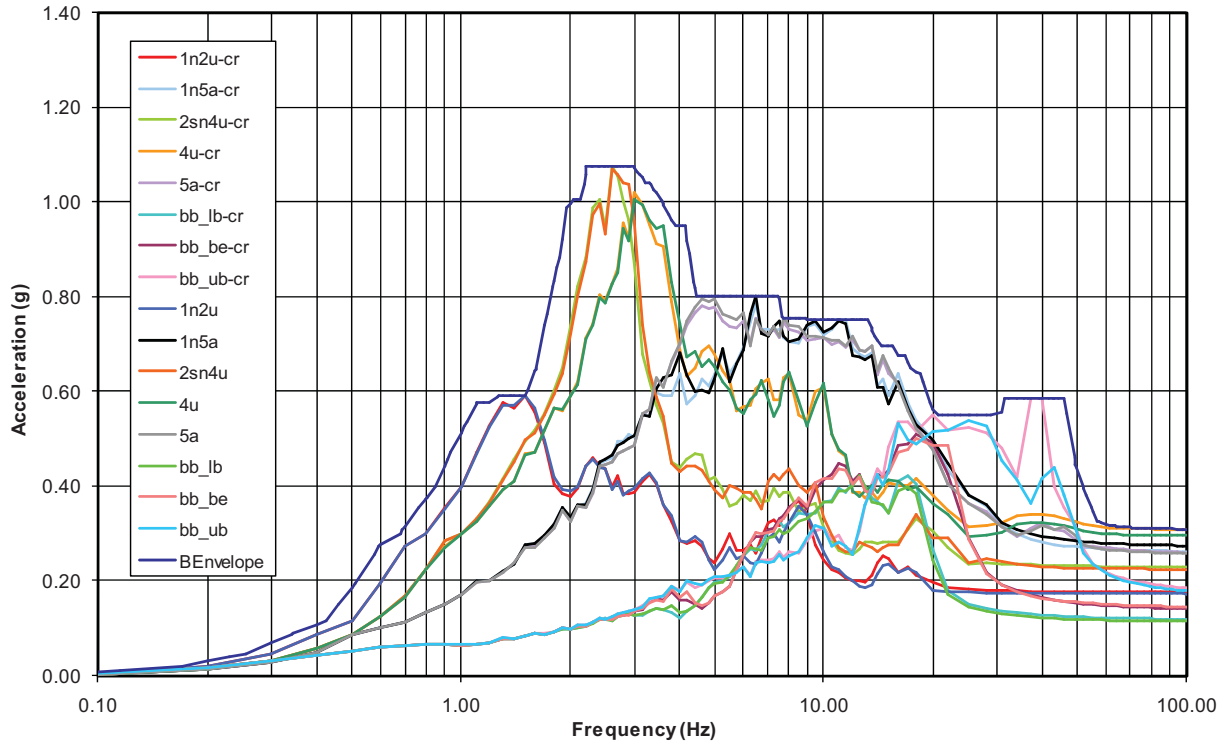
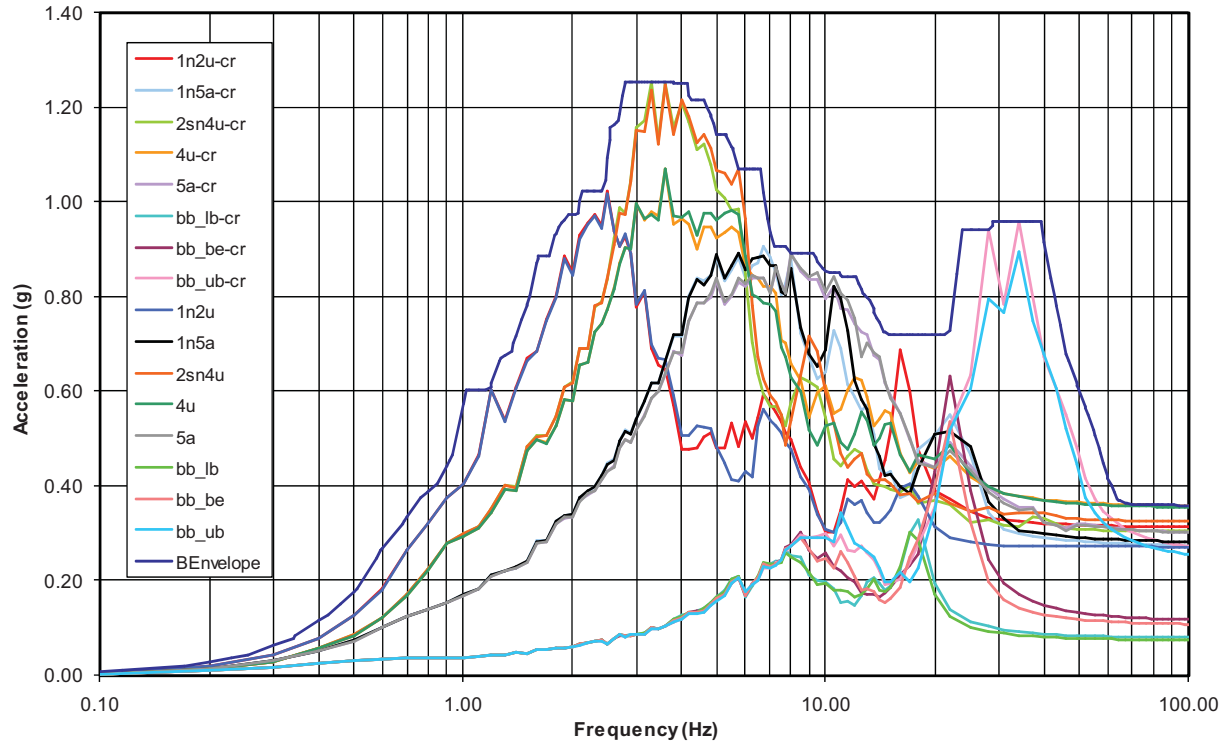


Figure 3.7.2-68-5—Center of Nuclear Island Basemat, In-Structure Response Spectra, Z-Direction, 5% Damping



Appendix A: Study for the High Frequency Transmission of U.S. EPR Soil Cases

A sensitivity study of the NI soil-structure interaction (SSI) model was performed to evaluate the capability for transmitting high frequency ground motions. A simplified finite element embedded model of the Essential Service Water Building (ESWB) was selected for the study. A comparison of the soil layer thicknesses for various soil profiles is shown in Figure 3.7.2-68-A1. The coarse SSI model of the simplified ESWB, shown in Figure 3.7.2-68-A2, is characterized by a coarse structural mesh size and soil layering similar to the NI model. As a result of the sensitivity study, a more refined mesh size for the current NI finite element model (FEM) was introduced. Figure 3.7.2-68-A3 shows the simplified ESWB model with a more refined mesh size. A comparison of modal mass participation shown in Figure 3.7.2-68-A4 demonstrates that the simplified ESWB model has similar high frequency content as the NI model. The coarse and refined mesh sizes were used to examine the ability of the subgrade to transmit the highest frequency of interest with the finer mesh being half the size of the coarser mesh. The results and the corresponding frequency transmission characteristics of the NI seismic model are addressed in this appendix.

The backfill, defined as the soil above the bottom of the basemat, has a lower shear wave velocity and always results in a lower passing frequency than for the soil below the bottom of the basemat for the analysis cases under consideration. Soil cases 1n2ue and high-frequency lower bound (hflb) were selected for this study because these soil cases have the lowest passing frequencies.

When the subtraction method is used, the soil element frequency transmission ability is based on:

$$f_{\max} = V_s / (5 L_e)$$

where

L_e is the largest layer thickness or element dimension.

V_s is the corresponding shear wave velocity.

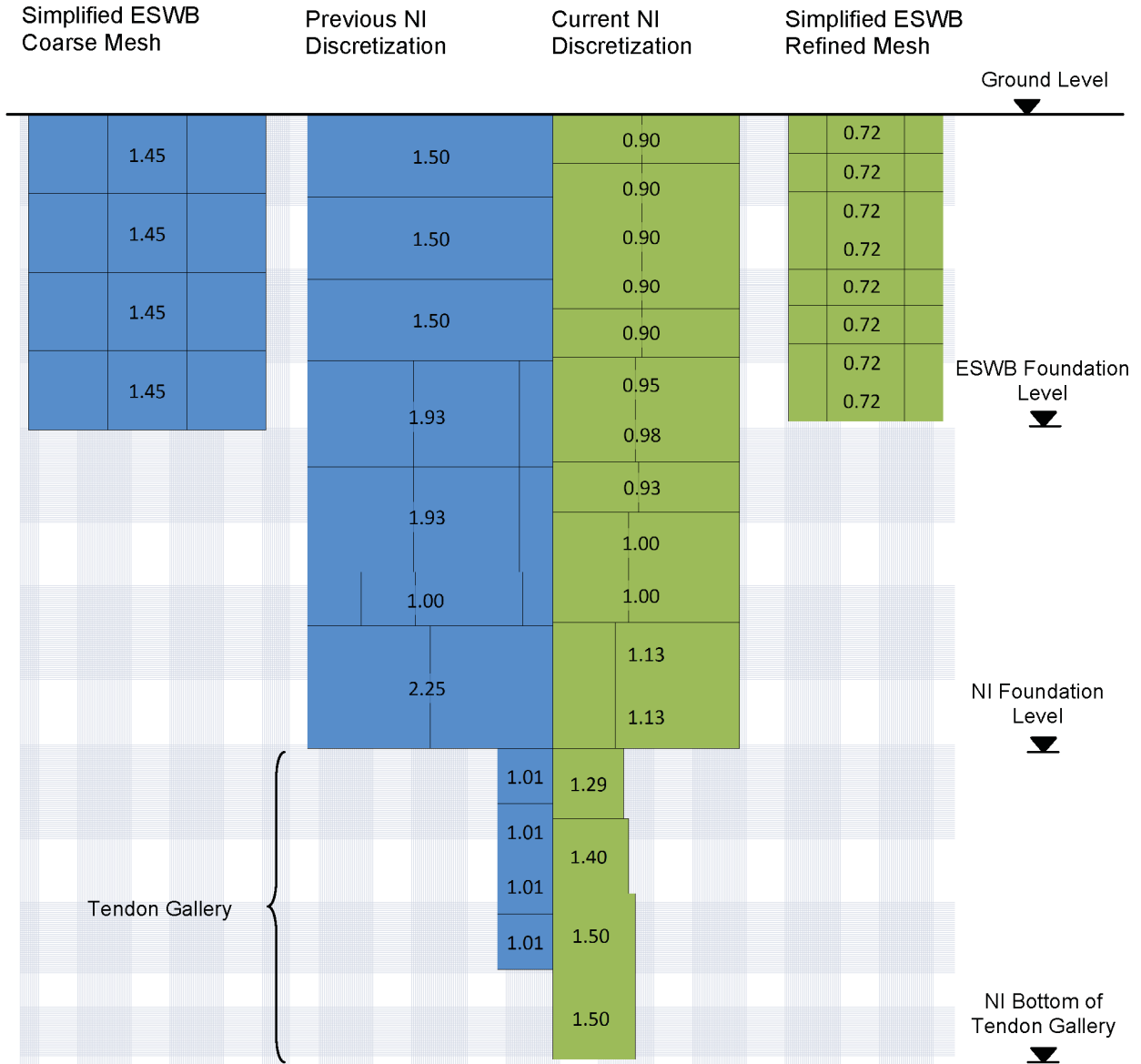
The formula for f_{\max} was confirmed in the sensitivity study, as shown in Table 3.7.2-68-A1, and in Figure 3.7.2-68-A5 through Figure 3.7.2-68-A7. When compared to the coarse model with the direct method, and the refined model with the subtraction method, the accuracy of the responses from the 12URB_LB coarse simplified ESWB starts to deteriorate beyond the passing frequency of 19.8 Hz, when analyzed by the subtraction method.

