ArevaEPRDCDocsPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Thursday, June 27, 2013 5:17 PM
To: Snyder, Amy
Cc: Hearn, Peter; ANDERSON Katherine (EXTERNAL AREVA); DELANO Karen (AREVA); LEIGHLITER John (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); KOWALSKI David (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Supplement 14
Attachments: RAI 513 Supplement 14 Response US EPR DC.pdf

Amy,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the ten questions in RAI No. 513 on October 27, 2011. Supplement 1, Supplement 2 and Supplement 3 responses to RAI No. 513 were sent on December 13, 2011, January 25, 2012, and February 24, 2012, respectively, to provide a revised schedule. Supplement 4 response was sent on April 17, 2012 to provide a technically correct INTERIM response to Question 09.01.01-59 and a revised schedule for the final response to this question. On April 24, 2012, AREVA NP submitted Supplement 5 to provide a technically correct and complete final response to one (Question 09.01.01-56) of the 10 questions in RAI 513. On June 5, 2012, Supplement 6 response to RAI No. 513 was sent to provide a revised schedule. Supplement 7 response was sent on August 17, 2012 to provide a technically correct and complete final response to three of the remaining nine questions in RAI 513 and a revised schedule for two questions. Supplement 8 response was sent on August 31, 2012 to revise the schedule for two questions. Supplement 9 response was sent on December 13, 2012 to provide a technically correct and complete final response to Questions 09.01.01-53 and 09.01.01-54. Supplement 10 response was sent on February 1, 2013 to provide a schedule for a revised final response to Question 09.01.01-59. Supplement 11 response was sent on March 1, 2013 to provide a revised final response to Question 09.01.01-59. Supplement 12 response was sent on March 20, 2013 to provide a technically correct and complete final response to Question 09.01.04-20. Supplement 13 response was sent on June 14, 2013 to provide a technically correct and complete revised final response to Question 09.01.01-59 to address NRC staff review comments.

The attached file, “RAI 513 Supplement 14 Response US EPR DC.pdf,” provides a technically correct and complete final response to Questions 09.01.01-61 and 09.01.01-62.

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 513 Question 09.01.01-61.

The following table indicates the respective pages in the response document, “RAI 513 Supplement 14 Response US EPR DC.pdf,” that contain AREVA NP’s response to the subject questions.

Question #	Start Page	End Page
RAI 513 — 09.01.01-61	2	3
RAI 513 — 09.01.01-62	4	4

The schedule for a technically correct and complete response to the remaining question has not changed as provided below.

Question #	Response Date
RAI 513 — 09.01.01-58	June 28, 2013

Sincerely,

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

From: RYAN Tom (RS/NB)
Sent: Friday, June 14, 2013 5:36 PM
To: Amy.Snyder@nrc.gov
Cc: ANDERSON Katherine (External AREVA NP INC.); DELANO Karen (RS/NB); LEWIS Ray (External RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); SHEPHERD Tracey (RS/NB); VANCE Brian (RS/NB); GUCWA Len (External RS/NB); WILLIFORD Dennis (RS/NB); KOWALSKI David (RS/NB); Hearn, Peter (Peter.Hearn@nrc.gov)
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Supplement 13

Amy,

AREVA NP Inc. letter NRC:13:042 dated June 14, 2013 provides a revised final response to Question 09.01.01-59, which addresses NRC review comments on the final response to Question 09.01.01-59 in RAI 513 Supplement 11 that was submitted on March 1, 2013. The response also includes a redline-strikeout version of the affected pages of AREVA Technical Report TN-Rack.0101. AREVA Transnuclear, Inc. has determined that some of the material contained in the response is proprietary. An affidavit is provided, as required by 10 CFR 2.390(b), to support the withholding of the information from public disclosure. A proprietary version of the enclosure to this letter is provided separately.

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

Question #	Start Page	End Page
RAI 513 — 09.01.01-59	2	3

The schedule for a final response to the remaining three questions is unchanged, as shown in the following table.

