

ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Friday, July 20, 2012 10:27 AM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505 (5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 24
Attachments: RAI 505 Supplement 24 Response US EPR DC.pdf

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised preliminary schedule for the response to Question 07.01-33. On February 9, 2012, AREVA NP provided Supplement 9 to revise the schedule for 11 questions. On February 17, 2012, AREVA NP provided Supplement 10 to revise the schedule for 20 questions. On February 21, 2012, AREVA NP provided Supplement 11 to revise the schedule for Question 07.01-33. On March 16, 2012, AREVA NP provided Supplement 12 to provide a complete and final response to 2 of the remaining questions (07.01-41 and 07.05-10), and a revised response to 2 questions (07.08-46 and 07.09-72). On April 3, 2012, AREVA NP provided Supplement 13 to provide a complete and final response to one of the remaining questions (07.08-47). On April 11, 2012, AREVA NP provided Supplement 14 to provide a complete and final response to one of the remaining questions (07.01-38). On April 17, 2012, AREVA NP provided Supplement 15 to provide a complete and final response to 2 of the remaining questions (07.01-37 and 07.03-38). On April 18, 2012, AREVA NP provided Supplement 16 to provide a correct and complete final response to one of the remaining questions (07.01-50) and a revised final response to another question (07.09-72) based on NRC staff comments. On April 19, 2012, AREVA NP provided Supplement 17 to provide a correct and complete final response to one of the remaining questions (07.01-45). On April 27, 2012, AREVA NP provided Supplement 18 to provide a correct and complete final response to three of the remaining questions. On May 9, 2012, AREVA NP provided Supplement 19 to provide a correct and complete final response to three of the remaining questions. On May 22, 2012, AREVA NP provided Supplement 20 to provide a correct and complete final response to four of the remaining questions. On May 29, 2012, AREVA NP provided Supplement 21 to provide a correct and complete final response to one of the remaining questions. On May 30, 2012, AREVA NP provided Supplement 22 to provide an interim response to one of the remaining questions (07.01-35). On July 6, 2012, AREVA NP provided Supplement 23 to provide a revised final response to one question (07.01-48).

The attached file, "RAI 505 Supplement 24 Response US EPR DC.pdf," provides a revised final response to Question 07.01-48 based on recent discussion with NRC staff. This response supersedes the prior response to Question 07.01-48 in its entirety. This revised response addresses clarification in U. S. EPR FSAR Sections 7.1 and 7.4 for RSS capability to achieve and maintain safe shutdown conditions. Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report (FSAR) in redline-strikeout format which support the response to this question.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 24 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.01-48 | 2 | 5 |

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

| Question # | Interim Response Date | Response Date |
|--------------------|-----------------------|------------------|
| RAI 505 — 07.01-33 | N/A | July 30, 2013 |
| RAI 505 — 07.01-35 | May 30, 2012 (Actual) | August 15 , 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Friday, July 06, 2012 1:29 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505 (5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 23

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised preliminary schedule for the response to Question 07.01-33. On February 9, 2012, AREVA NP provided Supplement 9 to revise the schedule for 11 questions. On February 17, 2012, AREVA NP provided Supplement 10 to revise the schedule for 20 questions. On February 21, 2012, AREVA NP provided Supplement 11 to revise the schedule for Question 07.01-33. On March 16, 2012, AREVA NP provided Supplement 12 to provide a complete and final response to 2 of the remaining questions (07.01-41 and 07.05-10), and a revised response to 2 questions (07.08-46 and 07.09-72). On April 3, 2012, AREVA NP provided Supplement 13 to provide a complete and final response to one of the remaining questions (07.08-47). On April 11, 2012, AREVA NP provided Supplement 14 to provide a complete and final response to one of the remaining questions (07.01-38). On April 17, 2012, AREVA NP provided Supplement 15 to provide a complete and final response to 2 of the remaining questions (07.01-37 and 07.03-38). On April 18, 2012, AREVA NP provided Supplement 16 to provide a correct and complete final response to one of the remaining questions (07.01-50) and a revised final response to another question (07.09-72) based on NRC staff comments. On April 19, 2012, AREVA NP provided Supplement 17 to provide a correct and complete final response to one of

the remaining questions (07.01-45). On April 27, 2012, AREVA NP provided Supplement 18 to provide a correct and complete final response to three of the remaining questions. On May 9, 2012, AREVA NP provided Supplement 19 to provide a correct and complete final response to three of the remaining questions. On May 22, 2012, AREVA NP provided Supplement 20 to provide a correct and complete final response to four of the remaining questions. On May 29, 2012, AREVA NP provided Supplement 21 to provide a correct and complete final response to one of the remaining questions. On May 30, 2012, AREVA NP provided Supplement 22 to provide an interim response to one of the remaining questions (07.01-35).

The attached file, "RAI 505 Supplement 23 Response US EPR DC.pdf," provides a revised final response to Question 07.01-48. This response supersedes the prior response to Question 07.01-48 in its entirety. This revised response addresses clarification in U. S. EPR FSAR Sections 7.1 and 7.4 for RSS capability to achieve and maintain safe shutdown conditions. Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report (FSAR) in redline-strikeout format which support the response to this question.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 23 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.01-48 | 2 | 5 |

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

| Question # | Interim Response Date | Response Date |
|--------------------|-----------------------|------------------|
| RAI 505 — 07.01-33 | N/A | July 30, 2013 |
| RAI 505 — 07.01-35 | May 30, 2012 (Actual) | August 15 , 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, May 30, 2012 5:31 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505 (5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 22

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided

Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised preliminary schedule for the response to Question 07.01-33. On February 9, 2012, AREVA NP provided Supplement 9 to revise the schedule for 11 questions. On February 17, 2012, AREVA NP provided Supplement 10 to revise the schedule for 20 questions. On February 21, 2012, AREVA NP provided Supplement 11 to revise the schedule for Question 07.01-33. On March 16, 2012, AREVA NP provided Supplement 12 to provide a complete and final response to 2 of the remaining questions (07.01-41 and 07.05-10), and a revised response to 2 questions (07.08-46 and 07.09-72). On April 3, 2012, AREVA NP provided Supplement 13 to provide a complete and final response to one of the remaining questions (07.08-47). On April 11, 2012, AREVA NP provided Supplement 14 to provide a complete and final response to one of the remaining questions (07.01-38). On April 17, 2012, AREVA NP provided Supplement 15 to provide a complete and final response to 2 of the remaining questions (07.01-37 and 07.03-38). On April 18, 2012, AREVA NP provided Supplement 16 to provide a correct and complete final response to one of the remaining questions (07.01-50) and a revised final response to another question (07.09-72) based on NRC staff comments. On April 19, 2012, AREVA NP provided Supplement 17 to provide a correct and complete final response to one of the remaining questions (07.01-45). On April 27, 2012, AREVA NP provided Supplement 18 to provide a correct and complete final response to three of the remaining questions. On May 9, 2012, AREVA NP provided Supplement 19 to provide a correct and complete final response to three of the remaining questions. On May 22, 2012, AREVA NP provided Supplement 20 to provide a correct and complete final response to four of the remaining questions. On May 29, 2012, AREVA NP provided Supplement 21 to provide a correct and complete final response to one of the remaining questions.

The attached file, "RAI 505 Supplement 22 Response US EPR DC - INTERIM.pdf," provides an interim response to one of the remaining two questions (07.01-35). Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to this question. Note that the details of the U. S. EPR FSAR Section 7.6 mark-ups and associated figures will be provided in the final response to Question 07.01-35.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 22 Response US EPR DC - INTERIM.pdf," that contain AREVA NP's response to the subject question.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.01-35 | 2 | 3 |

The schedule for a technically correct and complete final response to Question 07.01-35 has been changed as provided below. The schedule for a response to the other question (07.01-33) is unchanged.

| Question # | Interim Response Date | Response Date |
|--------------------|------------------------------|-------------------------|
| RAI 505 — 07.01-33 | N/A | July 30, 2013 |
| RAI 505 — 07.01-35 | May 30, 2012 (Actual) | August 15 , 2012 |

Sincerely,

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

7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262

From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, May 29, 2012 11:23 AM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 21

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised preliminary schedule for the response to Question 07.01-33. On February 9, 2012, AREVA NP provided Supplement 9 to revise the schedule for 11 questions. On February 17, 2012, AREVA NP provided Supplement 10 to revise the schedule for 20 questions. On February 21, 2012, AREVA NP provided Supplement 11 to revise the schedule for Question 07.01-33. On March 16, 2012, AREVA NP provided Supplement 12 to provide a complete and final response to 2 of the remaining questions (07.01-41 and 07.05-10), and a revised response to 2 questions (07.08-46 and 07.09-72). On April 3, 2012, AREVA NP provided Supplement 13 to provide a complete and final response to one of the remaining questions (07.08-47). On April 11, 2012, AREVA NP provided Supplement 14 to provide a complete and final response to one of the remaining questions (07.01-38). On April 17, 2012, AREVA NP provided Supplement 15 to provide a complete and final response to 2 of the remaining questions (07.01-37 and 07.03-38). On April 18, 2012, AREVA NP provided Supplement 16 to provide a correct and complete final response to one of the remaining questions (07.01-50) and a revised final response to another question (07.09-72) based on NRC staff comments. On April 19, 2012, AREVA NP provided Supplement 17 to provide a correct and complete final response to one of the remaining questions (07.01-45). On April 27, 2012, AREVA NP provided Supplement 18 to provide a correct and complete final response to three of the remaining questions. On May 9, 2012, AREVA NP provided Supplement 19 to provide a correct and complete final response to three of the remaining questions. On May 22, 2012, AREVA NP provided Supplement 20 to provide a correct and complete final response to four of the remaining questions.

The attached file, "RAI 505 Supplement 21 Response US EPR DC.pdf" provides a technically correct and complete final response to one of the remaining three questions (07.01-49). Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to this question.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 21 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.01-49 | 2 | 3 |

The schedule for a technically correct and complete final response to the remaining 2 questions remains unchanged as provided below.

| Question # | Response Date |
|--------------------|---------------|
| RAI 505 — 07.01-33 | July 30, 2013 |
| RAI 505 — 07.01-35 | May 30, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, May 22, 2012 4:53 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 20

Getachew,

AREVA NP Inc. letter NRC:12:030 dated May 22, 2012 provides a technically correct and complete final response to 4 questions (Questions 07.01-39, 07.01-40, 07.01-47 and 07.01-51) in RAI 505.

Enclosed with the letter as a part of the response are affected pages of ANP-10315P, "U.S. EPR Protection System Surveillance Testing and TELEPERM XS Self-Monitoring Technical Report," in redline-strikeout format which support the response to RAI 505, Questions 07.01-39, 07.01-40, 07.01-47 and 07.01-51. A complete revision to the technical report will be submitted after the final submittal of all responses to RAI 505 that impact the report are completed. Since AREVA NP considers some of the material contained in the response to be proprietary, an affidavit is included with the letter, as required by 10 CFR 2.390(b), to support the withholding of the information from public disclosure. Proprietary and non-proprietary versions of the enclosure to this letter are provided separately.

The following table indicates the respective pages in the response that contain AREVA NP's final response to the subject questions.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.01-39 | 2 | 4 |
| RAI 505 — 07.01-40 | 5 | 6 |
| RAI 505 — 07.01-47 | 7 | 7 |
| RAI 505 — 07.01-51 | 8 | 16 |

The schedule for a technically correct and complete response to Question 07.01-33 has been changed as provided below. The response schedule for the other questions remains unchanged. This schedule was transmitted to the NRC in AREVA NP letter 12:024 dated May 10, 2012.

| Question # | Response Date |
|--------------------|----------------------|
| RAI 505 — 07.01-33 | July 30, 2013 |

| | |
|--------------------|--------------|
| RAI 505 — 07.01-35 | May 30, 2012 |
| RAI 505 — 07.01-49 | May 30, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, May 09, 2012 10:02 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 19

Getachew,

AREVA NP Inc. letter NRC:12:027 dated May 9, 2012 provides a technically correct and complete final response to 3 questions (Questions 07.01-34, 07.01-44, and 07.01-48) in RAI 505.