The simplified ESWB model shows that the ISRS responses of the 12URB_LB are bounded in the high frequency range by the 12URB_UB, which is close to the hfub shown in Figures 3.7.2-68-A8 through 3.7.2-68-A10. ISRS will be bounded by the responses of the FEM founded on hard soil with a hard backfill (e.g., hfub) in the high frequency range.

**Table 3.7.2-68-A1—Simplified ESWB, Calculated Soil Passing Frequencies
for High Frequency U.S. EPR Soil Cases**

Soil Case	Location	Minimum Passing Frequency in [Hz]	
		Coarse Model	Refined Model
12URB_LB	Backfill	19.8	39.6
	Soil	48.7	48.7
12URB_UB	Backfill	29.7	59.5
	Soil	73.1	73.1

Figure 3.7.2-68-A1—Schematic Structural and Excavated Soil Discretization Comparison for NI and simplified ESWB below Ground Level



The numbers are the layer thicknesses in meters. The alignment and transition of the elements in the vertical direction are not shown explicitly.

Figure 3.7.2-68-A2—Cross Section of Simplified ESWB, Coarse Discretization

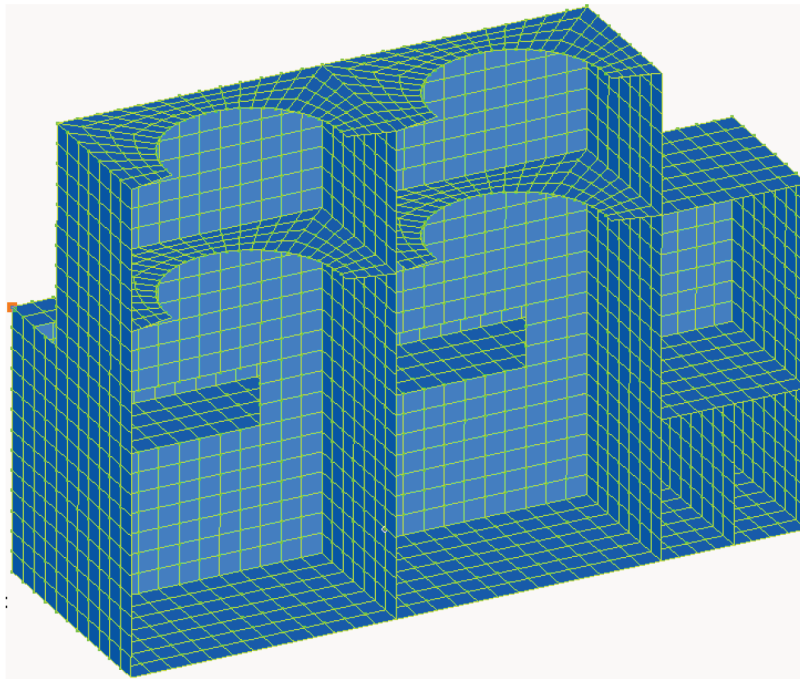


Figure 3.7.2-68-A3—Cross Section of Simplified ESWB, Refined Discretization

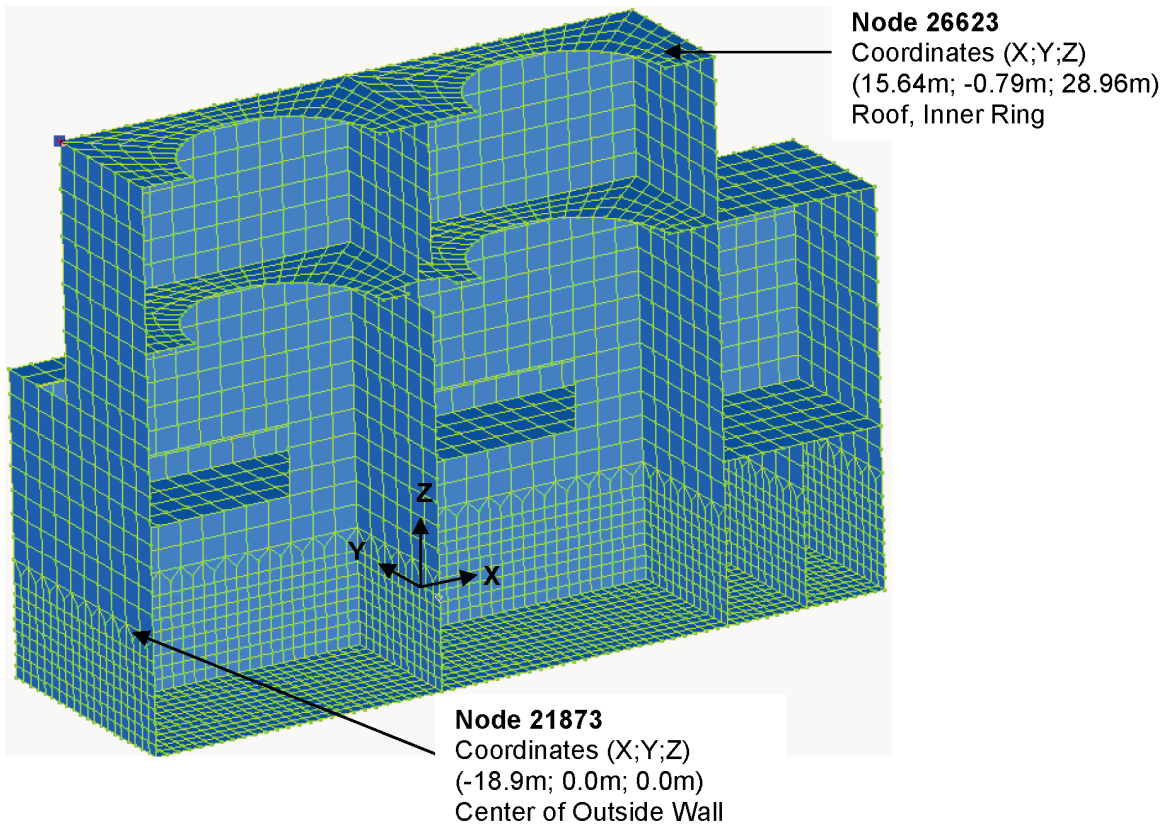


Figure 3.7.2-68-A4—Modal Participation Comparison for Nuclear Island and Simplified Refined ESWB FE Model

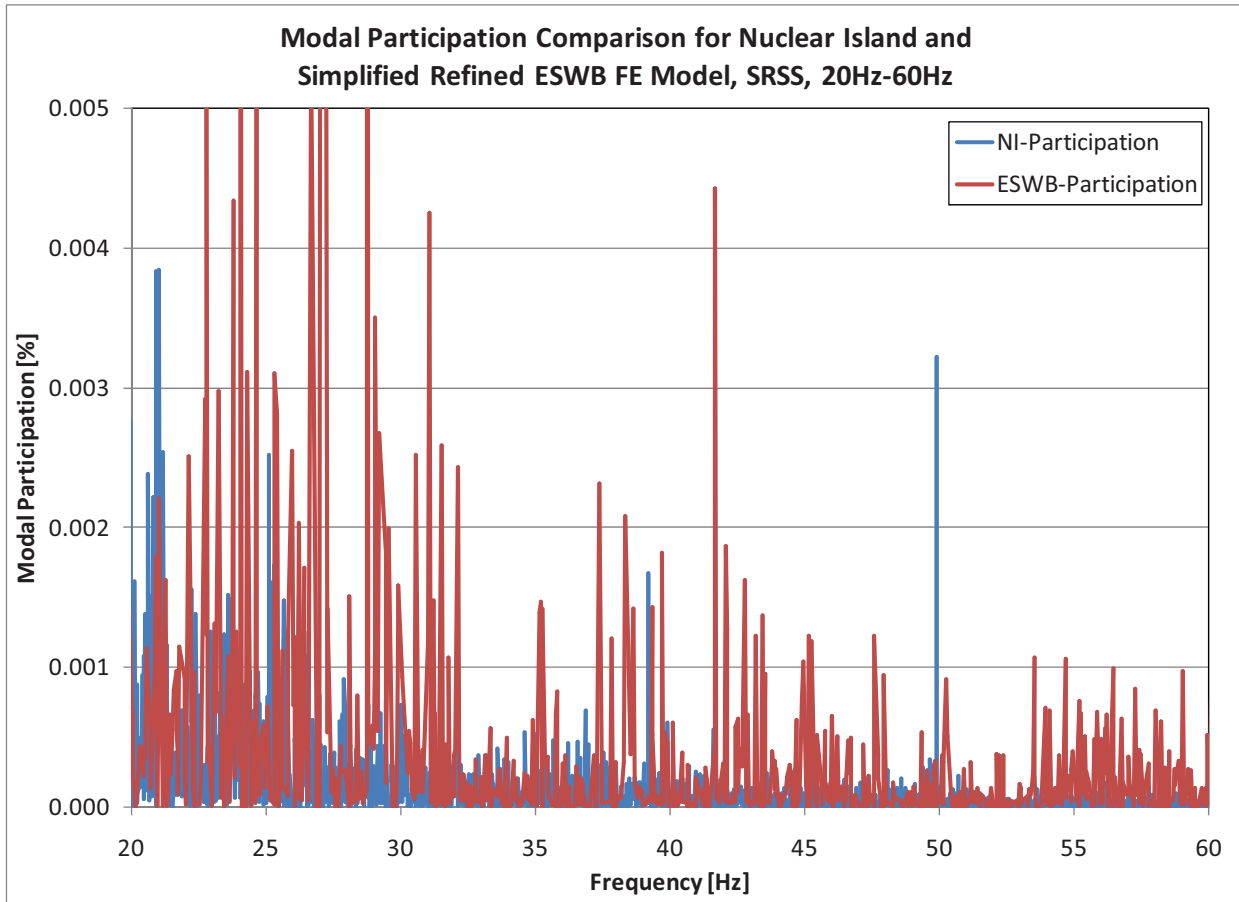


Figure 3.7.2-68-A5—Comparison of Subtraction and Direct Analysis Method for the Simplified Coarse and Refined ESWB, Flexible Node 21837, X-Direction, Soil Case 12URB_LB

