ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Friday, April 27, 2012 2:51 PM
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 18
Attachments: RAI 505 Supplement 18 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).

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.
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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
Email: Dennis.Williford@areva.com

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,

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From: Tesfaye, Getachew [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

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 3901

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D4C3ADD0)

Subject: Response to U.S. EPR Design Certification Application RAI No. 505 (5902,5735,5869,5754,5803,5950,5744), FSAR Ch. 7, Supplement 18
Sent Date: 4/27/2012 2:51:22 PM
Received Date: 4/27/2012 2:50:22 PM
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
"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>
Tracking Status: None
"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>
Tracking Status: None
"Tesfaye, Getachew" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

Post Office: auscharmx02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	67707	4/27/2012 2:50:22 PM
RAI 505 Supplement 18 Response US EPR DC.pdf	687726	

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

Response to

Request for Additional Information No. 505, Supplement 18

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 07.01-36:

OPEN ITEM

Clarify the new voting scheme for Safety Automation System (SAS) voting logic and how the voting logic is modified in the presence of a single failure.

10 CFR 50.55a(h) incorporates by reference IEEE Std. 603-1991. As part of an alternative request, the applicant proposes to use IEEE Std. 603-1998. Clause 5.1 of IEEE Std. 603-1998 require, in part, that safety systems perform all safety functions in the presence of any single detectable failure, all failures caused by a single failure, and all failures or spurious actuations caused by a design basis event.

Upon receiving a start signal from the PS, SAS provides closed-loop controls for specified engineered safety features (ESF) systems to allow the plant reach and maintain safe shutdown conditions. Initially, the design of SAS incorporated a 2nd min / 2nd max selection scheme as part of its divisional logic scheme, which can be seen in U.S. EPR FSAR, Tier 2, Section 7.3, Revision 2. In response to RAI 442, Question 07.03-32, the applicant provided Interim Revision 3 mark-ups of Tier 2, Section 7.3. As shown in Tier 2, Figure 7.3-12, Interim Revision 3 mark-ups, a single sensor voting scheme has replaced the 2nd min / 2nd max function. Given this change to a more conventional voting scheme, the applicant did not provide any design information on the new voting scheme in the FSAR. The applicant also did not provide any information on how SAS voting logic is modified in the presence of a single failure, similar to information provided for the PS in Technical Report ANP-10309P. This information is critical to the staff's evaluation of SAS compliance with IEEE Std. 603-1998, Clause 5.1. The staff requests the applicant provide information in the FSAR concerning the new SAS voting scheme and to also provide information on how SAS voting logic is modified in the presence of single failures, faulty signals and messages, etc.

Response to Question 07.01-36:

A failure modes and effects analysis (FMEA) for SAS, that demonstrates SAS failure modes, was incorporated into U.S. EPR FSAR Tier 2, Section 7.1, as new Table 7.1-7—SAS FMEA Results, as a part of the response to RAI 505, Question 07.01-35.

To bound the possible failures, both detected and undetected failures of sensors and digital equipment are analyzed and the worst-case effect of each failure is identified. Detected failures are defined as those automatically detected by the inherent and engineered monitoring mechanisms of the system. Two types of undetected failures are analyzed:

- A failure denoted “undetected–spurious” is defined as a failure not automatically detected which results in an actuation.
- A failure denoted “undetected–blocking” is defined as a failure not automatically detected which results in failure to issue an actuation when needed.

Since failures in the hardwired output logic are not detected automatically by the SAS, only undetected single failures of these devices are considered. A failure of the output logic can result in a spurious actuation (“undetected–spurious”), or failure to actuate when needed (“undetected–blocking”).

Network failures within the SAS allow the receiver of data to be affected in one of the three following ways:

- The network failure can result in the receipt of an invalid message. By definition, invalid messages are always detected failures, and are analyzed as single failures.
- A network failure can result in a message received as valid that contains spurious information. This type of failure is bounded by the "undetected–spurious" failure of the sending equipment.
- A network failure can result in a message received as valid that fails to request an action when one is needed. This type of failure is bounded by the "undetected–blocking" failure of the sending equipment.

The architecture of the SAS allows control units (CU) to be analyzed for single failure without regard to which specific CU in the division is the failure point. For these single failures, the functions of the system are considered affected, because each function is processed by at least one CU in a division. Considering the effect on each function of the system, bounds the cases of specific CU single failures.

When referring to the nature of a single failure, the terms "detected" and "undetected," as used in the context of the SAS FMEA, do not correspond to the definition of a detectable failure in IEEE 603-1998. The failures denoted "undetected" in U.S. EPR FSAR Tier 2, Table 7.1-7 are detectable through periodic testing. The terms "detected" and "undetected", as used in U.S. EPR FSAR Tier 2, Table 7.1-7, refer to the ability of the SAS to automatically detect a failure through self-surveillance. As defined by IEEE 603-1998, the SAS has only detectable failures, and does not have identifiable but non-detectable failures.