Enclosed with the letter as a part of the response are affected pages of ANP-10315P, "U.S. EPR Protection System Surveillance Testing and TELEPERM XS Self-Monitoring Technical Report," Revision 2, in redline-strikeout format which support the response to RAI 505, Questions 07.01-34, 07.01-44, and 07.01-48. A complete revision to the technical report will be submitted after the final submittal of all responses to RAI 505 that impact the report are completed. Since AREVA NP considers some of the material contained in the response to be proprietary, an affidavit is enclosed, as required by 10 CFR 2.390(b), to support the withholding of the information from public disclosure. Proprietary and non-proprietary versions of the enclosure to this letter are provided separately.

The following table indicates the respective pages in the response that contain AREVA NP's final response to the subject questions.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.01-34 | 2 | 4 |
| RAI 505 — 07.01-44 | 5 | 6 |
| RAI 505 — 07.01-48 | 7 | 10 |

The schedule for a technically correct and complete final response to the remaining 7 questions remains unchanged as provided below.

| Question # | Response Date |
|--------------------|-----------------|
| RAI 505 — 07.01-33 | August 30, 2013 |
| RAI 505 — 07.01-35 | May 30, 2012 |
| RAI 505 — 07.01-39 | May 22, 2012 |
| RAI 505 — 07.01-40 | May 22, 2012 |
| RAI 505 — 07.01-47 | May 22, 2012 |
| RAI 505 — 07.01-49 | May 30, 2012 |
| RAI 505 — 07.01-51 | May 22, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)

Sent: Friday, April 27, 2012 2:51 PM

To: Getachew.Tesfaye@nrc.gov

Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 18

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised preliminary schedule for the response to Question 07.01-33. On February 9, 2012, AREVA NP provided Supplement 9 to revise the schedule for 11 questions. On February 17, 2012, AREVA NP provided Supplement 10 to revise the schedule for 20 questions. On February 21, 2012, AREVA NP provided Supplement 11 to revise the schedule for Question 07.01-33. On March 16, 2012, AREVA NP provided Supplement 12 to provide a complete and final response to 2 of the remaining questions (07.01-41 and 07.05-

10), and a revised response to 2 questions (07.08-46 and 07.09-72). On April 3, 2012, AREVA NP provided Supplement 13 to provide a complete and final response to one of the remaining questions (07.08-47). On April 11, 2012, AREVA NP provided Supplement 14 to provide a complete and final response to one of the remaining questions (07.01-38). On April 17, 2012, AREVA NP provided Supplement 15 to provide a complete and final response to 2 of the remaining questions (07.01-37 and 07.03-38). On April 18, 2012, AREVA NP provided Supplement 16 to provide a correct and complete final response to one of the remaining questions (07.01-50) and a revised final response to another question (07.09-72) based on NRC staff comments. On April 19, 2012, AREVA NP provided Supplement 17 to provide a correct and complete final response to one of the remaining questions (07.01-45).

The attached file, "RAI 505 Supplement 18 Response US EPR DC.pdf" provides a technically correct and complete final response to 3 of the remaining 13 questions (07.01-36, 07.01-46 and 07.09-71). Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to these questions.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 18 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.01-36 | 2 | 6 |
| RAI 505 — 07.01-46 | 7 | 8 |
| RAI 505 — 07.09-71 | 9 | 11 |

The schedule for a technically correct and complete final response to the remaining 10 questions remains unchanged as provided below.

| Question # | Response Date |
|--------------------|-----------------|
| RAI 505 — 07.01-33 | August 30, 2013 |
| RAI 505 — 07.01-34 | May 9, 2012 |
| RAI 505 — 07.01-35 | May 30, 2012 |
| RAI 505 — 07.01-39 | May 22, 2012 |
| RAI 505 — 07.01-40 | May 22, 2012 |
| RAI 505 — 07.01-44 | May 9, 2012 |
| RAI 505 — 07.01-47 | May 22, 2012 |
| RAI 505 — 07.01-48 | May 9, 2012 |
| RAI 505 — 07.01-49 | May 30, 2012 |
| RAI 505 — 07.01-51 | May 22, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, April 19, 2012 11:13 AM

To: Getachew.Tesfaye@nrc.gov

Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 17

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised preliminary schedule for the response to Question 07.01-33. On February 9, 2012, AREVA NP provided Supplement 9 to revise the schedule for 11 questions. On February 17, 2012, AREVA NP provided Supplement 10 to revise the schedule for 20 questions. On February 21, 2012, AREVA NP provided Supplement 11 to revise the schedule for Question 07.01-33. On March 16, 2012, AREVA NP provided Supplement 12 to provide a complete and final response to 2 of the remaining questions (07.01-41 and 07.05-10), and a revised response to 2 questions (07.08-46 and 07.09-72). On April 3, 2012, AREVA NP provided Supplement 13 to provide a complete and final response to one of the remaining questions (07.08-47). On April 11, 2012, AREVA NP provided Supplement 14 to provide a complete and final response to one of the remaining questions (07.01-38). On April 17, 2012, AREVA NP provided Supplement 15 to provide a complete and final response to 2 of the remaining questions (07.01-37 and 07.03-38). On April 18, 2012, AREVA NP provided Supplement 16 to provide a correct and complete final response to one of the remaining questions (07.01-50) and a revised final response to another question (07.09-72) based on NRC staff comments.

The attached file, "RAI 505 Supplement 17 Response - US EPR DC.pdf" provides a technically correct and complete final response to 1 of the remaining 14 questions (07.01-45). Appended to this file are affected pages of the U.S. EPR Technical Report ANP-10315P in redline-strikeout format which support the response to Question 07.01-45.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 17 Response - US EPR DC.pdf," that contain AREVA NP's response to the subject question.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.01-45 | 2 | 3 |

The schedule for a technically correct and complete final response to the remaining 13 questions remains unchanged as provided below.

| Question # | Response Date |
|--------------------|-----------------|
| RAI 505 — 07.01-33 | August 30, 2013 |
| RAI 505 — 07.01-34 | May 9, 2012 |
| RAI 505 — 07.01-35 | May 30, 2012 |
| RAI 505 — 07.01-36 | May 1, 2012 |
| RAI 505 — 07.01-39 | May 22, 2012 |
| RAI 505 — 07.01-40 | May 22, 2012 |
| RAI 505 — 07.01-44 | May 9, 2012 |

| | |
|--------------------|--------------|
| RAI 505 — 07.01-46 | May 1, 2012 |
| RAI 505 — 07.01-47 | May 22, 2012 |
| RAI 505 — 07.01-48 | May 9, 2012 |
| RAI 505 — 07.01-49 | May 30, 2012 |
| RAI 505 — 07.01-51 | May 22, 2012 |
| RAI 505 — 07.09-71 | May 9, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, April 18, 2012 3:06 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 16

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised preliminary schedule for the response to Question 07.01-33. On February 9, 2012, AREVA NP provided Supplement 9 to revise the schedule for 11 questions. On February 17, 2012, AREVA NP provided Supplement 10 to revise the schedule for 20 questions. On February 21, 2012, AREVA NP provided Supplement 11 to revise the schedule for Question 07.01-33. On March 16, 2012, AREVA NP provided Supplement 12 to provide a complete and final response to 2 of the remaining questions (07.01-41 and 07.05-10), and a revised response to 2 questions (07.08-46 and 07.09-72). On April 3, 2012, AREVA NP provided Supplement 13 to provide a complete and final response to one of the remaining questions (07.08-47). On April 11, 2012, AREVA NP provided Supplement 14 to provide a complete and final response to one of the remaining questions (07.01-38). On April 17, 2012, AREVA NP provided Supplement 15 to provide a complete and final response to 2 of the remaining questions (07.01-37 and 07.03-38).

The attached file, "RAI 505 Supplement 16 Response - US EPR DC.pdf" provides a technically correct and complete final response to 1 of the remaining 15 questions (07.01-50) and a revised final response to another question (07.09-72) based on NRC staff comments. Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to Question 07.01-50 and Question 07.09-72.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 16 Response - US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.01-50 | 2 | 3 |
| RAI 505 — 07.09-72 | 4 | 5 |

The schedule for a technically correct and complete final response to the remaining 14 questions remains unchanged as provided below.

| Question # | Response Date |
|--------------------|-----------------|
| RAI 505 — 07.01-33 | August 30, 2013 |
| RAI 505 — 07.01-34 | May 9, 2012 |
| RAI 505 — 07.01-35 | May 30, 2012 |
| RAI 505 — 07.01-36 | May 1, 2012 |
| RAI 505 — 07.01-39 | May 22, 2012 |
| RAI 505 — 07.01-40 | May 22, 2012 |
| RAI 505 — 07.01-44 | May 9, 2012 |
| RAI 505 — 07.01-45 | May 1, 2012 |
| RAI 505 — 07.01-46 | May 1, 2012 |
| RAI 505 — 07.01-47 | May 22, 2012 |
| RAI 505 — 07.01-48 | May 9, 2012 |
| RAI 505 — 07.01-49 | May 30, 2012 |
| RAI 505 — 07.01-51 | May 22, 2012 |
| RAI 505 — 07.09-71 | May 9, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)

Sent: Tuesday, April 17, 2012 12:05 PM

To: Getachew.Tesfaye@nrc.gov

Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 15

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3

on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised preliminary schedule for the response to Question 07.01-33. On February 9, 2012, AREVA NP provided Supplement 9 to revise the schedule for 11 questions. On February 17, 2012, AREVA NP provided Supplement 10 to revise the schedule for 20 questions. On February 21, 2012, AREVA NP provided Supplement 11 to revise the schedule for Question 07.01-33. On March 16, 2012, AREVA NP provided Supplement 12 to provide a complete and final response to 2 of the remaining questions (07.01-41 and 07.05-10), and a revised response to 2 questions (07.08-46 and 07.09-72). On April 3, 2012, AREVA NP provided Supplement 13 to provide a complete and final response to one of the remaining questions (07.08-47). On April 11, 2012, AREVA NP provided Supplement 14 to provide a complete and final response to one of the remaining questions (07.01-38).

The attached file, "RAI 505 Supplement 15 Response - US EPR DC.pdf" provides a technically correct and complete final response to 2 of the remaining 17 questions (07.01-37 and 07.03-38). Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to Questions 07.01-37 and Question 07.03-38.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 15 Response - US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

| Question # | Start Page | End Page |
|--------------------|-------------------|-----------------|
| RAI 505 — 07.01-37 | 2 | 2 |
| RAI 505 — 07.03-38 | 3 | 35 |

The schedule for a technically correct and complete final response to the remaining 15 questions remains unchanged as provided below.

| Question # | Response Date |
|--------------------|----------------------|
| RAI 505 — 07.01-33 | August 30, 2013 |
| RAI 505 — 07.01-34 | May 9, 2012 |
| RAI 505 — 07.01-35 | May 30, 2012 |
| RAI 505 — 07.01-36 | May 1, 2012 |
| RAI 505 — 07.01-39 | May 22, 2012 |
| RAI 505 — 07.01-40 | May 22, 2012 |
| RAI 505 — 07.01-44 | May 9, 2012 |
| RAI 505 — 07.01-45 | May 1, 2012 |
| RAI 505 — 07.01-46 | May 1, 2012 |
| RAI 505 — 07.01-47 | May 22, 2012 |
| RAI 505 — 07.01-48 | May 9, 2012 |
| RAI 505 — 07.01-49 | May 30, 2012 |
| RAI 505 — 07.01-50 | May 30, 2012 |
| RAI 505 — 07.01-51 | May 22, 2012 |
| RAI 505 — 07.09-71 | May 9, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, April 11, 2012 11:00 AM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 14

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised preliminary schedule for the response to Question 07.01-33. On February 9, 2012, AREVA NP provided Supplement 9 to revise the schedule for 11 questions. On February 17, 2012, AREVA NP provided Supplement 10 to revise the schedule for 20 questions. On February 21, 2012, AREVA NP provided Supplement 11 to revise the schedule for Question 07.01-33. On March 16, 2012, AREVA NP provided Supplement 12 to provide a complete and final response to 2 of the remaining questions (07.01-41 and 07.05-10), and a revised response to 2 questions (07.08-46 and 07.09-72). On April 3, 2012, AREVA NP provided Supplement 13 to provide a complete and final response to one of the remaining questions (07.08-47).