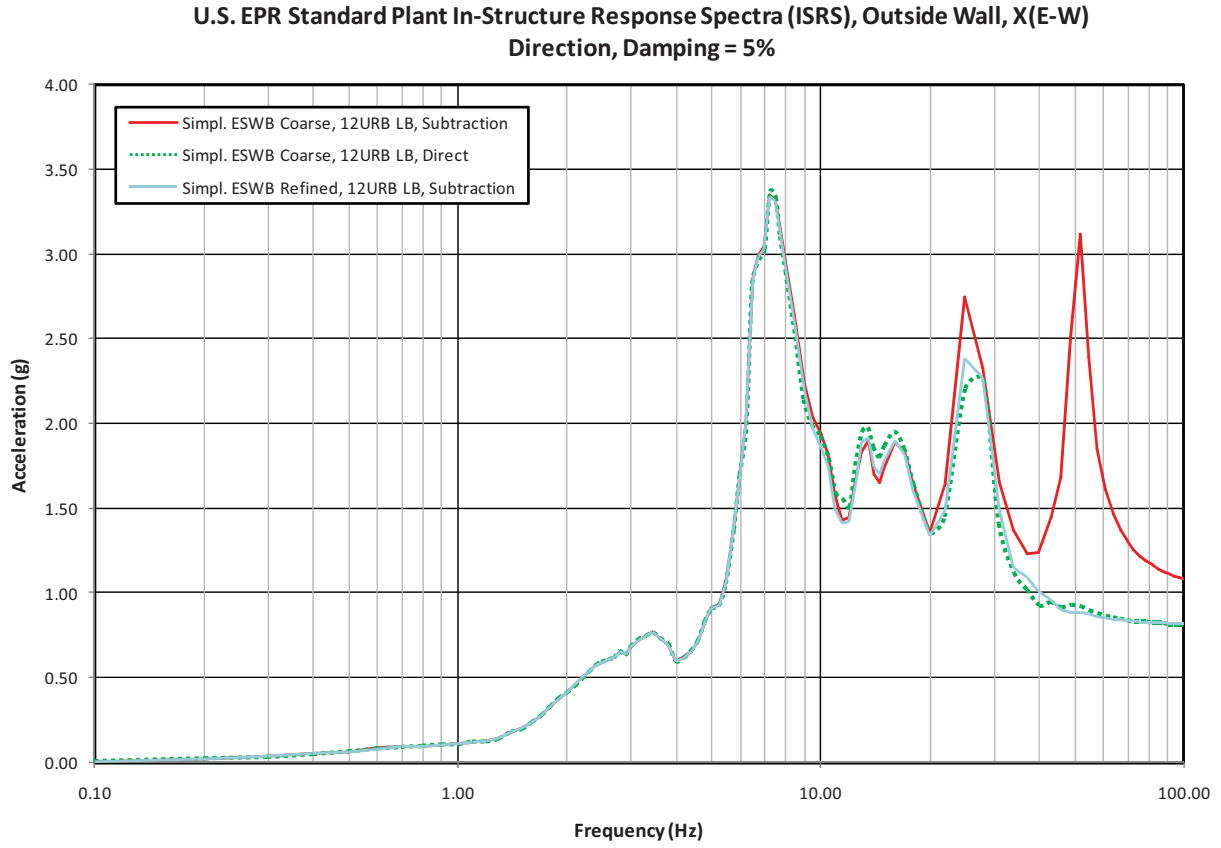


Figure 3.7.2-68-A6—Comparison of Subtraction and Direct Analysis Method for the Simplified Coarse and Refined ESWB, Flexible Node 21837, Y-Direction, Soil Case 12URB_LB

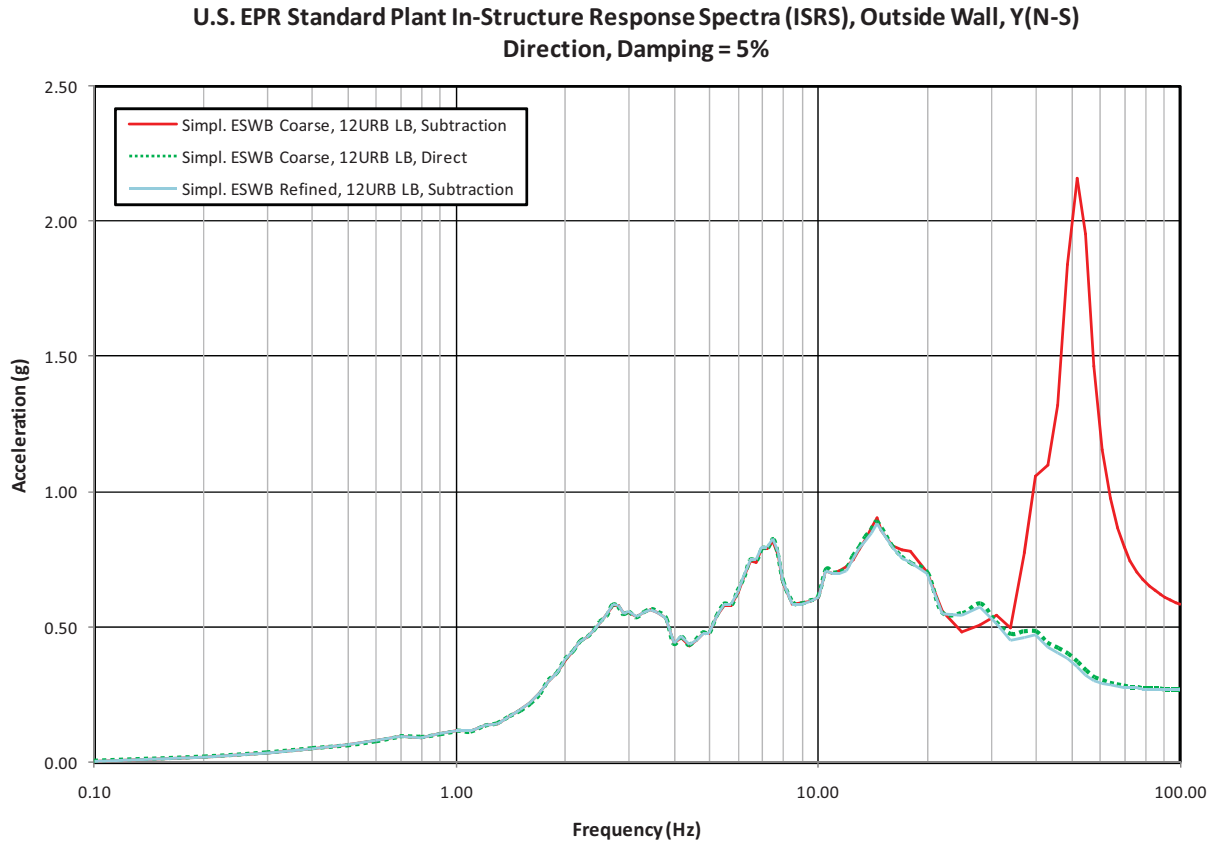
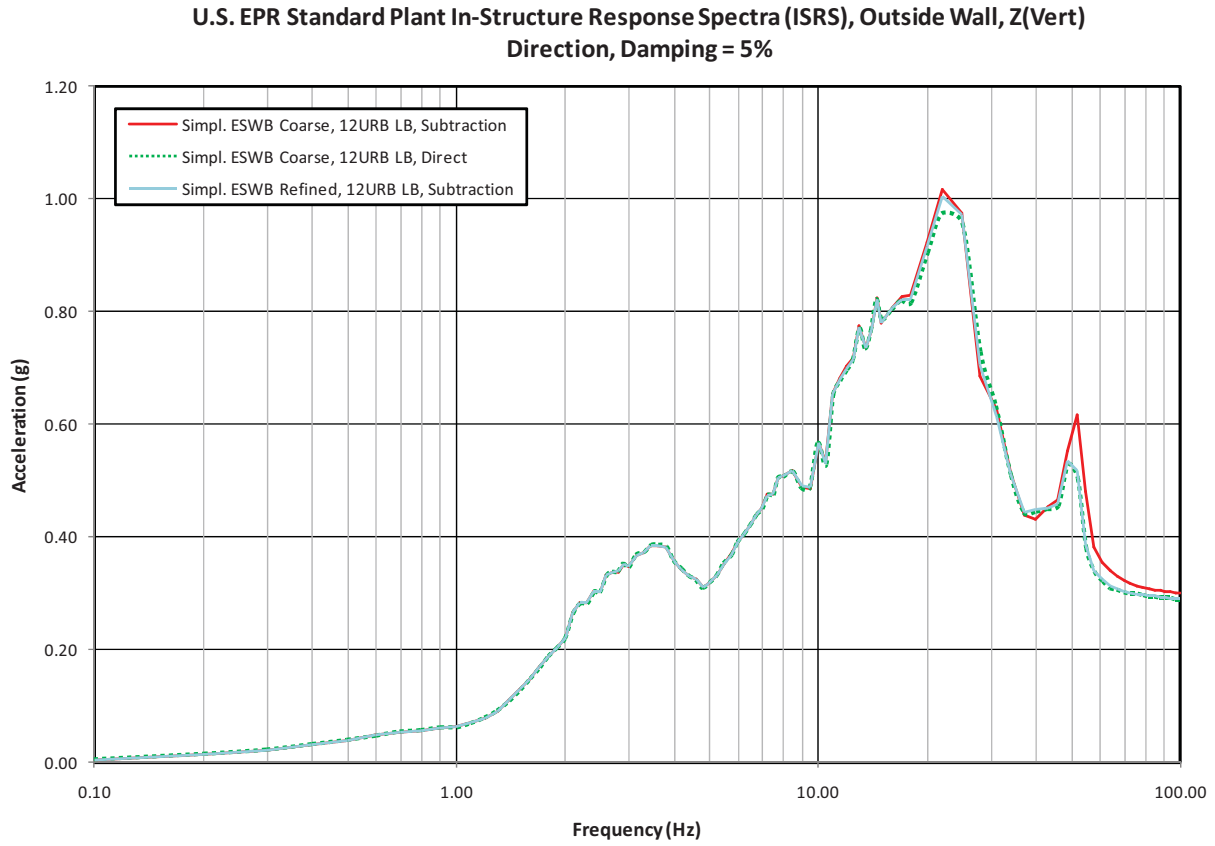
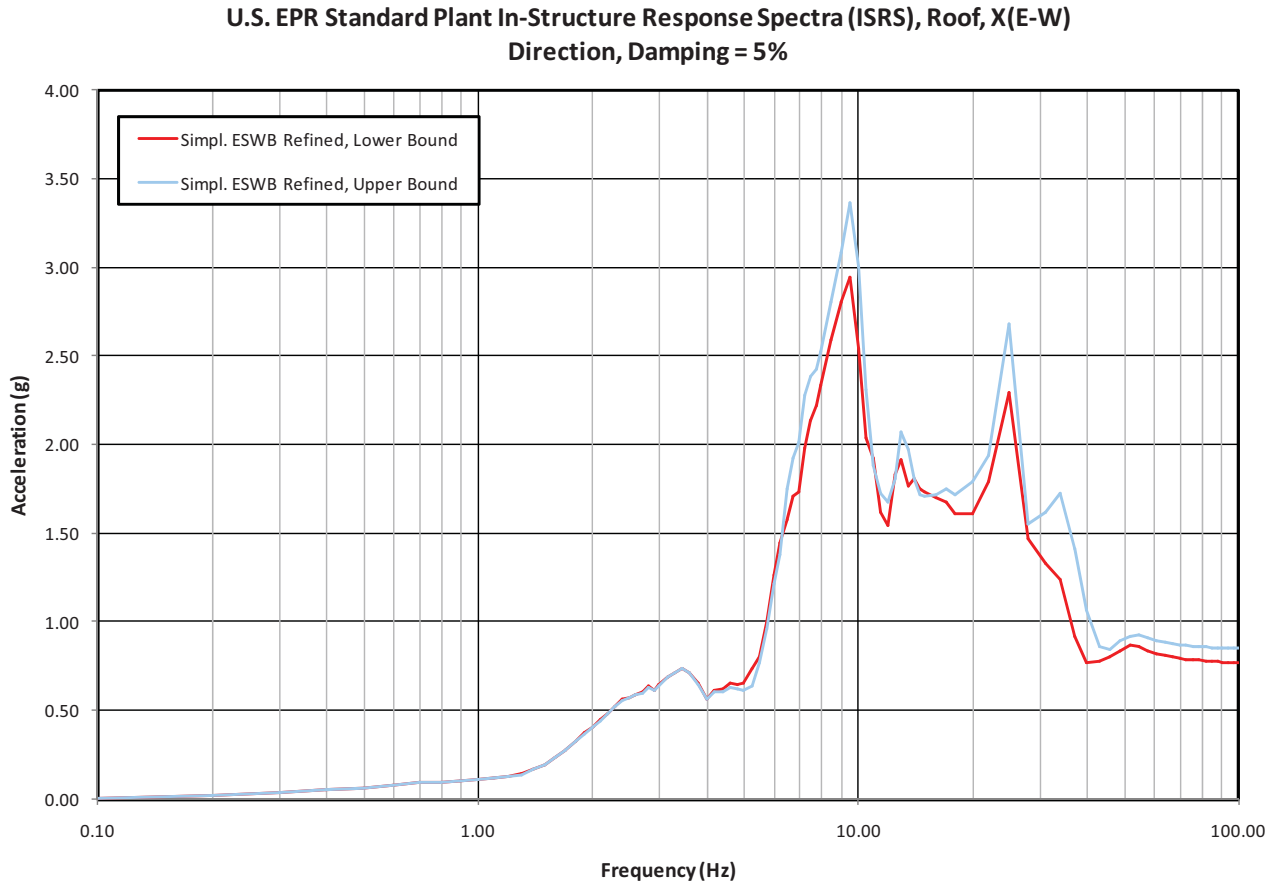