The functions of the SAS are implemented with two types of software on the CUs:

System Software

The system software is independent of the specific automation tasks and is identical in the CUs. It carries out the following functions:

- Calls up and controls the processing sequence of the user program.
- Monitors and activates the subordinate modules.
- Controls communication.
- Performs system startup.
- Performs monitoring and diagnostics.

Application Software

The application software carries out the specific automation tasks:

- Step sequence controls.
- Closed loop controls.
- Open loop controls.

- Set point elaboration.
- Alarm logics.
- Component and system interlocking.
- Manages and executes the master/standby redundancy switchover.

Hardware is subject to extensive self-tests and is monitored at start-up and cyclically.

A hardware watchdog monitors cyclic operation of every microprocessor and signals a failure independently from the monitored processor and its software during startup and as part of cyclic testing.

U.S. EPR FSAR Tier 2, Figure 7.1-7 provides the SAS architecture. Each division of the SAS implements redundant CU pairs that operate in the master/standby configuration. To avoid delay in switching from master CU to standby CU, the pair of CUs receives identical input data.

Figure 07.01-36-1 shows the logic for the master/standby configuration. The master CU controls the process. The outputs to the PACS module of each pair of CUs are OR-gated by hardwiring, but only the master CU is able to send signals to the PACS modules, while the output signals of the standby CU to the PACS modules are blocked. Each CU blocks its own outputs through the software of the CU.

A CU operates properly and is capable of becoming the master CU if each of the following are true:

- The CU is in the cyclic processing state. If the CU is out of the cyclic processing state this is an indication that the CU is not operable (i.e. the CU is placed in functional test state, an error that causes a reset of the CU, which is an error that causes the shutdown of the CU). A CU may be in cyclic processing state with error flags in the message buffer (e.g. minor communication error) and is capable of becoming the master CU.
- No input module faults found during the CU self-test.
- No output module faults found during the CU self-test.
- The insertion monitoring for the CU finds no faults. A fault occurs if the modules of the CU are not inserted correctly into the cabinet racks. The insertion monitoring function is part of the cabinet monitoring unit.
- The cyclic self-test of the CU completes in less than an hour. If the cyclic self-test of the master CU does not complete in less than an hour, this may be an indication that there is an error in the CU processing.

If a CU operates properly (as previously described), no manual master/standby switchover is initiated, and the other paired CU is not the master, then that CU designates itself as the master CU. Once a CU is designated the master CU, if the other paired CU operates properly (as previously described) and no manual master to standby switchover is initiated, then the other paired CU designates itself to be the hot standby CU.

Each CU sends two discrete hardwired signals to their paired CU for the master/standby switchover process. A signal is sent when a CU determines it is capable of being the master

CU (CU operates properly, as described above, and no manual master to standby switchover is initiated). The master CU sends out both signals to the other paired CU showing that it has designated itself the master and is capable of being the master. The standby CU sends out a signal to the other paired CU showing that it is capable of being the master, but does not send out a signal saying that it has designated itself the master.

If the master CU does not operate properly (as previously described) then it blocks its outputs to the PACS modules and does not designate itself to be the master CU. If the other paired CU has designated itself as the standby CU (operates properly and no manual master to standby switchover initiated), then it changes its designation to master CU and allows its outputs to send signals to the PACS modules.

If the standby CU does not operate properly (as previously described), then it continues to block its outputs to the PACS modules and is not capable of being designated the master CU until it operates properly (as previously described). The master CU continues to control the process and is able to send its output signals to the PACS modules.

If both CUs do no operate properly (as described above), then both CUs block their outputs to the PACS modules and there will be no master CU designated, until one of the CUs operates properly (as describe above). This results in a loss of a division of SAS and Table 7.1-7 – SAS FMEA Results describes the effects on the plant for a loss of a division of SAS.

Manual master to standby switchover capability is provided through the Service Unit (SU). A manual master to standby switchover is executed by manually placing the master CU into standby (blocks its outputs to the PACS modules). The other paired CU in standby will detect that the former master CU is no longer designated the master and designates itself the master CU (allows itself to send output signals to the PACS modules). A manual master to standby switchover is not possible unless the paired CU is in standby.

If a master CU is switched to standby, then the CU cannot be switched back to master within 500 ms. This is implemented in both CUs. This prevents the paired CUs from switching between master to standby and from standby to master within a short time period.

During startup of the CUs, the CU that starts up first is designated as the master CU. The second CU that starts up operates as the standby CU. If both paired CUs start up at the same time, a CU is predetermined in the software as the default master CU and the other operates as the standby CU.

The logic within the CUs require that a message be a specific signal name, and from a specific processor, for the message information to enter the logic and be acted upon. This prevents a CU from being incorrectly influenced to take actions by a CU that is communicating with it in error.

U.S. EPR FSAR Tier 2, Section 7.1.1.4.2 will be revised to describe the SAS switchover configuration, which is shown in the new Figure 7.1-29.