Question #	Response Date
RAI 513 — 09.01.01-58	June 28, 2013
RAI 513 — 09.01.01-61	June 28, 2013
RAI 513 — 09.01.01-62	June 28, 2013

Sincerely,

Tom Ryan
Project Engineer
Regulatory Affairs
AREVA NP
An AREVA and Siemens company
7207 IBM Drive - CLT2B
Charlotte, NC 28262
Phone: 704-805-2643, Cell : 704-292-5627
Fax: 434-382-6657

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, March 20, 2013 5:13 PM
To: Amy.Snyder@nrc.gov
Cc: peter.hearn@nrc.gov; DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); WILLS Tiffany (CORP/QP); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Supplement 12
Importance: High

Amy,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the ten questions in RAI No. 513 on October 27, 2011. Supplement 1, Supplement 2 and Supplement 3 responses to RAI No. 513 were sent on December 13, 2011, January 25, 2012, and February 24, 2012, respectively, to provide a revised schedule. Supplement 4 response was sent on April 17, 2012 to provide a technically correct INTERIM response to Question 09.01.01-59 and a revised schedule for the final response to this question. On April 24, 2012, AREVA NP submitted Supplement 5 to provide a technically correct and complete final response to one (Question 09.01.01-56) of the 10 questions in RAI 513. On June 5, 2012, Supplement 6 response to RAI No. 513 was sent to provide a revised schedule. Supplement 7 response was sent on August 17, 2012 to provide a technically correct and complete final response to three of the remaining nine questions in RAI 513 and a revised schedule for two questions. Supplement 8 response was sent on August 31, 2012 to revise the schedule for two questions. Supplement 9 response was sent on December 13, 2012 to provide a technically correct and complete final response to Questions 09.01.01-53 and 09.01.01-54. Supplement 10 response was sent on February 1, 2013 to provide a schedule for a revised final response to Question 09.01.01-59. Supplement 11 response was sent on March 1, 2013 to provide a technically correct and complete revised final response to Question 09.01.01-59.

The attached file, "RAI 513 Supplement 12 Response US EPR DC.pdf," provides a technically correct and complete final response to Question 09.01.04-20.

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 513 Question 09.01.04-20.

The following table indicates the respective pages in the response document, "RAI 513 Supplement 12 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 513 — 09.01.04-20	2	3

The schedule for technically correct and complete responses to the remaining three questions has not changed, as provided below.

Question #	Response Date
RAI 513 — 09.01.01-58	June 28, 2013
RAI 513 — 09.01.01-61	June 28, 2013
RAI 513 — 09.01.01-62	June 28, 2013

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Friday, March 01, 2013 4:18 PM
To: Amy.Snyder@nrc.gov
Cc: peter.hearn@nrc.gov; DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); WILLS Tiffany (CORP/QP); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Supplement 11

Amy,

AREVA NP Inc. letter NRC:13:010 dated March 1, 2013 provides a revised final response to Question 09.01.01-59. The response also includes a redline-strikeout version of the affected pages of AREVA Technical Report TN-Rack.0101. AREVA Transnuclear, Inc. has determined that some of the material contained in the response is proprietary. An affidavit is provided, as required by 10 CFR 2.390(b), to support the withholding of the information from public disclosure. A proprietary version of the enclosure to this letter is provided separately.

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

Question #	Start Page	End Page
RAI 513 — 09.01.01-59	2	3

The schedule for a final response to the remaining four questions is unchanged, as shown in the following table.

Question #	Response Date
RAI 513 — 09.01.01-58	June 28, 2013
RAI 513 — 09.01.01-61	June 28, 2013
RAI 513 — 09.01.01-62	June 28, 2013
RAI 513 — 09.01.04-20	July 30, 2013

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Friday, February 01, 2013 5:51 PM
To: Amy.Snyder@nrc.gov
Cc: peter.hearn@nrc.gov; DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); WILLS Tiffany (CORP/QP)
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Supplement 10

Amy,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the ten questions in RAI No. 513 on October 27, 2011. Supplement 1, Supplement 2 and Supplement 3 responses to RAI No. 513 were sent on December 13, 2011, January 25, 2012, and February 24, 2012, respectively, to provide a revised schedule. Supplement 4 response was sent on April 17, 2012 to provide a technically correct INTERIM response to Question 09.01.01-59 and a revised schedule for the final response to this question. On April 24, 2012, AREVA NP submitted Supplement 5 to provide a technically correct and complete final response to one (Question 09.01.01-56) of the 10 questions in RAI 513. Supplement 6 response sent on June 5, 2012 provided a revised schedule for the remaining questions. Supplement 7 response was sent on August 17, 2012 to provide a technically correct and complete final response to three of the remaining nine questions in RAI 513 and a revised schedule for two questions. Supplement 8 response was sent on August 31, 2012 to revise the schedule for two questions. Supplement 9 response was sent on December 13, 2012 to provide a technically correct and complete final response to Questions 09.01.01-53 and 09.01.01-54.