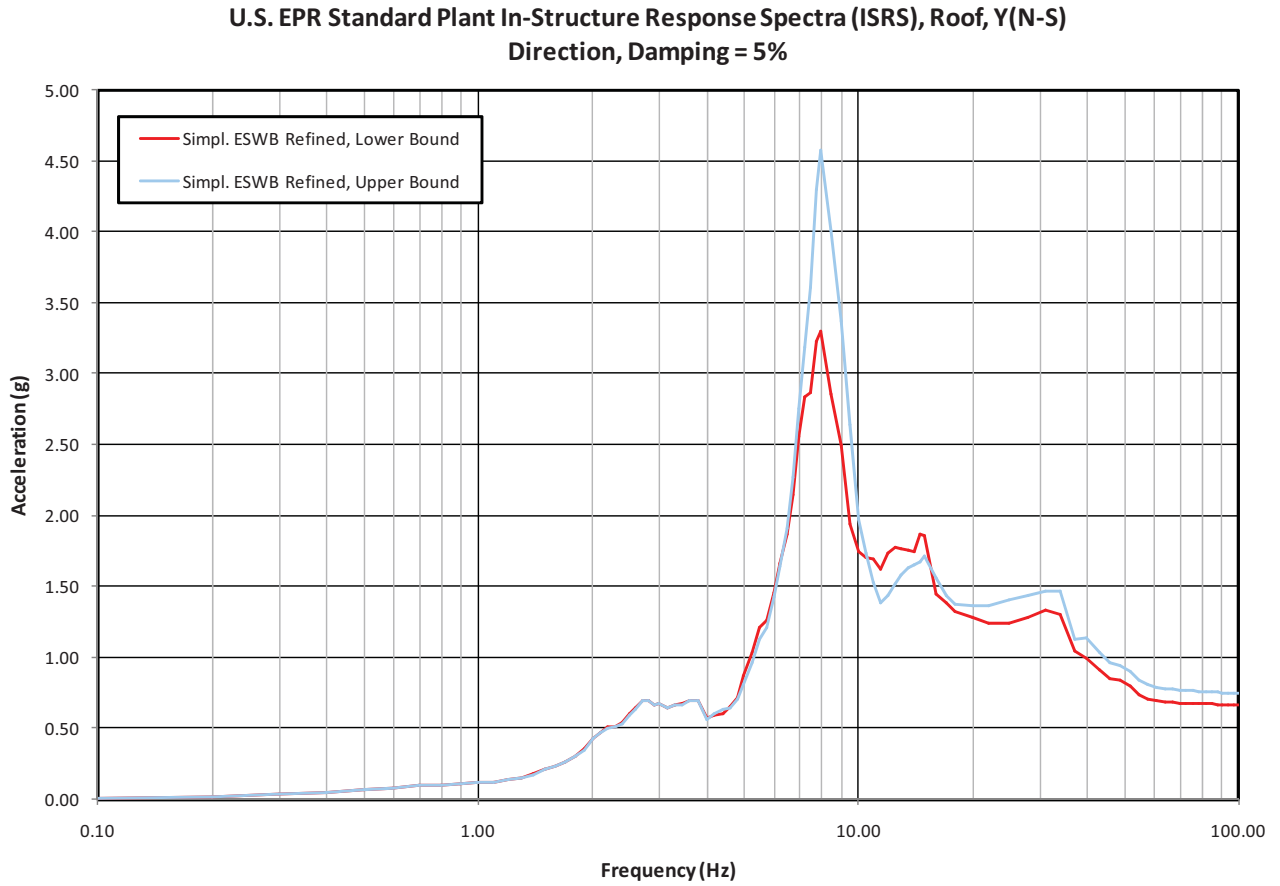
Figure 3.7.2-68-A7—Comparison of Subtraction and Direct Analysis Method for the Simplified Coarse and Refined ESWB, Flexible Node 21837, Z-Direction, Soil Case 12URB_LB