The attached file, "RAI 505 Supplement 14 Response - US EPR DC.pdf" provides a technically correct and complete response to 1 of the remaining 18 questions (07.01-38). Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to Question 07.01-38.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 14 Response - US EPR DC.pdf," that contain AREVA NP's response to the subject question.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.01-38 | 2 | 3 |

The schedule for a technically correct and complete response to the remaining 17 questions remains unchanged as provided below.

| Question # | Response Date |
|--------------------|-----------------|
| RAI 505 — 07.01-33 | August 30, 2013 |
| RAI 505 — 07.01-34 | May 9, 2012 |

| | |
|--------------------|----------------|
| RAI 505 — 07.01-35 | May 30, 2012 |
| RAI 505 — 07.01-36 | May 1, 2012 |
| RAI 505 — 07.01-37 | April 17, 2012 |
| RAI 505 — 07.01-39 | May 22, 2012 |
| RAI 505 — 07.01-40 | May 22, 2012 |
| RAI 505 — 07.01-44 | May 9, 2012 |
| RAI 505 — 07.01-45 | May 1, 2012 |
| RAI 505 — 07.01-46 | May 1, 2012 |
| RAI 505 — 07.01-47 | May 22, 2012 |
| RAI 505 — 07.01-48 | May 9, 2012 |
| RAI 505 — 07.01-49 | May 30, 2012 |
| RAI 505 — 07.01-50 | May 30, 2012 |
| RAI 505 — 07.01-51 | May 22, 2012 |
| RAI 505 — 07.03-38 | April 17, 2012 |
| RAI 505 — 07.09-71 | May 9, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, April 03, 2012 3:27 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 13

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised preliminary schedule for the response to Question 07.01-33. On February 9, 2012, AREVA NP provided Supplement 9 to revise the schedule for 11 questions. On February 17, 2012, AREVA NP provided Supplement 10 to revise the schedule for 20 questions. On February 21, 2012, AREVA NP provided Supplement 11 to revise the schedule for Question 07.01-33. On March 16, 2012, AREVA NP provided Supplement 12 to provide a complete and final response to 2 of the remaining questions (07.01-41 and 07.05-10), and a revised response to 2 questions (07.08-46 and 07.09-72).

The attached file, "RAI 505 Supplement 13 Response - US EPR DC.pdf" provides a technically correct and complete response to 1 of the remaining 19 questions (07.08-47). Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to Question 07.08-47. Also appended to this file are affected pages of Technical Report ANP-10315P. The revision to this technical report will be submitted by separate letter after completion of all responses to RAI 505.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 13 Response - US EPR DC.pdf," that contain AREVA NP's response to the subject question.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.08-47 | 2 | 7 |

The schedule for a technically correct and complete response to the remaining 18 questions remains unchanged as provided below.

| Question # | Response Date |
|--------------------|-----------------|
| RAI 505 — 07.01-33 | August 30, 2013 |
| RAI 505 — 07.01-34 | May 9, 2012 |
| RAI 505 — 07.01-35 | May 30, 2012 |
| RAI 505 — 07.01-36 | May 1, 2012 |
| RAI 505 — 07.01-37 | April 17, 2012 |
| RAI 505 — 07.01-38 | May 1, 2012 |
| RAI 505 — 07.01-39 | May 22, 2012 |
| RAI 505 — 07.01-40 | May 22, 2012 |
| RAI 505 — 07.01-44 | May 9, 2012 |
| RAI 505 — 07.01-45 | May 1, 2012 |
| RAI 505 — 07.01-46 | May 1, 2012 |
| RAI 505 — 07.01-47 | May 22, 2012 |
| RAI 505 — 07.01-48 | May 9, 2012 |
| RAI 505 — 07.01-49 | May 30, 2012 |
| RAI 505 — 07.01-50 | May 30, 2012 |
| RAI 505 — 07.01-51 | May 22, 2012 |
| RAI 505 — 07.03-38 | April 17, 2012 |
| RAI 505 — 07.09-71 | May 9, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Friday, March 16, 2012 12:59 PM
To: Getachew.Tesfaye@nrc.gov

Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 12

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised preliminary schedule for the response to Question 07.01-33. On February 9, 2012, AREVA NP provided Supplement 9 to revise the schedule for 11 questions. On February 17, 2012, AREVA NP provided Supplement 10 to revise the schedule for 20 questions. On February 21, 2012, AREVA NP provided Supplement 11 to revise the schedule for Question 07.01-33.

The attached file, "RAI 505 Supplement 12 Response - US EPR DC.pdf" provides technically correct and complete responses to 2 of the remaining 21 questions (07.01-41 and 07.05-10), and a revised response to 2 questions (07.08-46 and 07.09-72). Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the responses to Question 07.01-41, 07.05-10, 07.08-46, and 07.09-72. Also appended to this file are affected pages of Technical Reports ANP-10304, ANP-10309P and ANP-10315P. Revisions to these Technical Reports will be submitted by separate letter after completion of all responses to RAI 505.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 12 Response - US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.01-41 | 2 | 5 |
| RAI 505 — 07.05-10 | 6 | 9 |
| RAI 505 — 07.08-46 | 10 | 10 |
| RAI 505 — 07.09-72 | 11 | 12 |

The schedule for a technically correct and complete response to the remaining 19 questions remains unchanged as provided below.

| Question # | Response Date |
|--------------------|-----------------|
| RAI 505 — 07.01-33 | August 30, 2013 |
| RAI 505 — 07.01-34 | May 9, 2012 |
| RAI 505 — 07.01-35 | May 30, 2012 |
| RAI 505 — 07.01-36 | May 1, 2012 |
| RAI 505 — 07.01-37 | April 17, 2012 |
| RAI 505 — 07.01-38 | May 1, 2012 |
| RAI 505 — 07.01-39 | May 22, 2012 |
| RAI 505 — 07.01-40 | May 22, 2012 |
| RAI 505 — 07.01-44 | May 9, 2012 |

| | |
|--------------------|----------------|
| RAI 505 — 07.01-45 | May 1, 2012 |
| RAI 505 — 07.01-46 | May 1, 2012 |
| RAI 505 — 07.01-47 | May 22, 2012 |
| RAI 505 — 07.01-48 | May 9, 2012 |
| RAI 505 — 07.01-49 | May 30, 2012 |
| RAI 505 — 07.01-50 | May 30, 2012 |
| RAI 505 — 07.01-51 | May 22, 2012 |
| RAI 505 — 07.03-38 | April 17, 2012 |
| RAI 505 — 07.08-47 | May 30, 2012 |
| RAI 505 — 07.09-71 | May 9, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, February 21, 2012 9:31 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 11

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised preliminary schedule for the response to Question 07.01-33. On February 9, 2012, AREVA NP provided Supplement 9 to revise the schedule for 11 questions. On February 17, 2012, AREVA NP provided Supplement 10 to revise the schedule for 20 questions.

The schedule for a technically correct and complete response to question 07.01-33 has been changed as provided below. The response schedule for the other questions remains unchanged. This schedule was transmitted to the NRC in AREVA NP letter 12:008 dated February 21, 2012.

| Question # | Response Date |
|--------------------|------------------------|
| RAI 505 — 07.01-33 | August 30, 2013 |
| RAI 505 — 07.01-34 | May 9, 2012 |

| | |
|--------------------|----------------|
| RAI 505 — 07.01-35 | May 30, 2012 |
| RAI 505 — 07.01-36 | May 1, 2012 |
| RAI 505 — 07.01-37 | April 17, 2012 |
| RAI 505 — 07.01-38 | May 1, 2012 |
| RAI 505 — 07.01-39 | May 22, 2012 |
| RAI 505 — 07.01-40 | May 22, 2012 |
| RAI 505 — 07.01-41 | April 17, 2012 |
| RAI 505 — 07.01-44 | May 9, 2012 |
| RAI 505 — 07.01-45 | May 1, 2012 |
| RAI 505 — 07.01-46 | May 1, 2012 |
| RAI 505 — 07.01-47 | May 22, 2012 |
| RAI 505 — 07.01-48 | May 9, 2012 |
| RAI 505 — 07.01-49 | May 30, 2012 |
| RAI 505 — 07.01-50 | May 30, 2012 |
| RAI 505 — 07.01-51 | May 22, 2012 |
| RAI 505 — 07.03-38 | April 17, 2012 |
| RAI 505 — 07.05-10 | April 17, 2012 |
| RAI 505 — 07.08-47 | May 30, 2012 |
| RAI 505 — 07.09-71 | May 9, 2012 |

Sincerely,

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

7207 IBM Drive, Mail Code CLT 2B

Charlotte, NC 28262

Phone: 704-805-2223

Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)

Sent: Friday, February 17, 2012 4:09 PM

To: Getachew.Tesfaye@nrc.gov

Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 505

(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 10

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised

preliminary schedule for the response to Question 07.01-33. On February 9, 2012, AREVA NP provided Supplement 9 to revise the schedule for 11 questions.

The schedule for a technically correct and complete response to 20 of the remaining 21 questions has been changed as provided below. The response schedule to the other question remains unchanged.

| Question # | Response Date |
|--------------------|-----------------------|
| RAI 505 — 07.01-33 | February 21, 2012 |
| RAI 505 — 07.01-34 | May 9, 2012 |
| RAI 505 — 07.01-35 | May 30, 2012 |
| RAI 505 — 07.01-36 | May 1, 2012 |
| RAI 505 — 07.01-37 | April 17, 2012 |
| RAI 505 — 07.01-38 | May 1, 2012 |
| RAI 505 — 07.01-39 | May 22, 2012 |
| RAI 505 — 07.01-40 | May 22, 2012 |
| RAI 505 — 07.01-41 | April 17, 2012 |
| RAI 505 — 07.01-44 | May 9, 2012 |
| RAI 505 — 07.01-45 | May 1, 2012 |
| RAI 505 — 07.01-46 | May 1, 2012 |
| RAI 505 — 07.01-47 | May 22, 2012 |
| RAI 505 — 07.01-48 | May 9, 2012 |
| RAI 505 — 07.01-49 | May 30, 2012 |
| RAI 505 — 07.01-50 | May 30, 2012 |
| RAI 505 — 07.01-51 | May 22, 2012 |
| RAI 505 — 07.03-38 | April 17, 2012 |
| RAI 505 — 07.05-10 | April 17, 2012 |
| RAI 505 — 07.08-47 | May 30, 2012 |
| RAI 505 — 07.09-71 | May 9, 2012 |

Sincerely,

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

7207 IBM Drive, Mail Code CLT 2B

Charlotte, NC 28262

Phone: 704-805-2223

Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)

Sent: Thursday, February 09, 2012 8:15 AM

To: Getachew.Tesfaye@nrc.gov

Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 505

(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 9

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions. On January 19, 2012, AREVA NP provided Supplement 8 to provide a complete and final response to one question and a revised preliminary schedule for the response to Question 07.01-33.

The schedule for a technically correct and complete response to 11 of the remaining 21 questions has been changed as provided below. The response schedule to the other 10 questions remains unchanged.

| Question # | Response Date |
|--------------------|-----------------------|
| RAI 505 — 07.01-33 | February 21, 2012 |
| RAI 505 — 07.01-34 | April 5, 2012 |
| RAI 505 — 07.01-35 | April 26, 2012 |
| RAI 505 — 07.01-36 | April 5, 2012 |
| RAI 505 — 07.01-37 | March 8, 2012 |
| RAI 505 — 07.01-38 | April 5, 2012 |
| RAI 505 — 07.01-39 | April 26, 2012 |
| RAI 505 — 07.01-40 | April 26, 2012 |
| RAI 505 — 07.01-41 | March 8, 2012 |
| RAI 505 — 07.01-44 | April 5, 2012 |
| RAI 505 — 07.01-45 | April 26, 2012 |
| RAI 505 — 07.01-46 | April 26, 2012 |
| RAI 505 — 07.01-47 | April 5, 2012 |
| RAI 505 — 07.01-48 | April 5, 2012 |
| RAI 505 — 07.01-49 | April 26, 2012 |
| RAI 505 — 07.01-50 | April 26, 2012 |
| RAI 505 — 07.01-51 | April 26, 2012 |
| RAI 505 — 07.03-38 | March 8, 2012 |
| RAI 505 — 07.05-10 | March 8, 2012 |
| RAI 505 — 07.08-47 | April 26, 2012 |
| RAI 505 — 07.09-71 | April 5, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)

Sent: Thursday, January 19, 2012 11:19 AM

To: Getachew.Tesfaye@nrc.gov

Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 505

(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 8

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions. On January 10, 2012, AREVA NP provided Supplement 7 to provide a complete and final response to 2 questions.