To address NRC staff supplemental comments received on the response to Question 09.01.01-53 and as committed in the Supplement 9 response to these supplemental questions, we have provided a schedule for a revised final response to Question 09.01.01-59. The schedule for a technically correct and complete final response to the other questions is unchanged as shown in the following table.

Question #	Response Date
RAI 513 — 09.01.01-58	June 28, 2013
RAI 513 — 09.01.01-59	**March 1, 2013**
RAI 513 — 09.01.01-61	June 28, 2013
RAI 513 — 09.01.01-62	June 28, 2013
RAI 513 — 09.01.04-20	July 30, 2013

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, December 13, 2012 5:39 PM
To: Amy.Snyder@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); peter.hearn@nrc.gov
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Supplement 9

Amy,

AREVA NP Inc. letter NRC:12:064 dated December 13, 2012 provides a technically correct and complete final response to two of the remaining six questions in RAI 513. AREVA Transnuclear, Inc. has determined that some of the material contained in the response is proprietary. An affidavit is provided, as required by 10 CFR 2.390(b), to support the withholding of the information from public disclosure. Proprietary and non-proprietary versions of the enclosure to this letter are provided separately.

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

Question #	Start Page	End Page
RAI 513 — 09.01.01-53	2	5
RAI 513 — 09.01.01-54	6	6

The schedule for a technically correct and complete final response to the remaining four questions is unchanged as shown in the following table.

Question #	Response Date
RAI 513 — 09.01.01-58	June 28, 2013
RAI 513 — 09.01.01-61	June 28, 2013
RAI 513 — 09.01.01-62	June 28, 2013
RAI 513 — 09.01.04-20	July 30, 2013

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Friday, August 31, 2012 8:23 AM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Supplement 8

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the ten questions in RAI No. 513 on October 27, 2011. Supplement 1, Supplement 2 and Supplement 3 responses to RAI No. 513 were sent on December 13, 2011, January 25, 2012, and February 24, 2012, respectively, to provide a revised schedule. Supplement 4 response was sent on April 17, 2012 to provide a technically correct INTERIM response to Question 09.01.01-59 and a revised schedule for the final response to this question. On April 24, 2012, AREVA NP submitted Supplement 5 to provide a technically correct and complete final response to one (Question 09.01.01-56) of the 10 questions in RAI 513. Supplement 6 response sent on June 5, 2012 provided a revised schedule for the remaining questions. Supplement 7 response was sent on August 17, 2012 to provide a technically correct and complete final response to three of the remaining nine questions in RAI 513 and a revised schedule for two questions.

The schedule for a technically correct and complete final response to two of the remaining six questions has been revised as shown in the following table.

Question #	Response Date
RAI 513 — 09.01.01-53	**December 13, 2012**
RAI 513 — 09.01.01-54	**December 13, 2012**
RAI 513 — 09.01.01-58	June 28, 2013
RAI 513 — 09.01.01-61	June 28, 2013
RAI 513 — 09.01.01-62	June 28, 2013
RAI 513 — 09.01.04-20	July 30, 2013

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Friday, August 17, 2012 3:11 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Supplement 7

Getachew,

AREVA NP Inc. letter NRC:12:044 dated August 17, 2012 provides a technically correct and complete final response to three of the remaining nine questions in RAI 513. As AREVA has determined some of the material contained in the response to be proprietary, an affidavit is provided, as required by 10 CFR 2.390(b), to support the withholding of the information from public disclosure. Proprietary and non-proprietary versions of the enclosure to this letter are provided separately.

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

Question #	Start Page	End Page
RAI 513 — 09.01.01-57	2	2
RAI 513 — 09.01.01-59	3	4
RAI 513 — 09.01.01-60	5	5

The schedule for a technically correct and complete final response to two of the remaining six questions has been revised as shown in the following table.