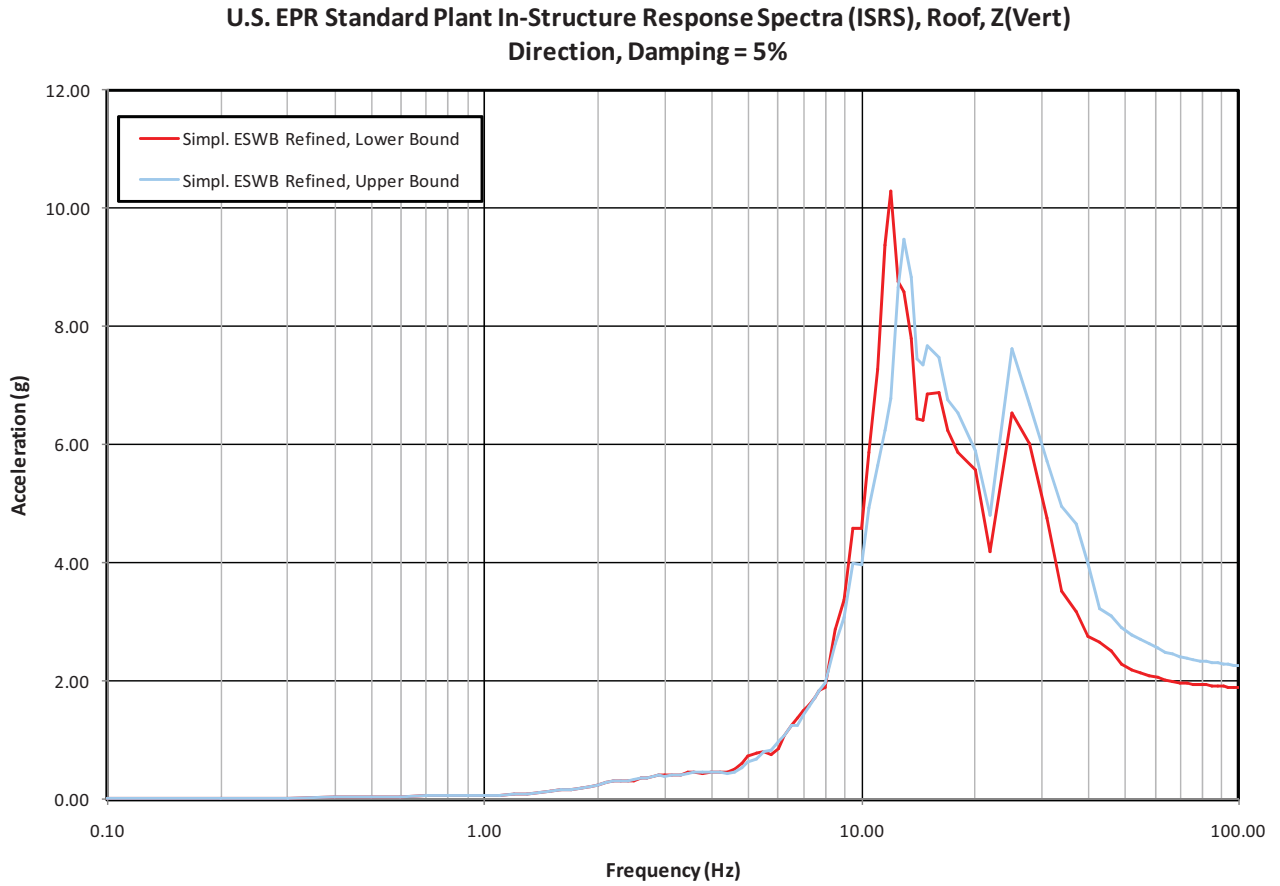
**Figure 3.7.2-68-A8—ESWB Flexible Node 26623, X-Direction,
Soil Case 12URB_LB versus 12URB_UB**



**Figure 3.7.2-68-A9—ESWB Flexible Node 26623, Y-Direction, Soil Case
12URB_LB versus 12URB_UB**



**Figure 3.7.2-68-A10—ESWB Flexible Node 26623, Z-Direction, Soil Case
12URB_LB versus 12URB_UB**



Appendix B: Nuclear Island Refined Mesh Parametric Study

The finite element mesh in the central portion of the Nuclear Island (NI) basemat is further refined to determine the high frequency transmittal capability of the original NI model. The Bell Bend ground motions have a high frequency content that is considered in the U.S. EPR design. The refined soil-structure interaction (SSI) model is used to demonstrate that the original model can adequately transmit frequencies up to 50 Hz to capture high frequency contents of the Bell Bend input motions. Figure 3.7.2-68-B1 shows that the finite element mesh in the basemat is refined except in the central area. Figure 3.7.2-68-B2 shows that the mesh size is mostly 1.5 m outside the central area. In the central area, the average horizontal mesh size is approximately 3.0 m. For the Bell Bend upper bound soil case, with backfill shear wave velocity equal to 429 m/s, the passing frequency is approximately $429/5/3 = 28.6$ Hz, which is less than the required 50 Hz.

The mesh refinement is performed on the central area of the basemat. The refined mesh is shown in Figure 3.7.2-68-B3. Figure 3.7.2-68-B4 shows that the average mesh size in the central area is 1.75 m. The passing frequency is approximately $429/5/1.75 = 49.0$ Hz. The SSI model for the refined mesh did not include the shear key as a result of program size limitations. Therefore, for comparison, an equivalent NI model with the original mesh without the shear key was developed from the existing model so that the effects of the mesh size could be assessed. Both models were analyzed for the Bell Bend upper bound soil and input motions.

The NI SSI model, with the original and refined basemat meshes, was analyzed for the Bell Bend upper bound soil case and input motions. The five percent damped in-structure response spectra (ISRS) at several key locations in the structure are computed from the original and refined mesh models and compared in Figure 3.7.2-68-B5. The spectra from the refined mesh model compare very well with or are less than those of the original mesh model with the exception of a few exceedances. Figure 3.7.2-68-B6 shows that these exceedances match or are bounded by the peak-broadened envelope design spectra. Overall, the original mesh adequately captures the seismic response of the NI.