The attached file, "RAI 505 Supplement 8 Response US EPR DC.pdf" provides a technically correct and complete final response to 1 of the remaining 22 questions.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 8 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.01-42 | 2 | 2 |

The schedule for a technically correct and complete response to the remaining 21 questions is provided below. The preliminary schedule for the response to Question 07.01-33 has been revised and is being reevaluated and a new supplement with a revised schedule will be transmitted by February 21, 2012.

| Question # | Response Date |
|--------------------|--------------------------|
| RAI 505 — 07.01-33 | February 21, 2012 |
| RAI 505 — 07.01-34 | April 5, 2012 |
| RAI 505 — 07.01-35 | April 26, 2012 |
| RAI 505 — 07.01-36 | February 9, 2012 |
| RAI 505 — 07.01-37 | March 8, 2012 |
| RAI 505 — 07.01-38 | February 9, 2012 |
| RAI 505 — 07.01-39 | February 9, 2012 |
| RAI 505 — 07.01-40 | February 9, 2012 |
| RAI 505 — 07.01-41 | February 9, 2012 |
| RAI 505 — 07.01-44 | February 9, 2012 |
| RAI 505 — 07.01-45 | April 26, 2012 |
| RAI 505 — 07.01-46 | April 26, 2012 |
| RAI 505 — 07.01-47 | February 9, 2012 |
| RAI 505 — 07.01-48 | February 9, 2012 |
| RAI 505 — 07.01-49 | February 9, 2012 |
| RAI 505 — 07.01-50 | April 26, 2012 |

| | |
|--------------------|------------------|
| RAI 505 — 07.01-51 | February 9, 2012 |
| RAI 505 — 07.03-38 | April 26, 2012 |
| RAI 505 — 07.05-10 | March 8, 2012 |
| RAI 505 — 07.08-47 | April 26, 2012 |
| RAI 505 — 07.09-71 | April 5, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (CORP/QP)
Sent: Tuesday, January 10, 2012 5:21 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 7

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions. On December 15, 2011, AREVA NP provided Supplement 6 to provide a complete and final response to 6 questions.

The attached file, "RAI 505 Supplement 7 Response US EPR DC.pdf" provides technically correct and complete final responses to 2 of the remaining 24 questions. Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 505 Question 07.08-48.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 7 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.08-44 | 2 | 3 |
| RAI 505 — 07.08-48 | 4 | 5 |

The schedule for a technically correct and complete response to the remaining 22 questions has changed as provided below. The preliminary schedule for the response to Question 07.01-33 is being reevaluated and a new supplement with a revised schedule will be transmitted by January 25, 2012.

| Question # | Response Date |
|------------|---------------|
|------------|---------------|

| | |
|--------------------|-------------------------|
| RAI 505 — 07.01-33 | January 25, 2012 |
| RAI 505 — 07.01-34 | April 5, 2012 |
| RAI 505 — 07.01-35 | April 26, 2012 |
| RAI 505 — 07.01-36 | February 9, 2012 |
| RAI 505 — 07.01-37 | March 8, 2012 |
| RAI 505 — 07.01-38 | February 9, 2012 |
| RAI 505 — 07.01-39 | February 9, 2012 |
| RAI 505 — 07.01-40 | February 9, 2012 |
| RAI 505 — 07.01-41 | February 9, 2012 |
| RAI 505 — 07.01-42 | February 9, 2012 |
| RAI 505 — 07.01-44 | February 9, 2012 |
| RAI 505 — 07.01-45 | April 26, 2012 |
| RAI 505 — 07.01-46 | April 26, 2012 |
| RAI 505 — 07.01-47 | February 9, 2012 |
| RAI 505 — 07.01-48 | February 9, 2012 |
| RAI 505 — 07.01-49 | February 9, 2012 |
| RAI 505 — 07.01-50 | April 26, 2012 |
| RAI 505 — 07.01-51 | February 9, 2012 |
| RAI 505 — 07.03-38 | April 26, 2012 |
| RAI 505 — 07.05-10 | March 8, 2012 |
| RAI 505 — 07.08-47 | April 26, 2012 |
| RAI 505 — 07.09-71 | April 5, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, December 15, 2011 1:49 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 6

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided Supplement 4 to revise the schedule for 7 questions. On December 14, 2011, AREVA NP provided Supplement 5 to revise the schedule for 5 questions.

The attached file, "RAI 505 Supplement 6 Response US EPR DC.pdf" provides technically correct and complete responses to 6 of the remaining 30 questions. Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the responses. Also appended to this file are affected pages of Technical Reports ANP-10304 and ANP-10309P. Revisions to these Technical Reports will be submitted by separate letter after completion of all responses to RAI 505.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 6 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

| Question # | Start Page | End Page |
|--------------------|-------------------|-----------------|
| RAI 505 — 07.03-37 | 2 | 3 |
| RAI 505 — 07.04-15 | 4 | 5 |
| RAI 505 — 07.05-11 | 6 | 6 |
| RAI 505 — 07.08-43 | 7 | 8 |
| RAI 505 — 07.08-45 | 9 | 10 |
| RAI 505 — 07.08-49 | 11 | 12 |

The schedule for a technically correct and complete response to the remaining 24 questions remains unchanged. The preliminary schedule for the response to Question 07.01-33 is being reevaluated and a new supplement with a revised schedule will be transmitted by January 25, 2012.

| Question # | Response Date |
|--------------------|----------------------|
| RAI 505 — 07.01-33 | January 25, 2012 |
| RAI 505 — 07.01-34 | January 10, 2012 |
| RAI 505 — 07.01-35 | February 9, 2012 |
| RAI 505 — 07.01-36 | January 10, 2012 |
| RAI 505 — 07.01-37 | January 19, 2012 |
| RAI 505 — 07.01-38 | January 10, 2012 |
| RAI 505 — 07.01-39 | January 10, 2012 |
| RAI 505 — 07.01-40 | January 10, 2012 |
| RAI 505 — 07.01-41 | January 10, 2012 |
| RAI 505 — 07.01-42 | January 10, 2012 |
| RAI 505 — 07.01-44 | January 10, 2012 |
| RAI 505 — 07.01-45 | February 9, 2012 |
| RAI 505 — 07.01-46 | February 9, 2012 |
| RAI 505 — 07.01-47 | January 10, 2012 |
| RAI 505 — 07.01-48 | January 10, 2012 |
| RAI 505 — 07.01-49 | January 10, 2012 |
| RAI 505 — 07.01-50 | January 10, 2012 |
| RAI 505 — 07.01-51 | January 10, 2012 |
| RAI 505 — 07.03-38 | February 9, 2012 |
| RAI 505 — 07.05-10 | January 19, 2012 |
| RAI 505 — 07.08-44 | January 10, 2012 |
| RAI 505 — 07.08-47 | January 10, 2012 |
| RAI 505 — 07.08-48 | January 10, 2012 |
| RAI 505 — 07.09-71 | January 10, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, December 14, 2011 11:30 AM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 5

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. In Supplement 1 sent on October 27, 2011, and Supplement 2 sent on November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. AREVA NP provided Supplement 3 on November 22, 2011 to provide a final response to 4 questions. On December 9, 2011, AREVA NP provided a revised schedule for 7 questions.

The schedule for the response to four questions (Questions 7.1-35, 7.1-45, 7.1-46, and 7.3-38) is being changed, as indicated in bold below. In addition, the preliminary schedule for the response to Question 07.01-33 has been revised as indicated. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by January 25, 2012. The schedule for a technically correct and complete response to the remaining 25 questions remains unchanged.

| Question # | Response Date |
|--------------------|-------------------------|
| RAI 505 — 07.01-33 | January 25, 2012 |
| RAI 505 — 07.01-34 | January 10, 2012 |
| RAI 505 — 07.01-35 | February 9, 2012 |
| RAI 505 — 07.01-36 | January 10, 2012 |
| RAI 505 — 07.01-37 | January 19, 2012 |
| RAI 505 — 07.01-38 | January 10, 2012 |
| RAI 505 — 07.01-39 | January 10, 2012 |
| RAI 505 — 07.01-40 | January 10, 2012 |
| RAI 505 — 07.01-41 | January 10, 2012 |
| RAI 505 — 07.01-42 | January 10, 2012 |
| RAI 505 — 07.01-44 | January 10, 2012 |
| RAI 505 — 07.01-45 | February 9, 2012 |
| RAI 505 — 07.01-46 | February 9, 2012 |
| RAI 505 — 07.01-47 | January 10, 2012 |
| RAI 505 — 07.01-48 | January 10, 2012 |

| | |
|--------------------|-------------------------|
| RAI 505 — 07.01-49 | January 10, 2012 |
| RAI 505 — 07.01-50 | January 10, 2012 |
| RAI 505 — 07.01-51 | January 10, 2012 |
| RAI 505 — 07.03-37 | January 19, 2012 |
| RAI 505 — 07.03-38 | February 9, 2012 |
| RAI 505 — 07.04-15 | January 19, 2012 |
| RAI 505 — 07.05-10 | January 19, 2012 |
| RAI 505 — 07.05-11 | January 19, 2012 |
| RAI 505 — 07.08-43 | January 19, 2012 |
| RAI 505 — 07.08-44 | January 10, 2012 |
| RAI 505 — 07.08-45 | January 10, 2012 |
| RAI 505 — 07.08-47 | January 10, 2012 |
| RAI 505 — 07.08-48 | January 10, 2012 |
| RAI 505 — 07.08-49 | January 19, 2012 |
| RAI 505 — 07.09-71 | January 10, 2012 |

Sincerely,

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

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

From: RYAN Tom (RS/NB)
Sent: Friday, December 09, 2011 8:35 AM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); WILLIFORD Dennis (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505 (5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 4

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. On October 27, 2011, and November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33. On November 22, 2011, AREVA NP provided a final response to four questions.

The schedule for the response to the questions 7.1-37, 7.3-37, 7.4-15, 7.5-10, 7.5-11, 7.8-43, and 7.8-49 is being changed and indicated in bold below, the remaining 23 questions remains unchanged, as indicated below. In addition, the preliminary schedule for a response to Question 07.01-33 remains unchanged. The schedule for Question 07.01-33 is being reevaluated and a new supplement with a revised schedule will be transmitted by December 14, 2011.

| Question # | Response Date |
|--------------------|----------------------|
| RAI 505 — 07.01-33 | December 14, 2011 |

| | |
|--------------------|-------------------------|
| RAI 505 — 07.01-34 | January 10, 2012 |
| RAI 505 — 07.01-35 | January 10, 2012 |
| RAI 505 — 07.01-36 | January 10, 2012 |
| RAI 505 — 07.01-37 | January 19, 2012 |
| RAI 505 — 07.01-38 | January 10, 2012 |
| RAI 505 — 07.01-39 | January 10, 2012 |
| RAI 505 — 07.01-40 | January 10, 2012 |
| RAI 505 — 07.01-41 | January 10, 2012 |
| RAI 505 — 07.01-42 | January 10, 2012 |
| RAI 505 — 07.01-44 | January 10, 2012 |
| RAI 505 — 07.01-45 | January 10, 2012 |
| RAI 505 — 07.01-46 | January 10, 2012 |
| RAI 505 — 07.01-47 | January 10, 2012 |
| RAI 505 — 07.01-48 | January 10, 2012 |
| RAI 505 — 07.01-49 | January 10, 2012 |
| RAI 505 — 07.01-50 | January 10, 2012 |
| RAI 505 — 07.01-51 | January 10, 2012 |
| RAI 505 — 07.03-37 | January 19, 2012 |
| RAI 505 — 07.03-38 | January 10, 2012 |
| RAI 505 — 07.04-15 | January 19, 2012 |
| RAI 505 — 07.05-10 | January 19, 2012 |
| RAI 505 — 07.05-11 | January 19, 2012 |
| RAI 505 — 07.08-43 | January 19, 2012 |
| RAI 505 — 07.08-44 | January 10, 2012 |
| RAI 505 — 07.08-45 | January 10, 2012 |
| RAI 505 — 07.08-47 | January 10, 2012 |
| RAI 505 — 07.08-48 | January 10, 2012 |
| RAI 505 — 07.08-49 | January 19, 2012 |
| RAI 505 — 07.09-71 | January 10, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, November 22, 2011 2:51 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 3

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. On October 27, 2011, and November 17, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 33 questions and a preliminary revised schedule for Question 07.01-33.