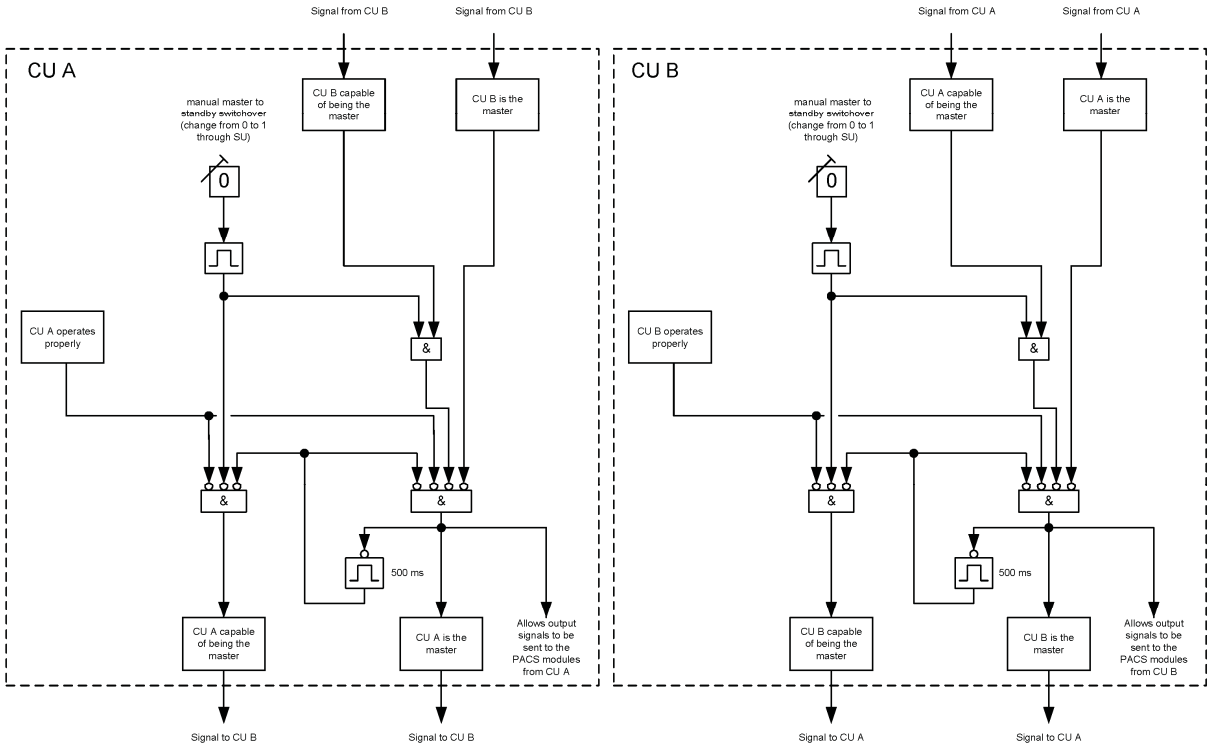
Table 7.1-7—SAS FMEA Results was added to U.S. EPR FSAR Tier 2, Section 7.1, as a part of the response to RAI 505, Question 07.01-35.

FSAR Impact:

U.S. EPR FSAR, Tier 2, Section 7.1.1.4.2 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR, Tier 2, Figure 7.1-29 will be added as described in the response and indicated on the enclosed markup.

Figure 7.1-36-1: SAS Master/Standby Configuration



NOTE: The terms CU A and CU B do not correspond to specific CUs. These terms are used to facilitate the understanding of a CU pair in the general master/standby configuration.

EPR3096 T2

Question 07.01-46:

OPEN ITEM

Provide more design information in the US EPR FSAR concerning the Operation I&C Disable Switch.

Clause 5.1 of IEEE Std. 603-1991 requires, in part, that safety systems shall perform all safety functions required for a design basis event in the presence of any single detectable failure, all failures caused by the single failure, and all failures and spurious actions that cause or are caused by the design basis event. SRP Appendices 7.1-C and 7.1-D and SRP BTP 7-17 were used as guidance in the review. The applicant states the following in U.S. EPR FSAR, Tier 2, Section 7.1, Interim Revision 3 mark-ups:

> *"During normal operation, the **operational I&C disable switch** on the SICS is set so that the PAS can send commands to the PACS. In this configuration, automatic commands from the PAS override manual commands from the SICS because of the nature of the manual control logic in the PACS. If the operational I&C disable switch is set to DISABLE by the operator, the PAS input will be disabled (i.e., the input signals from the PAS to the communications module will be blocked from being sent to the priority module), providing the priority of the SICS manual commands. The operational I&C disable switch disables PAS inputs, all other PACS inputs remain operational."*

The staff requests the applicant address the following follow-up items:

a. What is the safety-qualification of the Operation I&C Disable Switch?

b. Describe how the operational I&C disable switch addresses single failures.

c. Is the Operational I&C Disable Switch necessary for performance of credited manual operator actions to mitigate the Steam Generator Tube Rupture event, as described in Chapter 15 safety analyses?

d. Is an ITAAC necessary to verify the operation and design of the operational I&C disable switch?

Response to Question 07.01-46:

Item a:

The Operational I&C Disable switches are safety-related and are located on the safety information control system (SICS). U.S. EPR FSAR Tier 2, Section 7.1.1.6.5 will be revised to add that the Operational I&C Disable switches are safety-related, as shown in the attached markup.