Question #	Response Date
RAI 513 — 09.01.01-53	**August 31, 2012**
RAI 513 — 09.01.01-54	**August 31, 2012**
RAI 513 — 09.01.01-58	June 28, 2013
RAI 513 — 09.01.01-61	June 28, 2013
RAI 513 — 09.01.01-62	June 28, 2013
RAI 513 — 09.01.04-20	July 30, 2013

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, July 26, 2012 9:46 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); GARDNER Darrell (RS/NB) (Darrell.Gardner@areva.com); VANCE Brian (RS/NB); LEIGHLITER John (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Questions 9.1.1-53,-54,-57,-59 and -60 - STATUS

Getachew,
AREVA appreciates the notification you provided yesterday on the review status of the DRAFT RAI responses submitted on June 26th and understands that the NRC staff needs additional time to complete their review and

provide comments. AREVA will provide a revised schedule for submittal of the final responses to these 5 questions after receipt and evaluation of NRC staff comments.

The schedule for a technically correct and complete final response to the other 4 questions remains unchanged as shown below.

Question #	Response Date
RAI 513 — 09.01.01-53	**TBD**
RAI 513 — 09.01.01-54	**TBD**
RAI 513 — 09.01.01-57	**TBD**
RAI 513 — 09.01.01-58	June 28, 2013
RAI 513 — 09.01.01-59	**TBD**
RAI 513 — 09.01.01-60	**TBD**
RAI 513 — 09.01.01-61	June 28, 2013
RAI 513 — 09.01.01-62	June 28, 2013
RAI 513 — 09.01.04-20	July 30, 2013

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, June 05, 2012 2:43 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. 513 (5971,5040), FSAR Ch. 9, Supplement 6

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the ten questions in RAI No. 513 on October 27, 2011. Supplement 1, Supplement 2 and Supplement 3 responses to RAI No. 513 were sent on December 13, 2011, January 25, 2012, and February 24, 2012, respectively, to provide a revised schedule. Supplement 4 response was sent on April 17, 2012 to provide a technically correct INTERIM response to Question 09.01.01-59 and a revised schedule for the final response to this question. On April 24, 2012, AREVA NP submitted Supplement 5 to provide a technically correct and complete final response to one (Question 09.01.01-56) of the 10 questions in RAI 513.

The schedule for a technically correct and complete final response to the remaining 9 questions has been changed as shown below. This schedule was transmitted to the NRC in AREVA NP letter NRC:12:024 dated May 10, 2012.

Question #	Response Date
RAI 513 — 09.01.01-53	July 26, 2012
RAI 513 — 09.01.01-54	July 26, 2012
RAI 513 — 09.01.01-57	July 26, 2012
RAI 513 — 09.01.01-58	**June 28, 2013**
RAI 513 — 09.01.01-59	July 26, 2012
RAI 513 — 09.01.01-60	July 26, 2012
RAI 513 — 09.01.01-61	**June 28, 2013**
RAI 513 — 09.01.01-62	**June 28, 2013**
RAI 513 — 09.01.04-20	**July 30, 2013**

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, April 24, 2012 5:02 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Supplement 5

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the ten questions in RAI No. 513 on October 27, 2011. Supplement 1, Supplement 2 and Supplement 3 responses to RAI No. 513 were sent on December 13, 2011, January 25, 2012, and February 24, 2012, respectively, to provide a revised schedule. Supplement 4 response was sent on April 17, 2012 to provide a technically correct INTERIM response to Question 09.01.01-59 and a revised schedule for the final response to this question.

The attached file, “RAI 513 Supplement 5 Response US EPR DC.pdf” provides a technically correct and complete final response to Question 09.01.01-56. The following table indicates the pages in the response document, “RAI 513 Supplement 5 Response US EPR DC.pdf” that contain AREVA NP’s response to the subject question.

Question #	Start Page	End Page
RAI 513 — 09.01.01-56	2	3

The schedule for a technically correct and complete final response to the remaining 9 questions is unchanged as shown below.