After discussions with NRC staff, the attached file, "RAI 505 Supplement 3 Response US EPR DC.pdf" provides technically correct and complete responses to 4 of the 34 questions. Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the responses to RAI 505 Question 07.07-23, Question 07.08 -46 and Question 07.09.02-72.

The following table indicates the respective pages in the response document, "RAI 505 Supplement 3 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

| Question # | Start Page | End Page |
|--------------------|-------------------|-----------------|
| RAI 505 — 07.01-43 | 2 | 3 |
| RAI 505 — 07.07-23 | 4 | 4 |
| RAI 505 — 07.08-46 | 5 | 5 |
| RAI 505 — 07.09-72 | 6 | 7 |

The schedule for the response to the remaining 30 questions remains unchanged, as indicated below. In addition, the preliminary revised schedule for a response to Question 07.01-33 remains unchanged. The schedule for Question 07.01-33 is being reevaluated and a new supplement with a revised schedule will be transmitted by December 14, 2011.

| Question # | Response Date |
|--------------------|----------------------|
| RAI 505 — 07.01-33 | December 14, 2011 |
| RAI 505 — 07.01-34 | January 10, 2012 |
| RAI 505 — 07.01-35 | January 10, 2012 |
| RAI 505 — 07.01-36 | January 10, 2012 |
| RAI 505 — 07.01-37 | December 11, 2011 |
| RAI 505 — 07.01-38 | January 10, 2012 |
| RAI 505 — 07.01-39 | January 10, 2012 |
| RAI 505 — 07.01-40 | January 10, 2012 |
| RAI 505 — 07.01-41 | January 10, 2012 |
| RAI 505 — 07.01-42 | January 10, 2012 |
| RAI 505 — 07.01-44 | January 10, 2012 |
| RAI 505 — 07.01-45 | January 10, 2012 |
| RAI 505 — 07.01-46 | January 10, 2012 |
| RAI 505 — 07.01-47 | January 10, 2012 |
| RAI 505 — 07.01-48 | January 10, 2012 |
| RAI 505 — 07.01-49 | January 10, 2012 |
| RAI 505 — 07.01-50 | January 10, 2012 |
| RAI 505 — 07.01-51 | January 10, 2012 |
| RAI 505 — 07.03-37 | December 11, 2011 |
| RAI 505 — 07.03-38 | January 10, 2012 |

| | |
|--------------------|-------------------|
| RAI 505 — 07.04-15 | December 11, 2011 |
| RAI 505 — 07.05-10 | December 11, 2011 |
| RAI 505 — 07.05-11 | December 11, 2011 |
| RAI 505 — 07.08-43 | December 11, 2011 |
| RAI 505 — 07.08-44 | January 10, 2012 |
| RAI 505 — 07.08-45 | January 10, 2012 |
| RAI 505 — 07.08-47 | January 10, 2012 |
| RAI 505 — 07.08-48 | January 10, 2012 |
| RAI 505 — 07.08-49 | December 11, 2011 |
| RAI 505 — 07.09-71 | January 10, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, November 17, 2011 5:44 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 2

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for technically correct and complete responses to the 34 questions in RAI 505. On October 27, 2011, AREVA NP provided a revised schedule for technically correct and complete responses to 13 questions and a preliminary revised schedule for Question 07.01-33.

The schedule for the final responses has been revised, as indicated in bold below. In addition, the preliminary revised schedule for a response to Question 07.01-33 has been revised. The schedule for Question 07.01-33 is being reevaluated and a new supplement with a revised schedule will be transmitted by December 14, 2011.

| Question # | Response Date |
|--------------------|--------------------------|
| RAI 505 — 07.01-33 | December 14, 2011 |
| RAI 505 — 07.01-34 | January 10, 2012 |
| RAI 505 — 07.01-35 | January 10, 2012 |
| RAI 505 — 07.01-36 | January 10, 2012 |
| RAI 505 — 07.01-37 | December 11, 2011 |
| RAI 505 — 07.01-38 | January 10, 2012 |
| RAI 505 — 07.01-39 | January 10, 2012 |
| RAI 505 — 07.01-40 | January 10, 2012 |

| | |
|--------------------|--------------------------|
| RAI 505 — 07.01-41 | January 10, 2012 |
| RAI 505 — 07.01-42 | January 10, 2012 |
| RAI 505 — 07.01-43 | December 11, 2011 |
| RAI 505 — 07.01-44 | January 10, 2012 |
| RAI 505 — 07.01-45 | January 10, 2012 |
| RAI 505 — 07.01-46 | January 10, 2012 |
| RAI 505 — 07.01-47 | January 10, 2012 |
| RAI 505 — 07.01-48 | January 10, 2012 |
| RAI 505 — 07.01-49 | January 10, 2012 |
| RAI 505 — 07.01-50 | January 10, 2012 |
| RAI 505 — 07.01-51 | January 10, 2012 |
| RAI 505 — 07.03-37 | December 11, 2011 |
| RAI 505 — 07.03-38 | January 10, 2012 |
| RAI 505 — 07.04-15 | December 11, 2011 |
| RAI 505 — 07.05-10 | December 11, 2011 |
| RAI 505 — 07.05-11 | December 11, 2011 |
| RAI 505 — 07.07-23 | December 11, 2011 |
| RAI 505 — 07.08-43 | December 11, 2011 |
| RAI 505 — 07.08-44 | January 10, 2012 |
| RAI 505 — 07.08-45 | January 10, 2012 |
| RAI 505 — 07.08-46 | December 11, 2011 |
| RAI 505 — 07.08-47 | January 10, 2012 |
| RAI 505 — 07.08-48 | January 10, 2012 |
| RAI 505 — 07.08-49 | December 11, 2011 |
| RAI 505 — 07.09-71 | January 10, 2012 |
| RAI 505 — 07.09-72 | January 10, 2012 |

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, October 27, 2011 11:22 AM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 1

Getachew,

On September 29, 2011, AREVA NP Inc. provided a schedule for a technically correct and complete response to the 34 questions in RAI 505.

The schedule for the final response to Questions 07.01-38, 07.01-44, 07.01-45, 07.01-46, 07.01-47, 07.01-48, 07.01-49, 07.01-50, 07.01-51, 07.03-38, 07.08-43, 07.08-47, 07.08-48 has been revised, as indicated in bold below. In addition, a preliminary revised schedule for a technically correct and complete response to Question 07.01-33 is provided below. The schedule for Question 07.01-33 is being reevaluated and a new supplement with a revised schedule will be transmitted by November 17, 2011.

| Question # | Response Date |
|--------------------|--------------------------|
| RAI 505 — 07.01-33 | November 17, 2011 |
| RAI 505 — 07.01-34 | December 8, 2011 |
| RAI 505 — 07.01-35 | November 17, 2011 |
| RAI 505 — 07.01-36 | December 8, 2011 |
| RAI 505 — 07.01-37 | December 8, 2011 |
| RAI 505 — 07.01-38 | January 10, 2012 |
| RAI 505 — 07.01-39 | December 8, 2011 |
| RAI 505 — 07.01-40 | December 8, 2011 |
| RAI 505 — 07.01-41 | November 17, 2011 |
| RAI 505 — 07.01-42 | December 20, 2011 |
| RAI 505 — 07.01-43 | November 17, 2011 |
| RAI 505 — 07.01-44 | January 10, 2012 |
| RAI 505 — 07.01-45 | January 10, 2012 |
| RAI 505 — 07.01-46 | January 10, 2012 |
| RAI 505 — 07.01-47 | January 10, 2012 |
| RAI 505 — 07.01-48 | January 10, 2012 |
| RAI 505 — 07.01-49 | January 10, 2012 |
| RAI 505 — 07.01-50 | January 10, 2012 |
| RAI 505 — 07.01-51 | January 10, 2012 |
| RAI 505 — 07.03-37 | November 17, 2011 |
| RAI 505 — 07.03-38 | January 10, 2012 |
| RAI 505 — 07.04-15 | November 17, 2011 |
| RAI 505 — 07.05-10 | November 17, 2011 |
| RAI 505 — 07.05-11 | November 17, 2011 |
| RAI 505 — 07.07-23 | November 17, 2011 |
| RAI 505 — 07.08-43 | January 10, 2012 |
| RAI 505 — 07.08-44 | December 8, 2011 |
| RAI 505 — 07.08-45 | December 8, 2011 |
| RAI 505 — 07.08-46 | December 8, 2011 |
| RAI 505 — 07.08-47 | January 10, 2012 |
| RAI 505 — 07.08-48 | January 10, 2012 |
| RAI 505 — 07.08-49 | November 17, 2011 |
| RAI 505 — 07.09-71 | December 8, 2011 |
| RAI 505 — 07.09-72 | December 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
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From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, September 29, 2011 11:04 AM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 505 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the 34 questions cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 505 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

| Question # | Start Page | End Page |
|--------------------|------------|----------|
| RAI 505 — 07.01-33 | 2 | 2 |
| RAI 505 — 07.01-34 | 3 | 3 |
| RAI 505 — 07.01-35 | 4 | 4 |
| RAI 505 — 07.01-36 | 5 | 5 |
| RAI 505 — 07.01-37 | 6 | 6 |
| RAI 505 — 07.01-38 | 7 | 7 |
| RAI 505 — 07.01-39 | 8 | 8 |
| RAI 505 — 07.01-40 | 9 | 9 |
| RAI 505 — 07.01-41 | 10 | 10 |
| RAI 505 — 07.01-42 | 11 | 11 |
| RAI 505 — 07.01-43 | 12 | 12 |
| RAI 505 — 07.01-44 | 13 | 13 |
| RAI 505 — 07.01-45 | 14 | 14 |
| RAI 505 — 07.01-46 | 15 | 15 |
| RAI 505 — 07.01-47 | 16 | 16 |
| RAI 505 — 07.01-48 | 17 | 18 |
| RAI 505 — 07.01-49 | 19 | 19 |
| RAI 505 — 07.01-50 | 20 | 20 |
| RAI 505 — 07.01-51 | 21 | 22 |
| RAI 505 — 07.03-37 | 23 | 23 |
| RAI 505 — 07.03-38 | 24 | 24 |
| RAI 505 — 07.04-15 | 25 | 25 |
| RAI 505 — 07.05-10 | 26 | 26 |
| RAI 505 — 07.05-11 | 27 | 27 |

| | | |
|--------------------|----|----|
| RAI 505 — 07.07-23 | 28 | 28 |
| RAI 505 — 07.08-43 | 29 | 29 |
| RAI 505 — 07.08-44 | 30 | 30 |
| RAI 505 — 07.08-45 | 31 | 31 |
| RAI 505 — 07.08-46 | 32 | 32 |
| RAI 505 — 07.08-47 | 33 | 33 |
| RAI 505 — 07.08-48 | 34 | 34 |
| RAI 505 — 07.08-49 | 35 | 35 |
| RAI 505 — 07.09-71 | 36 | 36 |
| RAI 505 — 07.09-72 | 37 | 37 |

A complete answer is not provided for the 34 questions. The schedule for a technically correct and complete response to these questions is provided below.