Item b:

The Operational I&C Disable switches are designed to meet the single failure criterion. The Operational I&C Disable switches consist of four switches on the SICS. If at least two of the four switches (2 out of 4 voting) are set to DISABLE by the operator, the process automation system (PAS) input will be blocked by the PAC modules. This blocking function is implemented

within the PACS. The Operational instrumentation and controls (I&C) Disable switches block PAS inputs. The other PACS inputs remain operational.

Item c:

The Operational I&C Disable switches are not necessary for performing credited manual operator actions to mitigate the steam generator tube rupture (SGTR) event. The credited operator actions for mitigating an SGTR event are manual reactor trip, system-level manual steam generator isolation, and system-level manual safety injection on SICS, as described in U.S. EPR FSAR Tier 2, Section 7.2.1.2.22, 7.3, and 15.0.0.3.7. These system-level manual operator actions are performed by the SICS and PS. The signals are latched in; therefore, a signal from PAS does not interfere with the system-level manual operator action.

Item d:

An ITAAC item was added to U.S. EPR FSAR Tier 1, Section 2.4.2 to verify the operation of the Operational I&C Disable switches.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.4.2 and Tier 2 Section 7.1.1.6.5 will be revised as described in the response and indicated on the enclosed markup.

Question 07.09-71:

OPEN ITEM

Explain how invalid signals are identified by safety automation system (SAS) processors and state whether the voting logic in the SAS is modified to accommodate the identified invalid signals to meet the requirements of IEEE Std. 603-1998, Clause 5.6.1.

IEEE Std. 603-1998, Clause 5.6.1, requires redundant portions of the safety system to be independent and physically separated from each other to the degree necessary to retain the capability to accomplish the safety function. The staff issued Digital Instrumentation and Controls Interim Staff Guidance 4 (D I&C ISG-04) to provide criteria for implementing interdivisional data communications. Criterion 2 in Section 1 of D I&C ISG-04 states that "The safety channel should be protected from adverse influence from outside the division of which that channel is a member…" In addition, Criterion 12 in Section 1 of D I&C ISG-04 states that, "Communication faults should not adversely affect the performance of required functions in any way…" The staff evaluated the SAS interdivisional communication functions and determined that the SAS has not adequately addressed Criteria 2 and 12. Specifically, the staff finds that the applicant has not provided sufficient detail regarding provisions in the design that prevents SAS divisions from being adversely impacted by information originating from outside the division. As such, the staff requests the applicant explain how invalid signals are identified by SAS processors and state whether the voting logic in the SAS is modified to accommodate the identified invalid signals. Incorporate this description into the U.S. EPR FSAR, Tier 2, or in documents incorporated by reference.

Response to Question 07.09-71:

The safety automation system (SAS) meets the requirements of IEEE Std. 603-1998, Clause 5.6.1, which requires redundant portions of the SAS to be independent and physically separated from each other to the degree necessary to retain the capability to accomplish the safety function.

- Each division of the SAS implements redundant control unit (CU) pairs that operate in a master /standby configuration. To avoid delay in switching from master CU to standbyCU, the pair of CUs receives identical input data.

The SAS switchover configuration is described in U.S. EPR FSAR Tier 2, Section 7.1.1.4.2 as provided in the Response to RAI 505, Question 7.1-36.

The SAS meets the requirements of the Digital Instrumentation and Controls Interim Staff Guidance 4, which states that signal faults should not adversely affect the performance of required safety function in any way. In case of failure of sensors, sensor maintenance, or communication failure between SAS functional units detected by the SAS; the 2 out of 4 voting logic in the CU layer is automatically modified for data signals. This allows the CU to disregard the faulty signal while retaining the ability to actuate on the basis of the remaining non-faulty signals. This automatic voting modification is accomplished using the status of the signals that are inputs to the voting function block.

The data signals within the SAS carry a value and a status. The signal status can be propagated through the software function blocks; therefore, if an input signal to a function block

has a faulty status, the output of the function block also has a faulty status. When a signal with a faulty status reaches the voting function block, the signal is disregarded through modification of the vote. This results in the output of the voting function block having a non-faulty status. A signal typically obtains a faulty status through the following mechanisms:

During sensor maintenance, or when a sensor is suspected to be faulty, the sensor can be placed in maintenance bypass. This lockout attaches a faulty status to the sensor's signal. The lockout is a software function performed in the CU layer before any processing is performed using the signal.

If the SAS detects a faulty sensor through range monitoring, or by monitoring the status of the signal conditioning hardware, the corresponding signal is marked with a faulty status. This monitoring is also performed in the CU layer.

In case of a communication failure between SAS functional units, the receiving functional unit detects errors such as incorrect message length, format, or age.

This detection occurs when the functional unit retrieves the message from the 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.