Question #	Response Date
RAI 513 — 09.01.01-53	July 26, 2012

RAI 513 — 09.01.01-54	July 26, 2012
RAI 513 — 09.01.01-57	July 26, 2012
RAI 513 — 09.01.01-58	August 30, 2013
RAI 513 — 09.01.01-59	July 26, 2012
RAI 513 — 09.01.01-60	July 26, 2012
RAI 513 — 09.01.01-61	August 30, 2013
RAI 513 — 09.01.01-62	August 30, 2013
RAI 513 — 09.01.04-20	August 30, 2013

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, April 17, 2012 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. 513 (5971,5040), FSAR Ch. 9, Supplement 4

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the ten questions in RAI No. 513 on October 27, 2011. Supplement 1, Supplement 2 and Supplement 3 responses to RAI No. 513 were sent on December 13, 2011, January 25, 2012, and February 24, 2012, respectively, to provide a revised schedule.

The attached file, "RAI 513 Supplement 4 Response US EPR DC-INTERIM.pdf" provides a technically correct INTERIM response to Question 09.01.01-59. The following table indicates the pages in the response document, "RAI 513 Supplement 4 Response US EPR DC-INTERIM.pdf" that contains AREVA NP's INTERIM response to the subject question.

Question #	Start Page	End Page
RAI 513 — 09.01.01-59	2	2

The schedule for a technically correct and complete final response to this question (Question 09.01.01-59) has been changed as provided below. The schedule for the final response to the remaining questions is unchanged.

Question #	Response Date
RAI 513 — 09.01.01-53	July 26, 2012
RAI 513 — 09.01.01-54	July 26, 2012

RAI 513 — 09.01.01-56	April 26, 2012
RAI 513 — 09.01.01-57	July 26, 2012
RAI 513 — 09.01.01-58	August 30, 2013
RAI 513 — 09.01.01-59	**July 26, 2012**
RAI 513 — 09.01.01-60	July 26, 2012
RAI 513 — 09.01.01-61	August 30, 2013
RAI 513 — 09.01.01-62	August 30, 2013
RAI 513 — 09.01.04-20	August 30, 2013

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Friday, February 24, 2012 8:51 AM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Supplement 3

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the ten questions in RAI No. 513 on October 27, 2011. Supplement 1 and Supplement 2 responses to RAI No. 513 were sent on December 13, 2011 and January 25, 2012, respectively, to provide a revised schedule.

The schedule for technically correct and complete responses to the ten questions has been changed as provided below. This schedule was transmitted to the NRC in AREVA NP letter NRC:12:008 dated February 21, 2012.

Question #	**Response Date**
RAI 513 — 09.01.01-53	**July 26, 2012**
RAI 513 — 09.01.01-54	**July 26, 2012**
RAI 513 — 09.01.01-56	**April 26, 2012**
RAI 513 — 09.01.01-57	**July 26, 2012**
RAI 513 — 09.01.01-58	**August 30, 2013**
RAI 513 — 09.01.01-59	**April 26, 2012**
RAI 513 — 09.01.01-60	**July 26, 2012**
RAI 513 — 09.01.01-61	**August 30, 2013**
RAI 513 — 09.01.01-62	**August 30, 2013**

RAI 513 — 09.01.04-20	**August 30, 2013**

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, January 25, 2012 12:54 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); NOXON David (RS/NB); KOWALSKI David (RS/NB); Michael.Miernicki@nrc.gov; peter.hearn@nrc.gov
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Supplement 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a response to the ten questions in RAI No. 513 on October 27, 2011. Supplement 1 response sent on December 13, 2011 provided a preliminary revised schedule.

The preliminary schedule for the response to these ten questions has been changed as provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by February 21, 2012.

Question #	Response Date
RAI 513 — 09.01.01-53	**February 21, 2012**
RAI 513 — 09.01.01-54	**February 21, 2012**
RAI 513 — 09.01.01-56	**February 21, 2012**
RAI 513 — 09.01.01-57	**February 21, 2012**
RAI 513 — 09.01.01-58	**February 21, 2012**
RAI 513 — 09.01.01-59	**February 21, 2012**
RAI 513 — 09.01.01-60	**February 21, 2012**
RAI 513 — 09.01.01-61	**February 21, 2012**
RAI 513 — 09.01.01-62	**February 21, 2012**
RAI 513 — 09.01.04-20	**February 21, 2012**

Sincerely,

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

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

From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, December 13, 2011 4:55 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); NOXON David (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Supplement 1

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a response to the 10 questions of RAI 513 on October 27, 2011.