Please note that the date for the response to Question 07.01-33 is a commitment date to provide a final schedule for the response in a follow-up letter.

| Question # | Response Date |
|--------------------|----------------------|
| RAI 505 — 07.01-33 | October 27, 2011 |
| RAI 505 — 07.01-34 | December 8, 2011 |
| RAI 505 — 07.01-35 | November 17, 2011 |
| RAI 505 — 07.01-36 | December 8, 2011 |
| RAI 505 — 07.01-37 | December 8, 2011 |
| RAI 505 — 07.01-38 | December 20, 2011 |
| RAI 505 — 07.01-39 | December 8, 2011 |
| RAI 505 — 07.01-40 | December 8, 2011 |
| RAI 505 — 07.01-41 | November 17, 2011 |
| RAI 505 — 07.01-42 | December 20, 2011 |
| RAI 505 — 07.01-43 | November 17, 2011 |
| RAI 505 — 07.01-44 | December 20, 2011 |
| RAI 505 — 07.01-45 | December 20, 2011 |
| RAI 505 — 07.01-46 | December 20, 2011 |
| RAI 505 — 07.01-47 | December 8, 2011 |
| RAI 505 — 07.01-48 | December 20, 2011 |
| RAI 505 — 07.01-49 | December 20, 2011 |
| RAI 505 — 07.01-50 | December 20, 2011 |
| RAI 505 — 07.01-51 | December 20, 2011 |
| RAI 505 — 07.03-37 | November 17, 2011 |
| RAI 505 — 07.03-38 | December 20, 2011 |
| RAI 505 — 07.04-15 | November 17, 2011 |
| RAI 505 — 07.05-10 | November 17, 2011 |
| RAI 505 — 07.05-11 | November 17, 2011 |
| RAI 505 — 07.07-23 | November 17, 2011 |
| RAI 505 — 07.08-43 | December 20, 2011 |
| RAI 505 — 07.08-44 | December 8, 2011 |
| RAI 505 — 07.08-45 | December 8, 2011 |

| | |
|--------------------|-------------------|
| RAI 505 — 07.08-46 | December 8, 2011 |
| RAI 505 — 07.08-47 | December 20, 2011 |
| RAI 505 — 07.08-48 | December 20, 2011 |
| RAI 505 — 07.08-49 | November 17, 2011 |
| RAI 505 — 07.09-71 | December 8, 2011 |
| RAI 505 — 07.09-72 | December 8, 2011 |

Sincerely,

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

7207 IBM Drive, Mail Code CLT 2B
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From: Tesfaye, Getachew [\[mailto:Getachew.Tesfaye@nrc.gov\]](mailto:Getachew.Tesfaye@nrc.gov)

Sent: Tuesday, August 30, 2011 1:23 PM

To: ZZ-DL-A-USEPR-DL

Cc: Zhang, Deanna; Morton, Wendell; Spaulding, Deirdre; Mott, Kenneth; Truong, Tung; Zhao, Jack; Mills, Daniel; Jackson, Terry; Canova, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource

Subject: U.S. EPR Design Certification Application RAI No. 505 (5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on August 12, 2011, and discussed with your staff on August 22 and 25, 2011. No change is made to the draft RAI as a result of those discussions. 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

Tom Ryan
Project Engineer
Regulatory Affairs
AREVA NP
An AREVA and Siemens company

7207 IBM Drive - CLT2B
Charlotte, NC 28262
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Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 3971

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D4D41D2A)

Subject: Response to U.S. EPR Design Certification Application RAI No. 505
(5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 24
Sent Date: 7/20/2012 10:27:28 AM
Received Date: 7/20/2012 10:27:47 AM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

Recipients:
"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>
Tracking Status: None
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Tracking Status: None
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Tracking Status: None
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Post Office: auscharm02.adom.ad.corp

| Files | Size | Date & Time |
|--|-------|-----------------------|
| MESSAGE | 91751 | 7/20/2012 10:27:47 AM |
| RAI 505 Supplement 24 Response US EPR DC.pdf | | 629666 |

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

Response to

Request for Additional Information No. 505, Supplement 24

8/30/2011

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 07.01 - Instrumentation and Controls - Introduction

SRP Section: 07.03 - Engineered Safety Features Systems

SRP Section: 07.04 - Safe Shutdown Systems

SRP Section: 07.05 - Information Systems Important to Safety

SRP Section: 07.07 - Control Systems

SRP Section: 07.08 - Diverse Instrumentation and Control Systems

SRP Section: 07.09 - Data Communication Systems

Application Section: FSAR Chapter 7

**QUESTIONS for Instrumentation, Controls and Electrical Engineering 1
(AP1000/EPR Projects) (ICE1)**

Question 07.01-48:**OPEN ITEM**

Provide more design on SAS compliance with the requirements of IEEE Std. 603-1998, Clause 6.1. Also provide an ITAAC that verifies SAS control and display location in the main control room (MCR) to verify the requirements of Clause 6.2 are incorporated into the SAS design.

For Automatic Controls

Clause 6.1 of IEEE Std. 603-1991 requires that means shall be provided to automatically initiate and control all protective actions except as justified in Clause 4.e of IEEE Std. 603-1998. The guidance of SRP Appendix 7.1-C for Clause 6.1 indicates that the applicant's analysis should confirm that the safety system has been qualified to demonstrate that the performance requirements are met, and that the evaluation of the precision of the safety system should be addressed to the extent that setpoints, margins, errors, and response times are factored into the analysis.

The applicant provides the following design elements into the protection system design to meet the requirements of Clauses 6.1:

- An approved setpoint methodology for the U.S. EPR FSAR.
- Operating margins for process variables monitored for reactor trip (RT) and engineered safety features (ESF) systems presented in U.S. EPR FSAR, Tier 2, Sections 7.2 and 7.3.
- Setpoints and corresponding system response times (time delays) for each RT and ESF function documented in Tier 2, Table 15.0-7 and Table 15.0-8, respectively.
- ITAAC Item 4.1 and 4.2 from Tier 1, Table 2.4.1-7, which verifies the completion of protective action for automatic ESF actuation signals.

The SAS Tier 1 ITAAC is documented in Tier 1, Section 2.4.4. The applicant does not provide an ITAAC item that provides a direct verification of the SAS design meeting the requirements of Clauses 6.1 and 7.1. The staff is not aware of any setpoint analysis or response time requirements for SAS. Per the guidance provided in SRP Appendix 7.1-C, the staff requests the applicant to provide information such as the above four items for SAS.

In particular, does SAS have any response time requirements, considering that SAS functionality in terms of ESF support, may have timing requirements for helping the plant achieve safe shutdown conditions?

For Manual Controls

Clause 6.2 of IEEE Std. 603-1991 requires, in part, that means be provided to manually initiate protective system actuation at the division level with minimal number of discrete operator manipulations. There is also no information on the SAS manual controls in Tier 1, Section 2.4.4. Tier 1, Table 2.4.4-6, does not have an ITAAC item that verifies SAS manual controls design function. There is also no ITAAC item in Table 2.4.4-6 verifying where SAS controls and displays are located and verifying if they're in the main control room (MCR), specifically on the SICS. Tier 2, Table 7.1-4, Interim Revision 3 mark-ups, states that the SICS has a hardwired

connection to the SAS for manual grouped commands so this is also a potential discrepancy in the Tier 1 information.

The staff requests the applicant add information to Tier 1 concerning SAS manual grouped controls. The staff also requests the applicant add ITAAC Items to Table 2.4.4-6 to verify the manual control design function, as well as display and controls location in the MCR.

Response to Question 07.01-48:

This response supersedes the prior response to Question 07.01-48 in its entirety.

Automatic Controls

The safety automation system (SAS) meets the requirements of IEEE Std. 603-1998, Clause 6.1 which requires a means to be provided to automatically initiate and control protective actions, except as justified in Clause 4.1. The SAS also meets the requirements of IEEE Std. 603-1998, Clause 7.1, which requires capability to be incorporated in the design to receive and act upon automatic control signals from the sense and command features. U.S. EPR FSAR Tier 1, Table 2.4.4-6, Item 4.18 confirms that the SAS design meets the requirements of IEEE 603-1998, Clauses 6.1 and 7.1, by verifying the completion of each automatic function listed in U.S. EPR FSAR Tier 1 Table 2.4.4-5.

The following three SAS functions are included within scope of the Safety Analysis in U.S. EPR FSAR Tier, 2 Chapter 15:

- Emergency feedwater (EFW) level control.
- Emergency feedwater system (EFWS) pump overflow protection.
- Steam generator main steam relief control valve (MSRCV) regulation during pressure control.

U.S. EPR FSAR Tier 2, Section 7.1.1.4.2 will be revised to incorporate this reference to the SAS functions that are included within the scope of the safety analysis in Chapter 15.

These functions are closed loop control functions. The U.S EPR Setpoint Methodology document only analyzes setpoint uncertainties on open loop control functions such as RT or engineered safety feature actuation system (ESFAS) actuations. Uncertainty calculations are used to verify that setpoints associated with open loop control functions actuate conservatively before the analytical or safety limits are reached. Conversely, closed loop control functions are based on a physical value being fed back into the control loop and used to maintain the controlled parameter close to the setpoint. System control setpoints are in the acceptable range of the parameter. An operating margin exists between the control setpoint and any protective action setpoint. Therefore, as a result of the inherent properties of closed loop control functions, the uncertainty introduced by open loop functions is not relevant to closed loop control functions.

The measuring range of the process variables associated with each aforementioned function will be provided in the U.S. EPR FSAR Tier 2, Table 7.1-8 in order to fulfill the requirements of IEEE 603-1998, Clauses 6.1 and 7.1.

Due to the intrinsic properties of a closed loop control function, the system response time is directly proportional to the settling time of the control loop. This settling time is adjusted during the fine-tuning of the control loop.

In order for the SAS to verify that the MSRCV modulates to depressurize the secondary side at a rate corresponding to 180°F per hour, several mechanical, instrumentation and control (I&C) and electrical components must be functioning according to their design requirements. The SAS receives signals from the sensors associated with the MSRCV control function through the SCDS. The signals are then processed in the CU function processors within SAS and a modulating control signal is sent to the PACS module associated with the MSRCV valve.

Operation of each I&C component needed for closed loop control of the MSRCV valve is verified with the following tests and surveillance requirements:

- Operation of the sensors associated with the MSRCV control function are verified through the sensor operational test Surveillance Requirement (SR) as described in U.S. EPR FSAR Tier 2, Chapter 16 SR 3.3.1.5 and the calibration SR 3.3.1.2, 3.3.1.4, and 3.3.1.6, described in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications, 3.3.1 and associated Bases.
- Operation of the SCDS is verified through the sensor operational test SR 3.3.1.5, described in the U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications, Section 3.3.1 and associated Bases.
- Operation of the control units (CUs) is verified through SR 3.3.1.10, the setpoint verification surveillance requirement as described in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications, Section 3.3.1 and associated Bases; and the extended self test is verified through SR 3.3.1.7, described in the U.S. EPR FSAR Tier 2, Chapter 16 Technical Specifications, Section 3.3.1 and associated Bases. The operation of the CUs is also verified using a continuous self test which is described in ANP-10315P, Section 2.2.6.1.
- Operation of the PACS is verified through the actuating device operational test SRs 3.3.1.3 and 3.3.1.8, described in the U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications, Section 3.3.1 and associated Bases.

For Manual Controls

The SAS meets the requirements of IEEE Std. 603-1998, Clause 6.2. An ITAAC item will be added to U.S. EPR FSAR Tier 1, Table 2.4.4-4 to verify that the safety information and control system (SICS) has a hardwired connection to the SAS for manual grouped controls. The Human Factors Engineering (HFE) team will determine the location of the grouped controls on the SICS panels to verify that operators can optimally perform manual grouped controls.

An ITAAC item will be added to U.S. EPR FSAR Tier 1, Table 2.4.4-4 to verify that SAS manual grouped controls and indications are available on the SICS in the MCR.

U.S. EPR FSAR Tier 2, Section 7.4.1.1 will be revised to include clarification of the PICS controls in the remote shutdown station.

U.S. EPR FSAR Tier 2, Section 7.1 and 7.4 will be revised to state the RSS capability to achieve and maintain safe shutdown conditions when referred to generically for accident

mitigation. In specific cases where the safe shutdown condition is cold shutdown for the systems mitigating the event, the shutdown condition will be described as cold shutdown.