Due to the SAS interdivisional communication configuration and master/standby configuration shown in U.S. EPR FSAR Tier 2, Figure 7.1-7 – Safety Automation System Architecture, a single faulted CU would not modify voting logic within the faulted division. The voting logic remains 2/4 in the faulted division. The voting logic in other divisions is modified to 2/3. This is described in U.S. EPR FSAR Tier 2, Table 7.1-7 – SAS FMEA Results as provided in the Response to RAI 505, Question 7.1-35.

Hardwired signals which fail within range are detected during periodic testing of the CUs. Hardwired signals with fail out of range are automatically disregarded.

U.S. EPR FSAR Tier 2, Section 7.1.1.4.2 will be revised to include a description of the fault detection in the SAS.

FSAR Impact:

U.S. EPR FSAR, Tier 2, Section 7.1.1.4.2 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

4.12 Controls on the SICS in the RSS perform the function listed in Table 2.4.2-3—SICS Manual Controls in the RSS.~~Deleted..~~

4.13 The SICS provides controls in the MCR for blocking the PAS signals in the PACS through a set of operational I&C disable switches.~~Deleted.~~

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4.14 Deleted.

4.15 Deleted.

4.16 Deleted.

5.0 Electrical Power Design Features

5.1 ~~Class 1E SICS~~The components designated as Class 1E in Table 2.4.2-1 are powered from a Class 1E division as listed in Table 2.4.2-1 in a normal or alternate feed condition.

6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.2-~~2~~ 3 lists the SICS ITAAC.

Table 2.4.2-~~2~~4—Safety Information and Control System ITAAC (~~5~~ 6 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.10	The SICS is designed so that safety-related functions required for an AOO or PA are performed in the presence of the following: • Single ~~detectable~~ failures within the SICS. • Failures caused by the single failure. • Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function.	A failure modes and effects analysis will be performed on the SICS at the level of replaceable modules and components.	A report ~~exists and~~ concludes that the SICS is designed so that safety-related functions required for an AOO or PA are performed in the presence of the following: • Single ~~detectable~~ failures within the SICS. • Failures caused by the single failure. • Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function.
4.11	Locking mechanisms are provided on the SICS doors in the MCR and RSS. Opened SICS doors in the RSS are indicated in the MCR.~~Deleted.~~	a. An inspection will be performed.~~Deleted.~~ b. A test will be performed. c. A test will be performed.	a. Locking mechanisms exist on the SICS doors in the MCR and RSS.~~Deleted.~~ b. The locking mechanisms on the SICS doors in the MCR and RSS operate properly. c. Opened SICS doors in the RSS are indicated in the MCR when a SICS door is in the open position.
4.12	Controls on the SICS in the RSS perform the function listed in Table 2.4.2-3.~~Deleted.~~	Tests will be performed using manual controls on the SICS in the RSS.~~Deleted.~~	Controls on the SICS in the RSS perform the function listed in Table 2.4.2-3.~~Deleted.~~
4.13	The SICS provides controls in the MCR for blocking the PAS signals in the PACS through a set of operational I&C disable switches. ~~Deleted.~~	Tests will be performed to verify that the operational I&C disable switches block the PAS signals in the PACS. ~~Deleted.~~	The operational I&C disable switches perform their function to block the PAS signals in the PACS.~~Deleted.~~
4.14	Deleted.	Deleted.	Deleted.
4.15	Deleted.	Deleted.	Deleted.

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- Calls up and controls the processing sequence of the user program.
- Monitors and activates the subordinate modules.
- Controls communication.
- Performs system startup.
- Performs monitoring and diagnostics.

Application Software

The application software carries out the specific automation tasks:

- Step sequence controls.
- Closed loop controls.
- Open loop controls.
- Set point elaboration.
- Alarm logics.
- Component and system interlocking.

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- Manages and executes the master/standby redundancy switchover.

Figure 7.1-7—Safety Automation System Architecture provides the SAS architecture. Each division of the SAS implements redundant CU pairs that operate in the master / standby configuration. To avoid delay in switching from master CU to standby CU, the pair of CUs receive identical input data.

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Figure 7.1-29 shows the logic for the master/standby configuration. The master CU controls the process. The outputs to the PACS module of each pair of CUs are OR-gated by hardwiring, but only the master CU is able to send signals to the PACS modules, while the output signals of the standby CU to the PACS modules are blocked. Each CU blocks its own outputs through the software of the CU.

A CU operates properly and is capable of becoming the master CU if all of the following are true:

- The CU is in the cyclic processing state. If the CU is out of the cyclic processing state this is an indication that the CU is not operable (i.e. the CU is placed in functional test state, an error that causes a reset of the CU, an error that causes the shutdown of the CU). A CU may be in cyclic processing state with error flags in the message buffer (e.g. minor communication error) and is capable of becoming the master CU.

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- No input module faults found during the CU self-test.
- No output module faults found during the CU self-test.
- The insertion monitoring for the CU finds no faults. A fault occurs if the modules of the CU are not inserted correctly into the cabinet racks. The insertion monitoring function is part of the cabinet monitoring unit.
- The cyclic self-test of the CU completes in less than an hour. If the cyclic self-test of the master CU does not complete in less than an hour, this may be an indication that there is an error in the CU processing.