A preliminary revised schedule for technically correct and complete responses to these 10 questions is provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by January 25, 2012.

Question #	Response Date
RAI 513 — 09.01.01-53	**January 25, 2012**
RAI 513 — 09.01.01-54	**January 25, 2012**
RAI 513 — 09.01.01-56	**January 25, 2012**
RAI 513 — 09.01.01-57	**January 25, 2012**
RAI 513 — 09.01.01-58	**January 25, 2012**
RAI 513 — 09.01.01-59	**January 25, 2012**
RAI 513 — 09.01.01-60	**January 25, 2012**
RAI 513 — 09.01.01-61	**January 25, 2012**
RAI 513 — 09.01.01-62	**January 25, 2012**
RAI 513 — 09.01.04-20	**January 25, 2012**

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
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Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, October 27, 2011 3:04 PM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); NOXON David (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 513 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the 10 questions cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 513 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 513 — 09.01.01-53	2	2
RAI 513 — 09.01.01-54	3	3
RAI 513 — 09.01.01-56	4	4
RAI 513 — 09.01.01-57	5	5
RAI 513 — 09.01.01-58	6	6
RAI 513 — 09.01.01-59	7	7
RAI 513 — 09.01.01-60	8	8
RAI 513 — 09.01.01-61	9	9
RAI 513 — 09.01.01-62	10	10
RAI 513 — 09.01.04-20	11	12

A preliminary schedule for technically correct and complete responses to the 10 questions in RAI 513 is provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by December 14, 2011.

Question #	Response Date
RAI 513 — 09.01.01-53	December 14, 2011
RAI 513 — 09.01.01-54	December 14, 2011
RAI 513 — 09.01.01-56	December 14, 2011
RAI 513 — 09.01.01-57	December 14, 2011
RAI 513 — 09.01.01-58	December 14, 2011
RAI 513 — 09.01.01-59	December 14, 2011
RAI 513 — 09.01.01-60	December 14, 2011
RAI 513 — 09.01.01-61	December 14, 2011
RAI 513 — 09.01.01-62	December 14, 2011
RAI 513 — 09.01.04-20	December 14, 2011

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Friday, September 30, 2011 3:01 PM
To: ZZ-DL-A-USEPR-DL
Cc: Patel, Amrit; Lu, Shanlai; Donoghue, Joseph; Nolan, Ryan; Segala, John; Lee, Samuel; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on September 14, 2011, and discussed with your staff on September 29, 2011. Draft RAI Question 09.01.01-55 was deleted, and Draft RAI Questions 09.01.01-56 and 09.01.01-58 were modified as a result of that discussion. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

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

Hearing Identifier: AREVA_EPR_DC_Docs_Public
Email Number: 36

Mail Envelope Properties (554210743EFE354B8D5741BEB695E6561A8C5B)

Subject: Response to U.S. EPR Design Certification Application RAI No. 513 (5971,5040), FSAR Ch. 9, Supplement 14
Sent Date: 6/27/2013 5:17:11 PM
Received Date: 6/27/2013 5:17:21 PM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

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Tracking Status: None
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Files	**Size**	**Date & Time**
MESSAGE	34873	6/27/2013 5:17:21 PM
RAI 513 Supplement 14 Response US EPR DC.pdf	201965	

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

Response to

Request for Additional Information No. 513, Supplement 14

9/30/2011

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.01.01 - Criticality Safety of Fresh and Spent Fuel Storage and Handling
SRP Section: 09.01.04 - Light Load Handling System (Related to Refueling)

Application Section: 9.1 and Technical Report TN-Rack.0101, Rev 0

QUESTIONS for Reactor System, Nuclear Performance and Code Review (SRSB)
QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

Question 09.01.01-61:

OPEN ITEM

Follow-up to RAI 402, Question 09.01.01-42 (Issue #4)

In Issue #4, the staff had additional questions regarding the various sources of boron available at the plant and the potential for an abnormal condition associated with introduction of natural enrichment soluble boron into the SFP. The applicant was also asked to provide justification for TS SR 3.7.15.2 (verifies the isotopic enrichment of the boron in the SFP on a 24 month basis) with regard to both the expected impact of B-10 depletion in the SFP and the potential for introduction of natural boron.