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.4.4-4 and Tier 2, Section 7.1 and Section 7.4 and Tier 2, Table 7.1-8 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups



- By introducing and varying, a substitute input of the same nature as the measured variable.
- By cross-checking between channels that bear a known relationship to each other.
- By specifying equipment that is stable and the period of time it retains its calibration during post-accident conditions.

4.16 Deleted.

4.17 Hardwired disconnects exist between the service unit (SU) and each divisional monitoring and service interface (MSI) of the SAS. The hardwired disconnects prevent the connection of the SU to more than a single division of the SAS.

4.18 The SAS performs the automatic functions listed in Table 2.4.4-~~52~~—Safety Automation System Automatic Functions and Input Variables.

4.19 During data communication, the SAS function processors receive only the pre-defined messages for that specific function processor. Other messages are ignored.

4.20 SAS self-test features are capable of detecting and responding to faults.

4.21 SAS connections to the SICS are hardwired for manual grouped controls.

4.22 SAS manual grouped controls and indications are available on the SICS in the MCR.

4.23 Permissive P15 provides operating bypass capability for the following SAS functions:

- Safety Injection and Heat Removal System - Automatic Trip of LHSI Pump (in RHR Mode) on Low Delta Psat.
- Safety Injection and Heat Removal System - Automatic Trip of LHSI Pump (in RHR Mode) on Low Loop Level.

5.0 Electrical Power Design Features

5.1 ~~Class 1E SAS~~ The components designated as Class 1E in Table 2.4.4-1 are powered from a Class 1E division as listed in Table 2.4.4-1 in a normal or alternate feed condition.

6.0 Environmental Qualification

6.1 Components listed as Class 1E in Table 2.4.4-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.

~~6.0~~7.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.4-~~64~~ lists the SAS ITAAC.



Table 2.4.4-64—Safety Automation System ITAAC (11 Sheets)

| Commitment Wording | | Inspections, Tests, Analyses | Acceptance Criteria |
|--------------------|--|--|---|
| 4.20 | <u>SAS self-test features are capable of detecting and responding to faults consistent with the requirements of the SAS.</u> | <p>a. <u>Type tests, analyses or a combination of type tests and analyses will be performed to verify that faults requiring detection through self-test features are detected by the SAS equipment.</u></p> <p>b. <u>Type tests, analyses or a combination of type tests and analyses will be performed to verify that upon detection of faults through self-test features, the SAS equipment responds according to the type of fault.</u></p> | <p>a. <u>A report concludes that the SAS equipment is capable of detecting faults required to be detected by self-test features.</u></p> <p>b. <u>A report concludes that upon detection of faults through self-test features, the SAS equipment responds according to the type of fault.</u></p> |
| 4.21 | <u>SAS connections to the SICS are hardwired for manual grouped controls.</u> | <u>Inspections will be performed.</u> | <u>SAS connections to the SICS are hardwired for manual grouped controls.</u> |
| 4.22 | <u>SAS manual grouped controls and indications are available on the SICS in the MCR.</u> | <p>a. <u>Inspections will be performed.</u></p> <p>b. <u>Tests will be performed using test signals.</u></p> | <p>a. <u>SAS manual grouped controls and indications are available on the SICS in the MCR.</u></p> <p>b. <u>SAS equipment is capable of operating manual grouped control functions from the SICS in the MCR.</u></p> |



associated communication module before the individual signals are extracted from the message. If a communication failure is detected, a faulty status is attached to the signals in the message before they are used in function block processing.

Single failures upstream of the CU layer that could result in an invalid signal being used in the SAS actuation are accommodated by modifying the vote in the CU layer. Each SAS actuation function is evaluated on a case-by-case basis to determine whether the vote is modified toward actuation or no actuation. In cases where inappropriate actuation of an SAS function could challenge plant safety, the function is modified toward no actuation. Otherwise, the function is modified toward actuation. The concept of modification toward no actuation based on the number of input signals to the voting function block that carry a faulty status is as follows:

- 0 faulty input signals: Vote is 2/4.
- 1 faulty input signal: Vote is 2/3.
- 2 faulty input signals: Vote is 2/2.
- 3 faulty input signals: No actuation.
- 4 faulty input signals: No actuation.

Power Supply

The SAS is powered from the Class 1E uninterruptible power supply (EUPS). The EUPS provides backup power with two-hour batteries and the EDGs in the case of a LOOP. In the event of an SBO, the EUPS has the capability of receiving power from the SBODGs.

Refer to Chapter 8 for more information on the electrical power systems.

Safety Analysis

The following three SAS functions are included within the scope of the Safety Analysis in Chapter 15:

- EFW level control
- EFWS pump overflow protection
- Steam generator main steam relief control valve (MSRCV) regulation during pressure control.

The measuring range of the process variables associated with each aforementioned function is shown in Table 7.1-8. Due to the intrinsic properties of a closed loop control function, the system response time is directly proportional to the settling time



of the control loop. This settling time is adjusted during the fine-tuning of the control loop.

7.1.1.4.3 Priority and Actuator Control System

The PACS is a safety-related system that performs prioritization of signals from different I&C systems, drive actuation, and monitoring plant actuators.

Classification

The PACS is classified as safety-related.

Functions

Table 7.1-3 shows the functions of the PACS.

Interfaces

Table 7.1-4 shows the interfaces of the PACS.

Architecture

Figure 7.1-8—Priority and Actuator Control System Architecture provides a functional representation of the PACS.

The PACS is organized into four independent divisions located in the following buildings:

- Safeguard Buildings.
- Emergency Power Generating Buildings.
- Essential Service Water Pump Buildings.

In each division, there are safety-related and non-safety-related PACS equipment to interface with safety-related and non-safety-related actuators, respectively. The safety-related PACS and non-safety-related PACS equipment is located in separate cabinets.

The PACS is composed of priority modules and communication modules. One priority module and one communication module are provided for each actuator/black box.

The PACS receives actuation orders sent by the various DCS systems for prioritization. Signals are sent either via hardwired connections or a dedicated data connection to the PAS. Interfaces with actuation devices and actuated equipment (e.g., switchgear, torque and limit switches) are via hardwired connections. Priority between actuation requests from the various DCS systems is established by wiring the inputs using the



7.1.3.2.8 GDC 19 – Control Room

The applicable I&C systems listed in Table 7.1-2 are designed to meet the requirements of GDC 19. Section 7.1.1.3.1 and Section 7.1.1.3.2 describe the capabilities of the SICS and PICS with regards to the capability for safe operation of the plant from the MCR during normal and accident conditions. Section 7.3.1.2.16 describes the MCR air conditioning system isolation and filtering function to limit radiation levels in the MCR. Section 7.1.1.3.1 and Section 7.1.1.3.2 describe the capabilities of the SICS and PICS to achieve **both hot and cold safe** shutdown conditions from the RSS.

7.1.3.2.9 GDC 20 – Protection System Functions

The applicable I&C systems listed in Table 7.1-2 are designed to meet the requirements of GDC 20. Section 7.2 and Section 7.3 describe the protective actions credited in the accident analysis described in Chapter 15. Setpoints for these protective actions are determined using the methodology described in ANP-10275P-A (Reference 14). The single-sided measurement uncertainty reduction factor shall not be used in determining U.S. EPR setpoints.

7.1.3.2.10 GDC 21 – Protection System Reliability and Testability

The applicable I&C systems listed in Table 7.1-2 are designed to meet the requirements of GDC 21. This is provided by compliance with IEEE Std 603-1998 (Reference 1). Specifically, compliance with Clause 5.1 (single-failure criterion), Clauses 5.7 and 6.5 (capability for testing and calibration), and Clauses 6.7 and 7.5 (maintenance bypass) demonstrates the capability for testing the applicable I&C systems during operation.

7.1.3.2.11 GDC 22 – Protection System Independence

The applicable I&C systems listed in Table 7.1-2 are designed to meet the requirements of GDC 22. This is provided by compliance with Clause 5.6.2 (independence) of IEEE Std 603-1998 (Reference 1).

7.1.3.2.12 GDC 23 – Protection System Failure Modes

The applicable I&C systems listed in Table 7.1-2 are designed to meet the requirements of GDC 23. The failure modes and effects analysis (FMEA) for the PS is described in Section 7.2.2.2 and Section 7.3.2.2.

7.1.3.2.13 GDC 24 – Separation of Protection and Control Systems

The applicable I&C systems listed in Table 7.1-2 are designed to meet the requirements of GDC 24. This is provided by compliance with IEEE Std 603-1998 (Reference 1). Specifically, compliance with Clause 5.1 (single-failure criterion),



achieve ~~hot and cold~~ safe shutdown from the RSS in case of a fire. Fiber optic cable is extensively used for communications within the DCS systems to reduce the risk of fires and hot shorts. The fire analysis for the U.S. EPR is described in Chapter 9.

7.1.3.4.19 RG 1.204 – Guidelines for Lightning Protection of Nuclear Power Plants

The applicable I&C systems listed in Table 7.1-2 are designed to meet the guidance of RG 1.204, which endorses IEEE Std 1050-1996 (Reference 19) and IEEE Std C62.23-1995 (Reference 20). Refer to Section 8.3 for more information on lightning and surge protection for the U.S. EPR.

7.1.3.4.20 RG 1.209 – Guidelines for Environmental Qualification of Safety-Related Computer-Based Instrumentation and Control Systems in Nuclear Power Plants

The applicable I&C systems listed in Table 7.1-2 are designed to meet the guidance of RG 1.209, which endorses IEEE Std 323-2003 (Reference 21) with modifications. The equipment qualification program is described in Section 3.11.

7.1.3.5 Conformance to Branch Technical Positions

7.1.3.5.1 BTP 7-1 – Guidance on Isolation of Low-Pressure Systems from the High Pressure Reactor Coolant System

The applicable I&C systems listed in Table 7.1-2 are designed to meet the guidance of BTP 7-1 (Reference 22), with the exception that the applicable RHR valves are not automatically shut upon re-pressurization of the RCS. The RHR suction valve interlocks and a justification for this approach are described in Section 7.6.1.2.1.

7.1.3.5.2 BTP 7-2 – Guidance on Requirements of Motor-Operated Valves in the Emergency Core Cooling System Accumulator Lines

The applicable I&C systems listed in Table 7.1-2 are designed to meet the guidance of BTP 7-2 (Reference 23). The interlocks associated with the safety injection accumulators are described in Section 7.6.1.2.4.

7.1.3.5.3 BTP 7-3 – Guidance on Protection System Trip Point Changes for Operation with Reactor Coolant Pumps Out of Service

The applicable I&C systems listed in Table 7.1-2 are designed to meet the guidance of BTP 7-3 (Reference 24). Upon a loss of a RCP, a three-loop signal is automatically generated and is used to modify the calculation of various reactor trips described in Section 7.2 to account for the changes in flow rate. This performs the same effect as modifying the setpoint.

Table 7.1-8—SAS Variables included within the Scope of Safety Analysis

| <u>Safety Function</u> | <u>Variables to be Monitored</u> | <u>Range of Variables</u> |
|---|--|---------------------------|
| <u>EFW Level Control</u> | <u>SG Level (WR)</u> | <u>0-100% MR</u> |
| <u>EFWS pump overflow protection</u> | <u>EFW Pump Discharge Flow</u> | <u>0-450 gpm</u> |
| <u>Steam generator MSRCV regulation during pressure control</u> | <u>Pressurizer Pressure (NR)</u> | <u>1615-2515 psia</u> |
| | <u>Hot Leg Pressure (WR)</u> | <u>15-3015 psia</u> |
| | <u>Hot Leg Temperature (WR)</u> | <u>32-662 °F</u> |
| | <u>Hot Leg Temperature (NR)</u> | <u>536°F-662°F</u> |
| | <u>Hot Leg Loop Level</u> | <u>0-30.71 in</u> |
| | <u>Neutron Flux-Self Powered Neutron Detectors</u> | <u>0.5-200% NP</u> |
| | <u>Cold Leg Temperature (NR)</u> | <u>32°F - 662°F</u> |
| | <u>RCP Speed</u> | <u>800 -1600 rpm</u> |
| | <u>RCS Loop Flow</u> | <u>0-120% NF</u> |
| | <u>RCCA position</u> | <u>0-100% Insertion</u> |
| | <u>Pressurizer Pressure (NR)</u> | <u>1615-2515 psia</u> |
| | <u>Neutron Flux-Power Range Detectors</u> | <u>0.5-200% NP</u> |
| | <u>Neutron Flux-Intermediate Range Detectors</u> | <u>5 x 10E-6-60% NP</u> |
| | <u>Pressurizer Level</u> | <u>0-100% MR</u> |
| | <u>SG Pressure</u> | <u>15-1615 psia</u> |
| | <u>SG Level (NR)</u> | <u>0-100% MR</u> |
| | <u>Containment Service Compartment Pressure (NR)</u> | <u>-3 psig to +7 psig</u> |
| | <u>Containment Equipment Compartment Pressure</u> | <u>-3 psig to +7 psig</u> |
| | <u>Cold Leg Temperature (WR)</u> | <u>32°F - 662°F</u> |

Notes:

NP = Nuclear Power, NF = Nominal Flow, MR = Measuring Range

Next File



7.4 Systems Required For Safe Shutdown

To achieve a safe shutdown configuration, the appropriate alignment of systems is required to implement the following functions associated with attaining and maintaining a safe shutdown condition:

- Reactivity control.
- Reactor coolant makeup.
- Reactor coolant system pressure control.
- Decay heat removal.
- Process monitoring.