If a CU operates properly (as described above), no manual master/standby switchover is initiated, and the other paired CU is not the master, then that CU will designate itself to be the master CU. Once a CU is designated the master CU, if the other paired CU operates properly (as described above) and no manual master to standby switchover is initiated, then the other paired CU designates itself to be the standby CU.

Each CU sends two discrete hardwired signals to their paired CU for the master/standby switchover process. A signal is sent when a CU determines it is capable of being the master CU (CU operates properly, as described above, and no manual master to standby switchover is initiated). The master CU sends out both signals to the other paired CU showing that it has designated itself the master and is capable of being the master. The standby CU sends out a signal to the other paired CU showing that it is capable of being the master, but does not send out a signal saying that it has designated itself the master.

If the master CU does not operate properly (as described above) then it blocks its outputs to the PACS modules and does not designate itself to be the master CU. If the other paired CU has designated itself the standby CU (operates properly and no manual master to standby switchover initiated), then it will change its designation to master CU and will allow its outputs to send signals to the PACS modules.

If the standby CU does not operate properly (as described above), then it continues to block its outputs to the PACS modules and will not be capable of being designated the master CU until it operates properly (as described above). The master CU will continue to control the process and is able to send its output signals to the PACS modules.

If both CUs do no operate properly (as described above), then both CUs block their outputs to the PACS modules and there will be no master CU designated, until one of the CUs operates properly (as describe above). This results in a loss of a division of SAS and Table 7.1-7 - SAS FMEA Results describes the effects on the plant for a loss of a division of SAS.

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Manual master to standby switchover capability is provided through the Service Unit (SU). A manual master to standby switchover is executed by manually placing the master CU into standby (blocks its outputs to the PACS modules). The other paired CU in standby will detect that the former master CU is no longer designated the master and designates itself the master CU (allows itself to send output signals to the PACS modules). A manual master to standby switchover is not possible unless the paired CU is in standby.

If a master CU is switched to standby, then the CU cannot be switched back to master within 500 ms. This is implemented in both CUs. This prevents the paired CUs from switching between master to standby and from standby to master within a short time period.

During startup of the CUs, the CU that starts up first is designated the master CU. The second CU that starts up afterwards operates as the standby CU. If both paired CUs startup at the same time, a CU is predetermined in the software as the default master CU and the other operates as the standby CU.

The logic within the CUs require that a message be a specific signal name and from a specific processor for the message information to enter the logic and be acted upon. This prevents a CU from being incorrectly influenced to take actions by a CU that is communicating with it in error.

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

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

The SAS consists of these functional units:

- Control Units (CU).
- MSIs.
- GWs.
- SU.

The CUs execute the logic for the assigned automatic and manual grouped control functions. There are redundant pairs of CUs within a division. The number of redundant pairs of CUs is dependent on sizing requirements for the SAS. Redundant pairs of CUs that perform functions requiring interdivisional communication identified in Table 7.1-5 have data communications between CUs in different

described in Section 7.1.1.6.4. These data connections are provided to implement only those automatic functions requiring interdivisional communication, which are listed in Table 7.1-5—SAS Automatic Safety Function.

- CU-Monitoring Service Interface (MSI) – bi-directional, point to point data connections implemented with the TXS Profibus protocol.

- MSI-GW – uni-directional, point-to-point data connections implemented with the TXS Ethernet protocol. This network is provided so the SAS can provide status information to the PICS. The design features that provide for independence between safety-related and non-safety-related systems are described in Section 7.1.1.6.4.

- MSI-SU –bi-directional, point-to-point data connections implemented with the TXS Ethernet protocol. This network is provided for the servicing of the SAS. The design features that provide for independence between safety-related and non-safety-related systems are described in Section 7.1.1.6.4.

- GW-PICS - bi-directional, point-to-point data communications. Signals are only engineered to be sent from the SAS to the PICS. Signals coming from the PICS to the SAS GW are to request messages to be sent.

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Fault Detection

Signal faults in the SAS are detected via diverse means dependent on the signal type.

Hardwired signals, which fail within range, are detected during the periodic testing of the CU. Hardwired signals which fail out of range are automatically disregarded.

Data signals within the SAS carry a value and a status. The signal status can be propagated through the software function block; therefore, if an input signal to a function block has a faulty status, the output of the function block also has a faulty status. When a signal with a faulty status reaches the voting function block, the signal is disregarded through modification of the vote. This results in the output of the voting function block having a non-faulty status. A signal typically obtains a faulty status through the following mechanisms:

- During sensor maintenance, or when a sensor is suspected to be faulty, the sensor can be placed in maintenance bypass. This lockout attaches a faulty status to the sensor's signal. The lockout is a software function performed in the CU layer before any processing is performed using the signal.

- If the SAS detects a faulty sensor through range monitoring, or by monitoring the status of the signal conditioning hardware, the corresponding signal is marked with a faulty status. This monitoring is also performed in the CU layer.