Figure 3.7.2-68-B1—Original Mesh of the Basemat

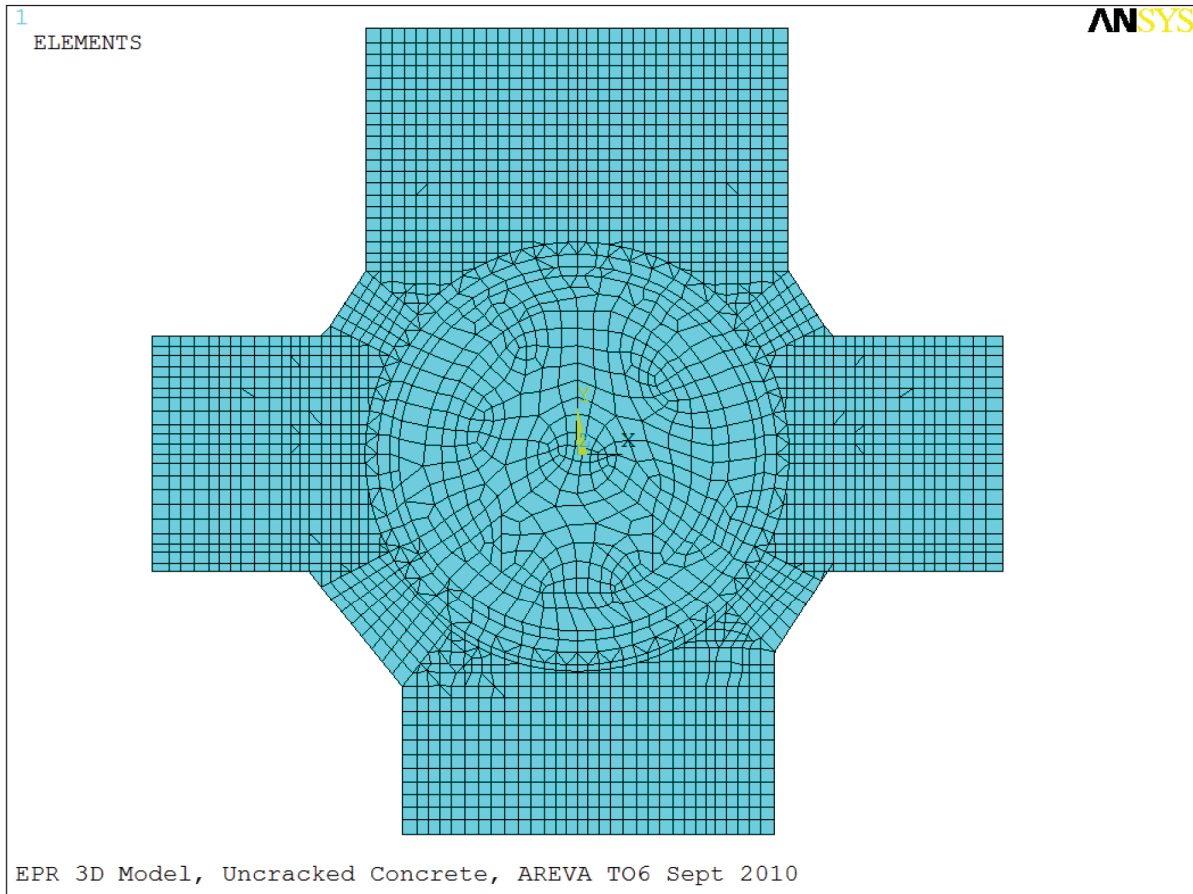


Figure 3.7.2-68-B2—Element Mesh Size - Original Mesh of the Basemat

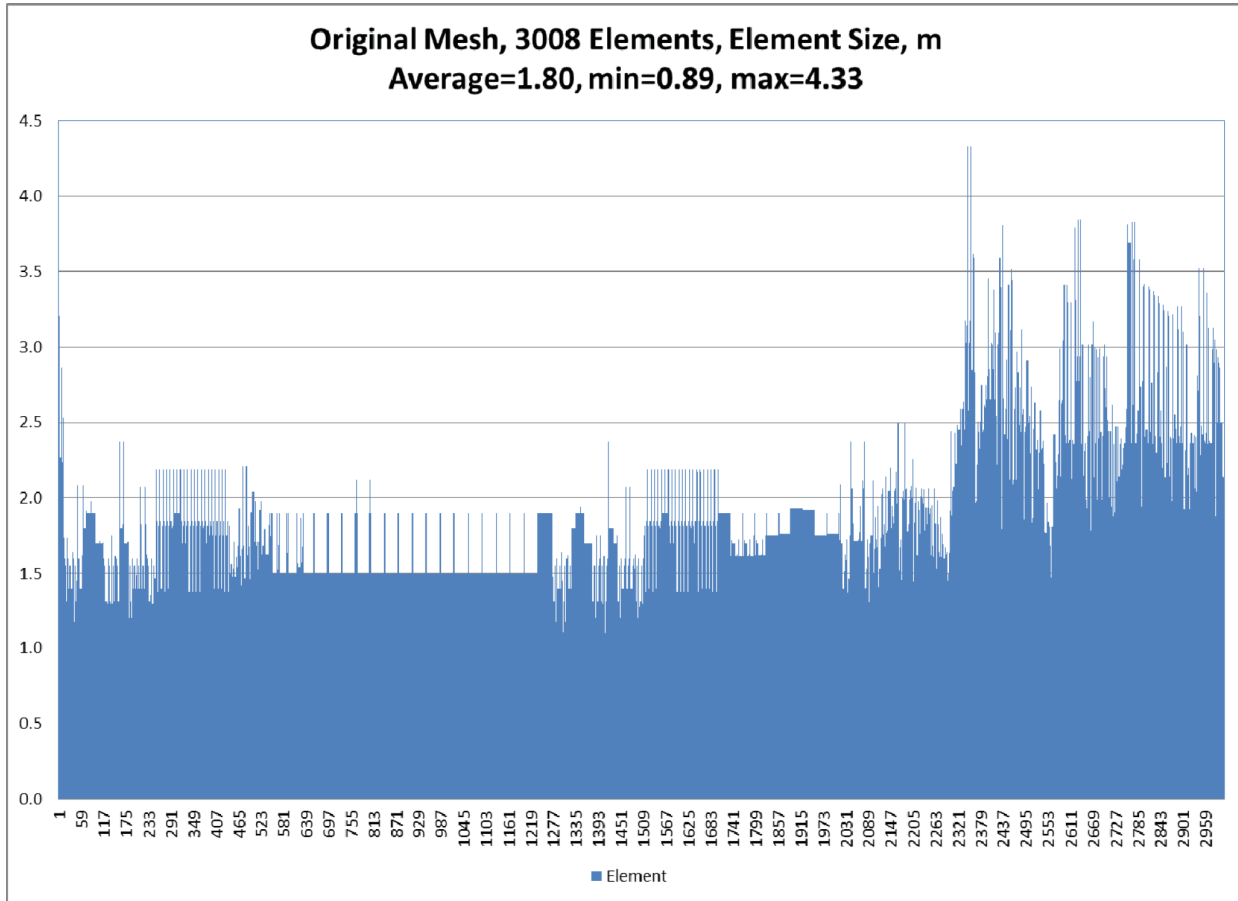


Figure 3.7.2-68-B3—Refined Mesh of the Basemat

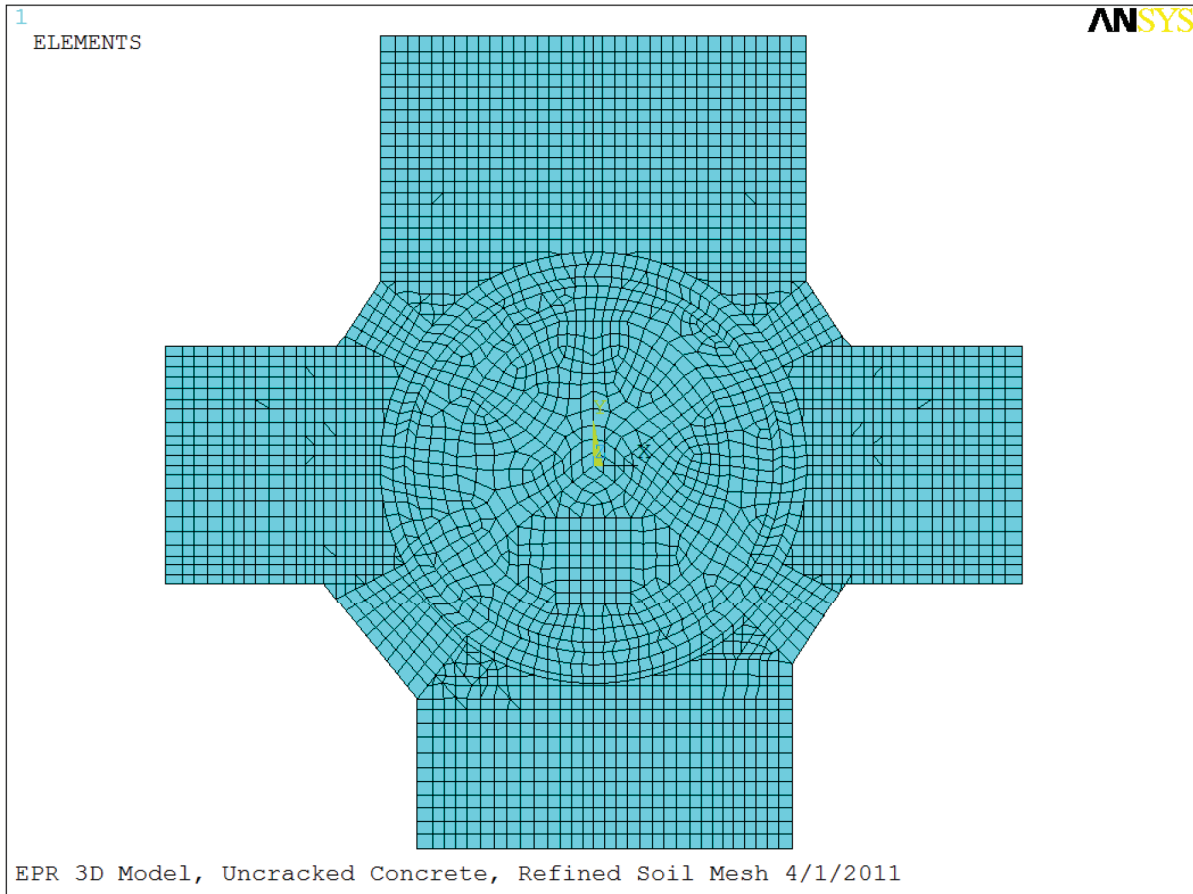


Figure 3.7.2-68-B4—Element Mesh Size - Refined Mesh of the Basemat

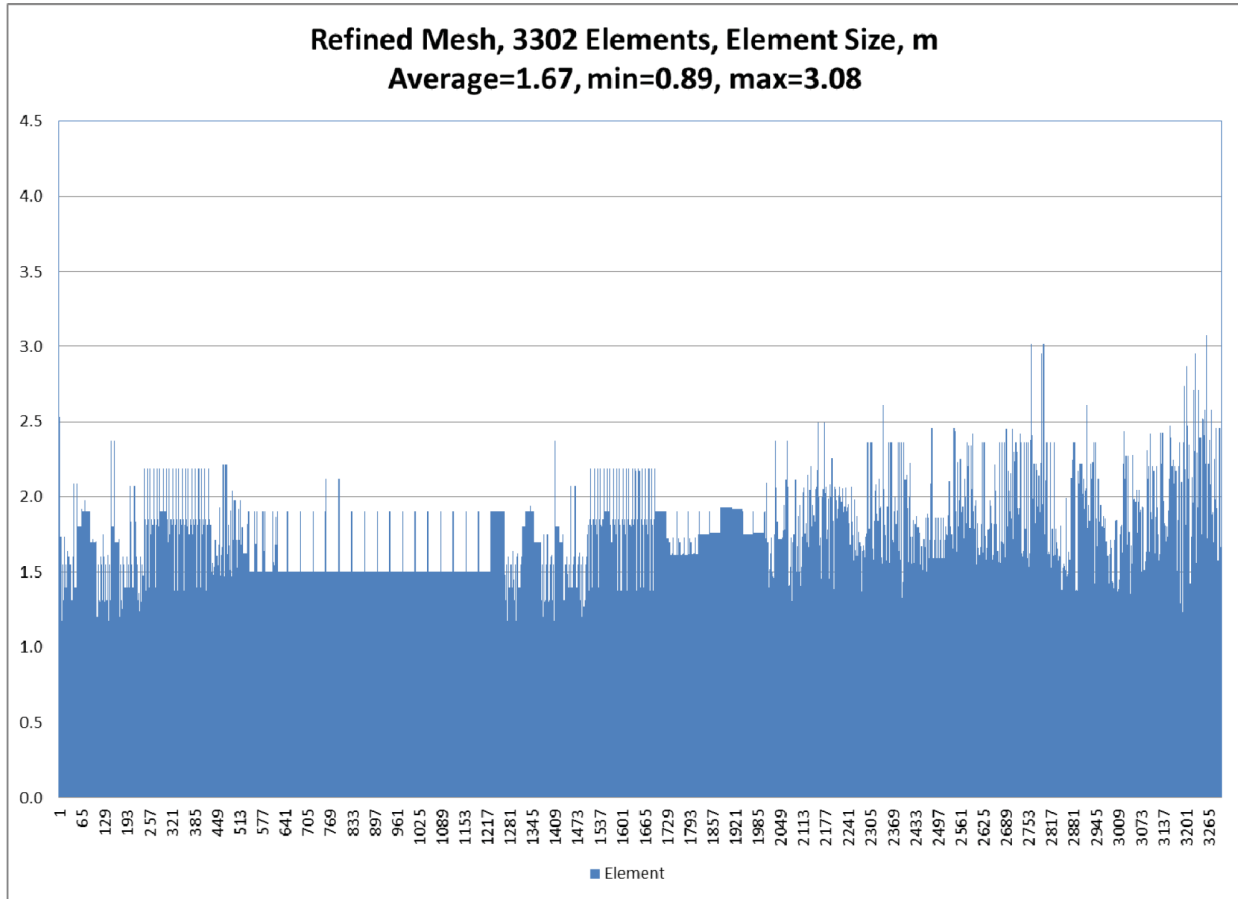
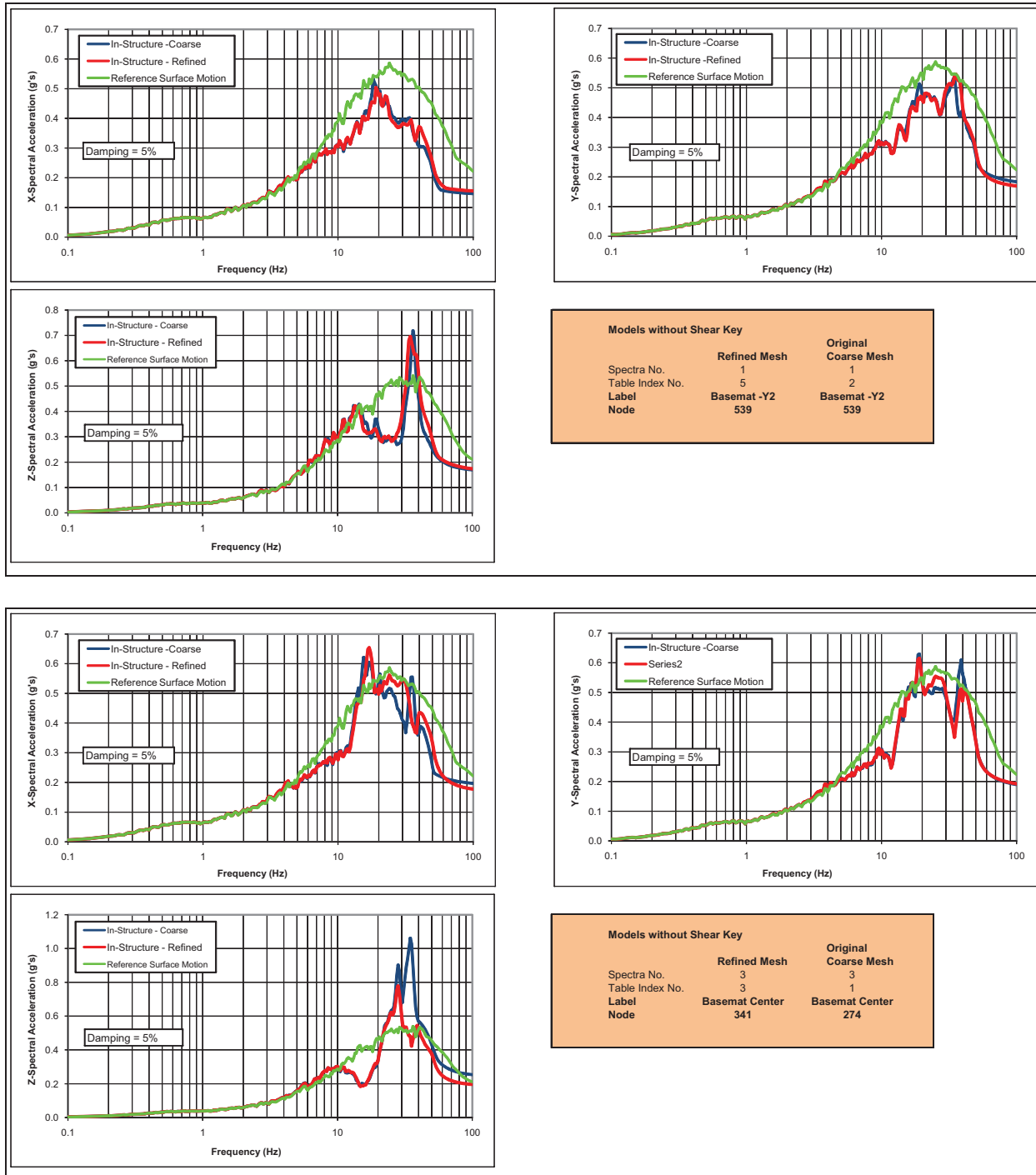