The definition of safe shutdown, the criteria applicable to the shutdown, and the equipment that can be utilized to reach safe shutdown are different depending on the scenario. This section provides information on components and systems that are used to achieve safe shutdown for specific scenarios.

- **Cold S**shutdown using only safety-related equipment to shutdown the plant in accordance with BTP 5-4 (Reference 2).
- **Cold S**shutdown post-fire in accordance with RG 1.189.
- **Hot S**shutdown required during and following a station blackout (SBO) in accordance with 10 CFR 50.63 and in accordance with RG 1.155.

Section 7.4.1 describes the systems necessary to achieve safe shutdown, including the instrumentation and control (I&C) systems that are associated with the safe shutdown functions. Several systems can perform a safe shutdown function. Section 7.4.1 also notes the description of these systems and their associated I&C references.

7.4.1 Description

7.4.1.1 I&C Systems Associated with Safe Shutdown

Engineered safety features (ESF) are used to achieve and maintain safe shutdown. The actuation of the ESF is performed by the protection system (PS). The I&C that perform ESF actuation are described in Section 7.3. The safety automation system (SAS) automatically controls the safety-related systems once those systems are actuated by the PS. The SAS provides grouped commands execution initiated from the safety information and control system (SICS). This is designed to provide control of the safety-related systems that are needed to reach safe shutdown of the plant.

The priority and actuator control system (PACS) controls safety-related components associated with safe shutdown. The functions performed by the PACS are described in



Section 7.1.1.4.3. The manual functions needed for safe shutdown functions are duplicated in the process information and control system (PICS) and the process automation system (PAS). The SICS is directly hardwired to PACS for the component-level manual commands.

The human machine interface (HMI) is the PICS and SICS. Monitoring and control of the safety-related systems are both available in the main control room (MCR) and the remote shutdown station (RSS). The operator uses the PICS as the primary HMI in the MCR and RSS to mitigate the event and to achieve and maintain ~~cold~~safe shutdown (e.g. manual component level control, manual grouped controls, indications, alarms). The PICS and PAS are credited in the RSS for manual grouped controls, manual component level controls, indications, and alarms. Because the PICS does not send commands to the diverse actuation system (DAS), PS, or SAS, there are some functions that the operator must perform using the SICS from the MCR. These include:

- Manual actuation of reactor trip (RT) and ESF actuation (as required).
- Manual reset of ESF actuation functions.
- Validating or inhibiting of DAS and PS permissives as needed to transition the plant to ~~cold~~safe shutdown.
- Interfacing with automatic functions within SAS (e.g., auto/manual switchover) as needed.

The SICS inventory in the RSS consists of the following controls that are unavailable on PICS but are needed to achieve and maintain ~~safe~~cold shutdown:

- RT.
- P12 permissive (switches safety injection (SI) modes, bypasses main steam relief train (MSRT) isolation, main steam isolation, main feedwater startup and shutdown system (SSS) isolation functions, and SI accumulator valve interlock bypass).
- P14 permissive (partial cooldown operating bypass, setpoint change for MSRT opening residual heat removal (RHR) interlock).
- P15 permissive (SI mode switching).
- P17 permissive (pressurizer safety relief valve opening operating bypass, large miniflow line interlock).
- SIS actuation reset.
- Emergency feedwater system (EFWS) actuation reset.
- EFWS isolation reset.



- MSRIV opening reset.
- MSRT isolation reset.
- SG isolation reset.

7.4.1.2 Safe Shutdown Using Safety-Related Systems and Equipment

The plant is designed so that it can be taken from normal operating conditions to cold shutdown from the MCR using only safety-related systems in accordance with BTP 5-4. The safety-related systems and equipment, that with proper alignment are capable of achieving a safe shutdown of the plant, are described in Section 7.4.1.2.1 through Section 7.4.1.2.13. These systems satisfy GDC 1, GDC 2, GDC 3, and GDC 4.

The systems and equipment described in Section 7.4.1.2.1 through Section 7.4.1.2.13 are capable of bringing the plant to a cold shutdown condition, with only offsite or onsite power available along with the most limiting single failure. The entire shutdown procedure is completed from the MCR.

7.4.1.2.1 Emergency Feedwater System

The emergency feedwater system (EFWS) provides a safety-related means of supplying feedwater to the steam generators (SG) for decay heat removal. This system is capable of maintaining hot standby and facilitating a plant cooldown. The I&C associated with the EFWS are described in Section 10.4.9.

7.4.1.2.2 Main Steam System

The main steam system (MSS) contains the MSRT. The MSRT provides secondary side pressure control capability. The MSRT valves are located outside of containment upstream of the main steam isolation valves (MSIV). These valves are used to remove decay heat via the SGs in the event the condenser is unavailable (including loss of power), and to dissipate the heat to atmosphere. The MSRT may be used to cool and depressurize the reactor coolant system (RCS) to conditions necessary to initiate residual heat removal. The MSS contains the MSIVs and associated bypass valves that are necessary to isolate the secondary plant and to allow decay heat removal by the MSRT. The I&C associated with the MSS are described in Section 10.3.

7.4.1.2.3 Medium Head Safety Injection

The safety injection system (SIS) contains medium head safety injection (MHSI) pumps that are capable of providing negative reactivity by the injection of highly borated water into the RCS from the in-containment refueling water storage tank (IRWST). The MHSI pumps may be used to add boron to the RCS during hot shutdown and cold shutdown phases, if the extra borating system (EBS) is unavailable. The I&C associated with the MHSI pumps and IRWST are described in Section 6.3.



- All equipment in one fire area (except for the MCR and containment) is rendered inoperable by fire.
- Re-entry to the fire area for repair or operator actions is not possible.

The fire protection analysis described in Appendix 9A confirms the plant capability to safely reach cold shutdown following a fire. The systems described in Section 7.4.1.2 and the additional systems listed in Section 7.4.1.3.1 through Section 7.4.1.3.3 were identified as post-fire safe shutdown systems.

7.4.1.3.1 Main Feedwater System

Associated circuits of concern were identified when selecting post-fire safe shutdown systems. These circuits are non-safety-related or safety-related circuits that could adversely affect the identified shutdown equipment by feeding back potentially disabling conditions. One of these disabling conditions is spurious operation of the main feedwater pumps caused by fire damage to the power circuit of these pumps. In the event that spurious operation of the main feedwater pumps occur, capability to isolate the main feedwater system is provided to prevent possible overcooling of the steam generator (SG).

7.4.1.3.2 Chemical and Volume Control System

The chemical and volume control system (CVCS) is a non-safety-related system that provides reactivity control and reactor coolant makeup water. Reactivity control is possible through the injection of borated water through the CVCS charging lines. The CVCS is an alternate to the safety-related systems in Section 7.4.1.2 that provides reactivity control and reactor coolant makeup water. The I&C associated with the CVCS are described in Section 9.3.4.

7.4.1.3.3 Fuel Pool Cooling and Purification System

The spent fuel pool cooling and purification system (FPCPS) provides cooling to the spent fuel pool to remove decay heat during normal operation, plant shutdown, and accident conditions. The FPCPS is included as a post-fire shutdown system because fires in the spent fuel areas must be considered. The I&C associated with the FPCPS are described in Section 9.1.3.

7.4.1.3.4 Remote Shutdown Station

The RSS provides an independent alternative shutdown capability that is physically and electrically independent of the MCR.

The RSS is a control center located in Safeguard Building 3 near the MCR. It contains the equipment necessary to bring the plant to a safe shutdown state during an event requiring evacuation of the MCR, in conjunction with:



- A single failure of a system, structure, or component required to bring the plant to safe shutdown (in the event of a fire, no additional single failure, unrelated to the damage caused by the fire, is considered).
- A sustained loss of either onsite or offsite AC power.

The RSS contains both the PICS and the SICS. The PICS provides most of the necessary controls for safe shutdown. The SICS controls are only those controls needed to achieve safe shutdown that are unavailable on the PICS. These SICS

controls are listed in Section 7.4.1.1. Therefore, the RSS, using PICS and SICS, provides all the displays and controls necessary to reach and maintain safe shutdown.

The architecture of the SICS and PICS is described in Section 7.1. Communication equipment is described in Section 9.5.2.

The ~~SICS and PICS provide the~~ displays and controls in the RSS to allow the monitoring and control of the following safe shutdown functions during a postulated fire in the MCR or during an event that could cause the MCR to become uninhabitable, coupled with a single failure:

- Reactivity control.
- Reactor coolant makeup.
- Reactor coolant system pressure control.
- Decay heat removal.
- Control and monitoring of safety support systems for the above functions, as well as essential service water, component cooling water, and onsite power including the emergency diesel generators.

The physical layout of the RSS and equipment located in it is taken into consideration in the human factors engineering program described in Chapter 18.

In the event of a condition requiring MCR evacuation, operators will transfer control from the MCR to the RSS via the MCR-RSS transfer switches, which are located in the RSS. MCR actions required per procedures to transfer control to the RSS can be accomplished during a rapid evacuation of the MCR. Communications equipment is provided to support the transfer. If the MCR requires evacuation, the following actions are taken:

- Perform an RT (from the MCR if time allows, from the RSS if there is not enough time).
- Log out of the PICS workstations in the MCR (if time allows).
- Transition to the RSS.



- Actuate the MCR-RSS transfer switches, which performs the following actions:
 - Disables diverse actuation system (DAS) outputs so that no DAS functions (automatic or manual) are operable.
 - Disables manual controls for PS, SAS and PACS from the MCR.
 - Disables the ability of the PICS workstations in the MCR to communicate to the RCSL and PAS.
 - Enables manual controls for PS in the RSS.
- Log into the PICS workstations in the RSS.
- Take actions as needed to reach and maintain hot standby with the PICS.

If the MCR will be unavailable for an extended period of time, the operator will use the PICS as well as the necessary permissives and ESF resets, if necessary, on the SICS to reach and maintain cold shutdown.

The RSS is only utilized following an evacuation of the MCR. No actions are required from the RSS during normal operation.

The MCR-RSS transfer switches maintain divisional independence, so that an electrical failure in one safety division cannot affect another safety division. Additionally, the MCR-RSS transfer switches cannot be disabled by a single active failure coincident with a LOOP. Access to the MCR-RSS transfer switches results in annunciation of an alarm in the MCR. The MCR-RSS transfer switches are key-locked.

Displays in the MCR and RSS contain real-time plant data prior to, during, and after control transfer from one station to the other. The RSS data are populated from the same information buses that supply data to the MCR. During the time that control is transferred from the MCR to the RSS or vice versa, data are not lost or interrupted. An indication on the PICS and SICS shows that RSS control has been established.

7.4.1.4 Station Blackout Safe Shutdown

The SBO safe shutdown equipment are predicated on fulfilling those functions delineated by 10 CFR 50.63 and RG 1.155 to take the plant from normal operating conditions to hot shutdown from the MCR. Section 8.4 describes the systems and equipment, including I&C systems necessary for achieving safe shutdown.