- In case of a communication failure between SAS functional units, the receiving functional unit detects errors such as incorrect message length, format, or age. This detection occurs when the functional unit retrieves the message from the

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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
- MSRT setpoint increase on SG Level>Max2p+partial cooldown initiated (affected SG)

The measuring range of the process variables associated with each aforementioned function is shown in Table 7.1-8.

selection algorithms and redundancy to minimize the possibility of a single failure that results in a DBE that also reduces the redundancy of the safety-related systems. The safety-related systems implement error detection algorithms to detect and accommodate failures.

7.1.1.6.5 Priority

The U.S. EPR I&C design allows for multiple I&C systems to send requests to a given actuator. To make certain that each individual actuator executes the proper action for the given plant condition, priority management rules for the PACS are provided. The following systems inputs to the PACS are listed in order of priority:

- PS/DAS.
- ~~DAS.~~
- SAS.
- SICS.
- PAS.

The DAS is given a higher priority than the SAS because it is a functional substitute to the PS and is needed at this level of priority to verify proper operation of SAS functions on a SWCCF of the PS.

The SICS manual component level commands are momentary signals that are removed once the actuator has reached its final limit position. Once the SICS component level command signal is removed, the PAS has the ability to manipulate the actuator. This may be undesirable to the operator controlling the device. Therefore, four safety-related Operational I&C Disable switches are implemented to prevent PAS from manipulating the actuator. During normal operation, the ~~o~~Operational I&C ~~d~~Disable switches on the SICS are~~is~~ set so that the PAS can send commands to the PACS. If at least two of the four switches (2 out of 4 voting) are set to DISABLE by the operator, the PAS input is blocked by the PAC modules. This blocking function is implemented within the PACS. The Operational I&C Disable switches block PAS inputs. The other PACS inputs remain operational. ~~In this configuration, automatic commands from the PAS override manual commands from the SICS because of the nature of the manual control logic in the PACS. If the operational I&C disable switch is set to DISABLE by the operator, the PAS input will be disabled (i.e., the input signals from the PAS to the communications module will be blocked from being sent to the priority module), providing the priority of the SICS manual commands. The operational I&C disable switch disables PAS inputs, all other PACS inputs remain operational.~~

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Figure 7.1-7—Safety Automation System Architecture

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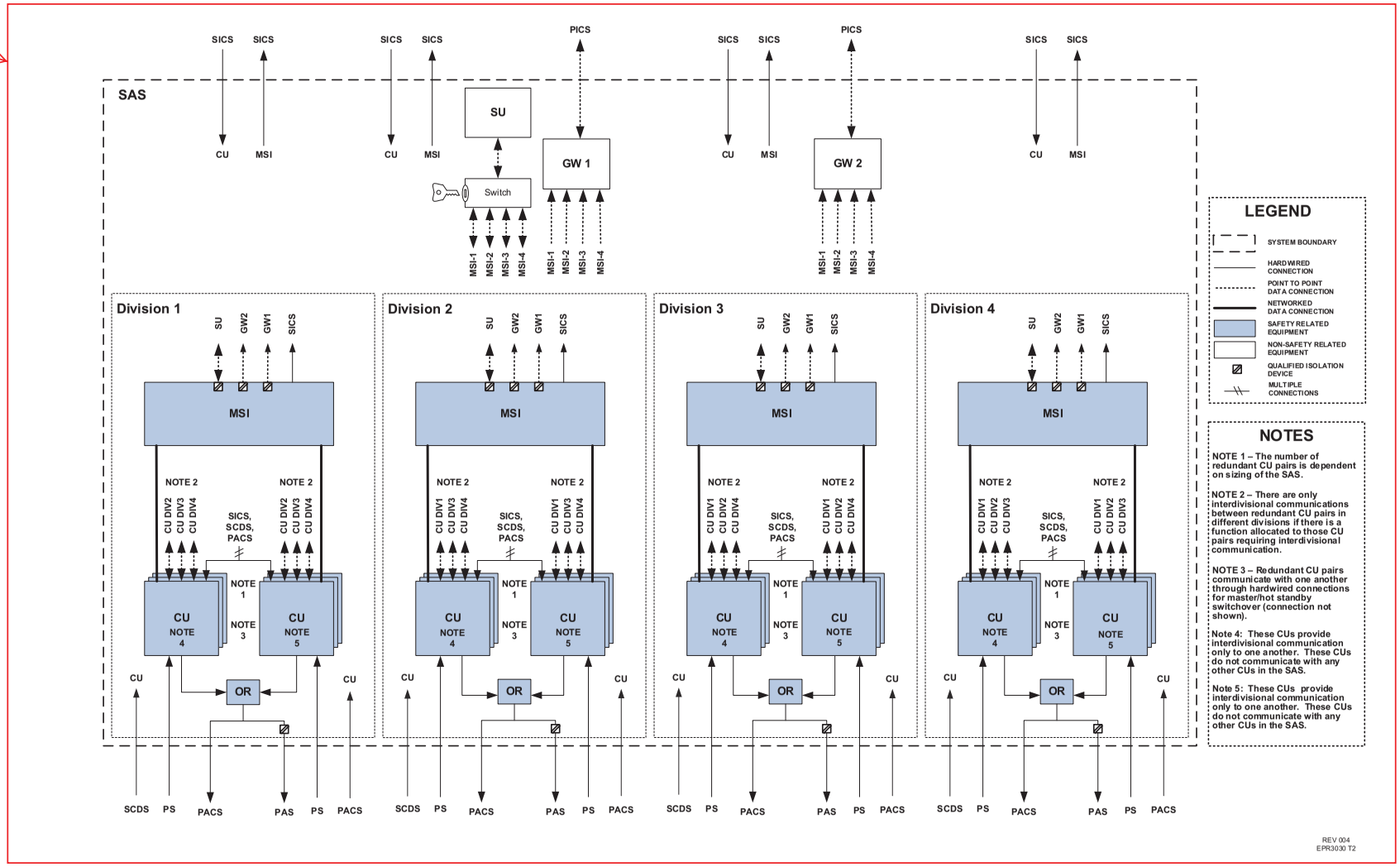