Figure 3.7.2-68-B5—Comparison of Refined Mesh and Coarse Mesh Models ISRS



**Figure 3.7.2-68-B5—Comparison of Refined Mesh and Coarse Mesh Models
 ISRS
 (continued)**

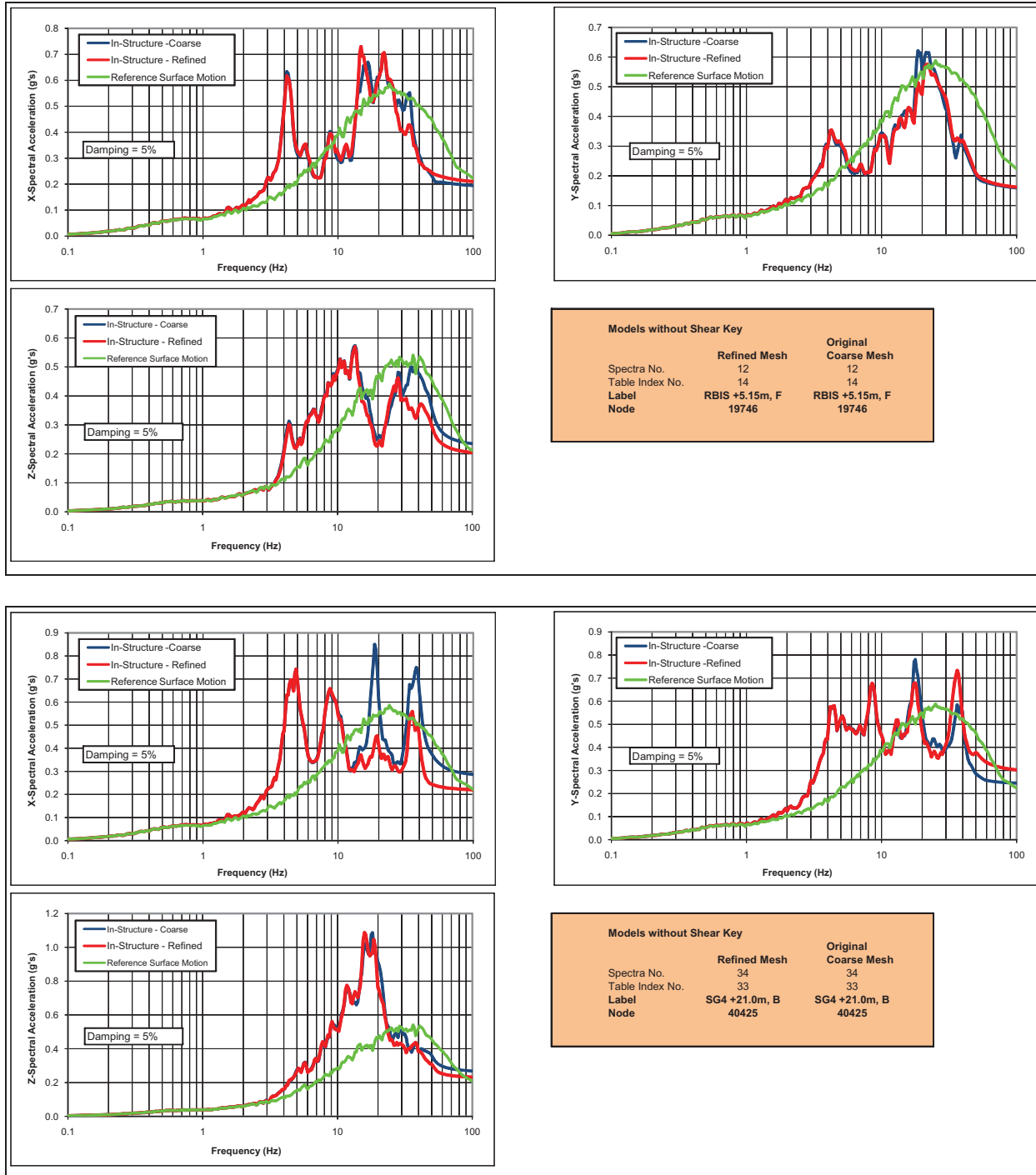
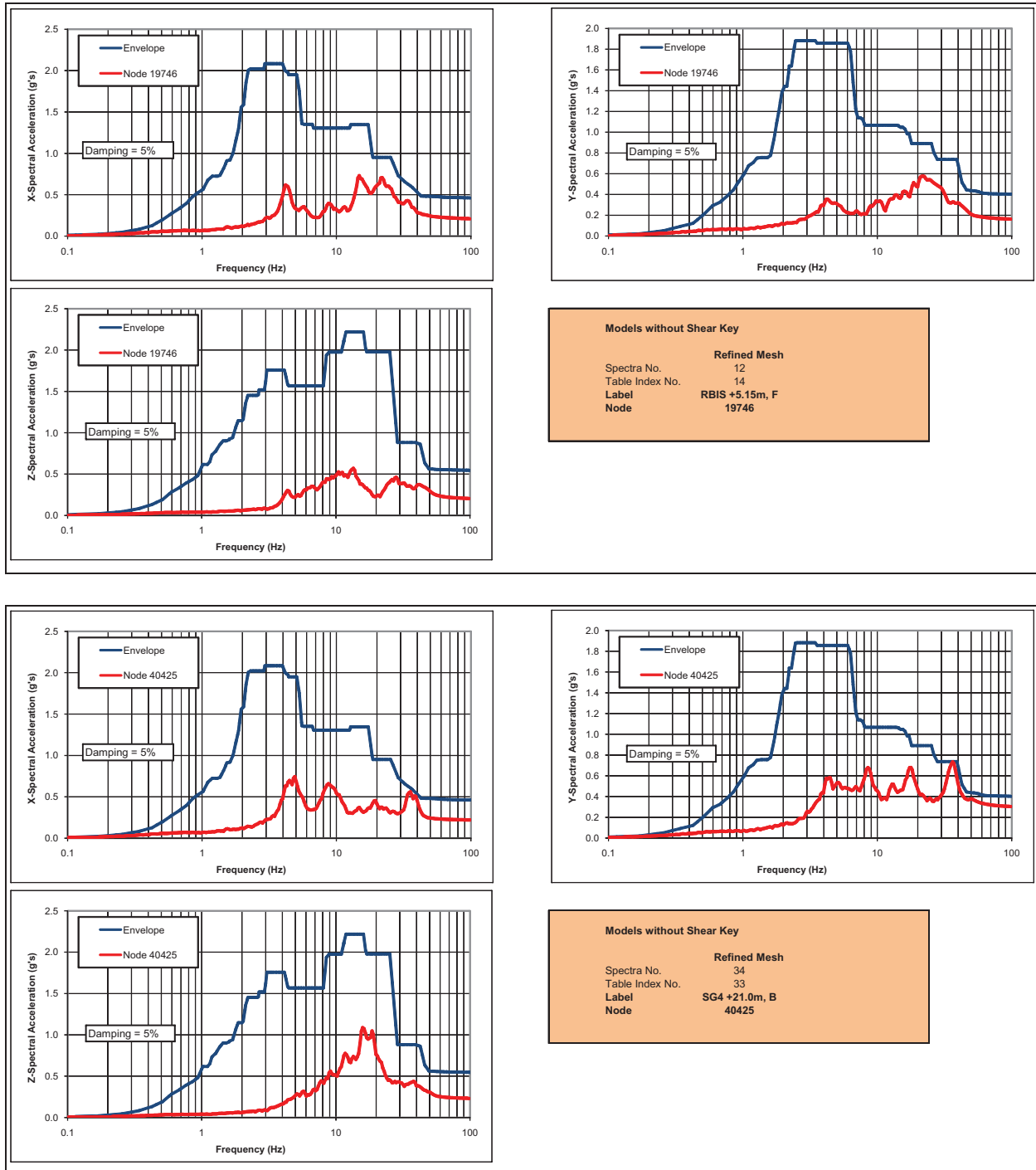


Figure 3.7.2-68-B6—Comparison of Refined Model with Peak-Broadened Envelope Design Spectra



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Layout Showing Basemat, Sidewalls, and Shear Key. Table 3.7.2-6 lists the frequencies and modal mass ratios calculated using the GTSTRUDL code for the first 25 modes of the fixed-base stick model of the NAB structure.

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

- Reinforced concrete (RBIS, balance-of-NI Common Basemat Structures and NAB) – 7 percent.
- Prestressed concrete (containment) – 5 percent.
- RCS components – 4 percent.
- ~~Vent stack—4 percent.~~

~~As an option noted previously in Section 3.7.2.3.1.1, the 3D FEM of the NI Common Basemat Structures or a dynamically compatible simplified 3D FEM may be used in lieu of the stick models in the SSI analysis.~~

(2) EPGB and ESWB

Section 3.7.2.3.2 describes the development of the GTSTRUDL code 3D FEM of the structure, the translation of the FEM to that suitable for the ~~Bechtel MTR/-SASSI 2000~~ code, and the development of the cracked FEM with reduced flexural stiffness in the out-of-plane direction of walls and slabs~~addition of SDOF oscillators to the FEM to simulate out-of-plane flexibility of selected slabs and walls.~~ Table ~~3.7.2-8, and Table 3.7.2-28~~ Table 3.7.2-8, and Table 3.7.2-32 show the frequencies computed by GTSTRUDL for the 3D FEM of the EPGB, ESWB (EUR motions), and ESWB (HF motion), respectively.

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

3.7.2.4.3 Step 3 - Development of Soil Model

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

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soil case bounds the ISRS responses in the high frequency range. The analysis models used in the seismic analyses, thus, adequately develop the seismic demand. The soil

properties of the sub-layers corresponding to different generic shear wave velocities are shown in Table 3.7.2-9. ~~Generic soil cases 1n2u and 2n3u consist of a top soil layer within which the shear wave velocity increases linearly with depth. In such cases, the soil properties are linearly interpolated accordingly.~~

~~As discussed in Section 3.7.2.4.4, the NI Common Basemat Structures and NAB are analyzed as surface founded structures and structural embedment is ignored in the SSI analysis. The surface of the soil model is placed at elevation -38 ft, 10 1/2 inches which corresponds to the bottom of the NI Common Basemat. For the SSI analysis of the EPG and ESWB, the surface of the soil model is at the grade (elevation 0 ft, 0 inches).~~

3.7.2.4.4 Step 4 - Development of SSI Analysis Model

(1) NI Common Basemat Structures and NAB

~~The footprint of the NI Common Basemat is similar to a cross, being about 357.61 ft wide in the global X direction and about 341.2 ft long in the global Y direction. The area of the footprint is approximately 77,339 ft² (see Figure 3.7.2-64—Schematic Footprint Area of NI Common Basemat). The radius of an equivalent circle having the same area is:~~

$$R_e = (77,339/\pi)^{1/2} = 156.82 \text{ ft}$$

~~The maximum depth of embedment of the NI Common Basemat is 41.34 ft. The embedment ratio is 41.34 ft/156.82 ft = 0.26. According to the guidelines of ASCE 4-98, Reference 1, Section 3.3.4.2.4, the effect of the structural embedment on the seismic SSI response of the NI Common Basemat Structures may be ignored because the embedment ratio is less than 0.30. In addition, the portions of the NI Common Basemat adjacent to the NAB and Access Building are only slightly embedded. Thus, in the SSI analysis model, the NI Common Basemat Structures and basemat are taken to be a surface founded structure and the surface of the soil profile is taken to be at elevation -38 ft, 10 1/2 inches. For the NAB, the two sides adjacent to the NI Common Basemat are unembedded, the side adjacent to the Radioactive Waste Building, depending on its final design, may not be fully embedded, and only the south side is fully embedded. Thus, for the SSI analysis it is sufficient to take the NAB to be also surface founded and to take the bottom of the NAB basemat to be at the same elevation as that of the NI Common Basemat Structures.~~

The NI Common Basemat Structures and NAB are embedded with the ground surface modeled at elevation -9-3/4 inches (-0.25 m) and the bottom of the basemat at elevation -38 ft, 10-1/2 inches (-11.85 m). The SSI analysis model is established by coupling the ~~stick models~~ dynamic 3D FEM for ~~both~~ the NI Common Basemat

centerline. Flexible components (i.e., those with natural frequencies less than the ZPA cutoff frequency) are included in the model using beam elements and lumped mass locations to represent the dynamic response of the component.

3.7.3.4 Basis for Selection of Frequencies

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The modes having frequencies above the ZPA are included in the modal analysis to establish that the principal response of the subsystem is computed. The residual rigid response due to the missing mass effect is calculated as described in Section 3.7.3.7. ~~It is considered sufficient to include enough modes to confirm that inclusion of the remaining modes does not result in more than a 10 percent increase in total responses of interest.~~

For the analysis and design of subsystems for the U.S. EPR, seismic effects due to coupling with the building are accounted for either by the use of ISRS from the uncoupled building analysis as input to the subsystem, or by a coupled analysis of the building and equipment. Certain components are designed to be rigid to minimize their seismic response by establishing that their first fundamental natural frequency exceeds 4050 Hz. For some situations in which resonance with the supporting structure is well defined, the design avoids a resonance situation by establishing that the fundamental frequencies of the subsystem are outside a band defined by one-half and twice the fundamental frequencies of the supporting structure.

3.7.3.5 Analysis Procedure for Damping

Damping values used in seismic analyses of subsystems are presented in Section 3.7.1.3 and are dependent on the seismic analysis method used. Damping values for the SSE used for different types of analysis are provided in Table 3.7.1-1. For subsystems that are composed of different material types, composite modal damping using either the weighted stiffness method or the weighted mass method is used as described below. Composite modal damping is also used when subsystems and non-simple module steel frames are used in a single coupled model. The minimum damping value may conservatively be used for these systems.

For subsystems that consist of substructures with different damping properties, the composite global damping matrix, [C], may be obtained by appropriate superposition of damping matrices for individual substructures as:

$$[C] = \sum_{i=1}^{NS} [C]_i$$

Where:

$[C]_i$ = Damping matrix for the i^{th} substructure in the global coordinate system.

3.7.3.7 Combination of Modal Responses

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The inertial response of a distribution subsystem in a seismic response spectrum analysis is considered in two parts: low frequency mode and high frequency mode. The modal analysis calculates the peak response of the distribution subsystem for natural frequencies of the system below a defined cutoff frequency. The low frequency (or non-rigid) modes consist of every mode with seismic excitation frequencies up to the frequency at which spectral accelerations return to the ZPA. For seismic analysis of the U.S. EPR standard plant, this frequency, the ZPA cutoff frequency, is about 40 Hz, as shown in Figure 3.7.1-1. For high frequency ground motion, a cutoff frequency of at least 50 Hz is used. Higher ZPA cutoff frequencies may be required for other dynamic load cases.

At modal frequencies above the ZPA cutoff frequency, distribution subsystem members are considered rigid. The acceleration associated with these rigid modes is usually small. However, in certain situations the response to high frequency modes can significantly affect support loads, particularly axial restraints on long distribution system runs. To account for these effects, a missing mass correction is applied.

3.7.3.7.1 Low Frequency (Non-Rigid) Modes

RG 1.92, Revision 2, provides guidance on combining the individual modal results of a response spectrum analysis for structure supported at a single point and for multiply supported structures analyzed using the USM method. Guidance for modal combinations for the ISM method including the missing mass effects is provided in NUREG-1061, Volume 4. (Reference 8).

The combination method used considers the effects of closely spaced modes. Modes are defined as being closely spaced if their frequencies differ from each other by 10 percent or less of the lower frequency.

For subsystems analyzed using the USM method and with no closely spaced modes, the SRSS method is applied to obtain the representative maximum response of each element, as shown in the following equation:

$$R = \left[\sum_{k=1}^N R_k^2 \right]^{\frac{1}{2}}$$

Where:

R = the representative maximum response due to earthquake motion in one direction. (This calculation is performed in each of the earthquake directions.)

3.7.3.9.2 Independent Support Motion Method

Distribution subsystems supported at multiple locations within one or more buildings with different seismic input response maybe analyzed using the ISM method. In this method of analysis, supports may be divided into support groups. A single ISRS is applied to all supports of each group, but different ISRS are applied to different groups. Typically, a support group is made up of supports attached to the same structure, floor, or portion of a floor. For distribution subsystems analyzed using the ISM method, criteria presented in NUREG-1061 (Reference 8) are followed.

~~In lieu of performing a response spectrum analysis with USM or ISM inputs, time-histories of support motions may be utilized as input excitations. The responses due to relative displacements at the support points are combined with the inertial responses by the SRSS method.~~

3.7.3.10 Use of Equivalent Vertical Static Factors

Equivalent vertical static factors are not used in the design of subsystems for the U.S. EPR design. Seismic loads are calculated assuming that the vertical seismic motion occurs simultaneously with the two horizontal motions.

3.7.3.11 Torsional Effects of Eccentric Masses

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Torsional effects due to the effect of eccentric masses connected to a subsystem are included in that subsystem analysis. For rigid components (i.e., those with natural frequencies greater than the ZPA cutoff frequency of 4050 Hz), the lumped mass is modeled at the center of gravity of the component with a rigid link to the subsystem member centerline. For flexible components having a frequency less than the ZPA, the subsystem model is expanded to include an appropriate model of the component.

3.7.3.12 Buried Seismic Category I Piping and Conduits

Seismic Category I buried pipe and electrical conduit bank are used in the U.S. EPR design. Examples of such utilities include pipe encased in concrete box, electrical conduit bank, pipe encased in another pipe, and pipes buried in the soil. In some cases, these structural components are anchored to adjacent buildings. Some of these underground utilities are classified as safety-related since seismic and other loads could adversely affect their function. Based on observations of past earthquakes, seismic-induced damage to buried utilities is largely due to wave propagation or permanent ground deformation resulting from fault movement, landslide, and liquefaction-induced lateral spread. Other forms of damage include seismic-induced settlement due to soil compaction and rearrangement. For the case of utilities anchored to an adjacent building, strain development in the utility due to settlement of the building requires evaluation.