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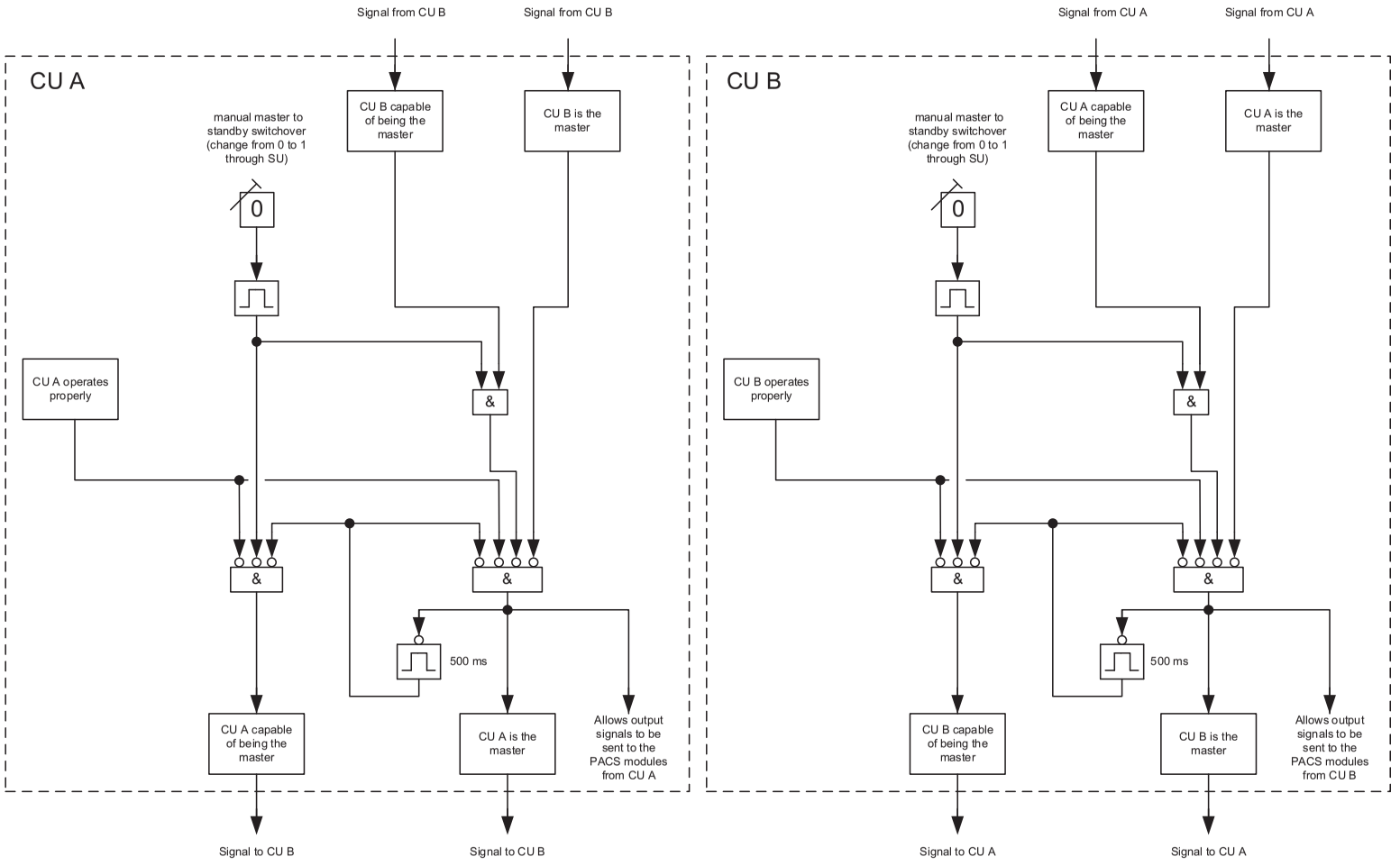
Figure 7.1-29—SAS Switchover Configuration



NOTE: The terms CU A and CU B do not correspond to specific CUs. These terms are used to facilitate the understanding of a CU pair in the general master/standby configuration.

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