It was explained that both natural and enriched boron could be available as feed stock and that fresh boric acid is introduced into plant systems via the boric acid mixing tank. It is explained that the boric acid storage tanks will be maintained at an enrichment of 40 ± 1 percent. Two ways that allow for altering of the storage tank boron enrichment are given: (1) highly enriched boron will be added in the RCS water to account for B-10 depletion, and (2) blends of highly enriched boron and natural boron will be added to the storage tanks to replace boric acid that cannot be recycled. It is stated that mixture of the boric acid storage tank water with the SFP water is possible because the storage tank water is injected into the RCS before the refueling cavity is filled for refueling. It is also stated that "because the boric acid storage tank enrichment is maintained above 37% before borating the RCS to refueling concentration, it will not reduce the average enrichment of the spent fuel pool." Provide the procedures and controls that are in place to ensure a minimum of 37% B-10 enrichment is maintained in the boric acid storage tank.

Response to Question 09.01.01-61:

Periodic testing of the boron concentration and enrichment in the boric acid storage tank is performed to demonstrate that sufficient boron of ≥ 37 percent enrichment is available.

U.S. EPR FSAR Tier 2, Section 9.3.4.4 will be revised to include the following:

> "Periodic testing of the boron concentration and enrichment in the boric acid storage tank is performed to demonstrate that sufficient boron of ≥ 37 percent enrichment is available."

U.S. EPR FSAR Tier 2, Section 14.2 and Table 14.2-1 will be revised to reflect the addition of a new test abstract #051 (Boron Recovery) to U.S. EPR FSAR Tier 2, Section 14.2.12.6.1.

U.S. EPR FSAR Tier 2, Section 9.1.2.2.2 will be revised to include the following:

> "Prior to refueling, water from the boric acid storage tank (BAST) is injected into the RCS and the refueling cavity is filled. Consequently, water stored in the BAST could mix with the SFP inventory due to fluid interchange between the SFP and refueling cavity during fuel movement. Therefore, before borating the RCS to the refueling concentration, the BAST enrichment is verified to be 40 percent +/- 1.0 percent by performing testing in accordance with Section 14.2 (test abstract #051). This test demonstrates that the addition of borated water from the BAST will not reduce the average boron enrichment of the SFP."

U.S. EPR FSAR Tier 2, Sections 3.1.3.7.1, 3.1.4.4.1, 3.9.4, 5.2.3.2.1, 9.1.4.2.1, and 9.3.4.2.1 will be revised to provide additional clarification that the discussion pertains to enriched boric acid.

U.S. EPR FSAR Tier 2, Section 3.9.4 will also be revised to correct a reference to an incorrect chapter number.

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 3.1.3.7.1, 3.1.4.4.1, 3.9.4, 5.2.3.2.1, 9.1.2.2.2, 9.1.4.2.1, 9.3.4.2.1, 9.3.4.4 and 14.2 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR, Tier 2, Table 14.2-1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.01.01-62:

OPEN ITEM

The applicant identified two additional ways that the SFP B-10 enrichment could potentially be impacted: (1) impact of makeup batches from the boric acid mixing tank to the SFP and (2) B-10 depletion that occurs as a result of the neutron fluence in the SFP. One reason for a makeup batch to the SFP is to add water lost due to evaporation. This case does not involve boron addition and therefore is not of concern with respect to B-10 enrichment. The other reason for a makeup batch is to add borated water, potentially containing natural boron, to the SFP. Despite the fact that borated water additions are planned to be an infrequent event, the staff is unaware of any limitations on the number of borated makeup operations to the SFP or the quantity of water that is added in a given makeup batch. With this in mind, provide a description of the verification process for ensuring that the proper B-10 enrichment for this operation is verified.

Response to Question 09.01.01-62:

The boron enrichment of the spent fuel pool (SFP) is verified every 24 months per U.S. EPR FSAR Tier 2, Chapter 16 Technical Specifications, Surveillance Requirement Section 3.7.15. Since the boron in the SFP is not exposed to a significant neutron flux, 24 months is considered a very conservative time period. Enriched boron in systems that are not exposed to a high neutron flux, such as the SFP, are relatively unaffected by boron depletion. Consequently, boric acid additions to the SFP are not planned.

However, in the event that an unplanned boron addition to the SFP occurs, fresh boron will be provided by the boric acid mixing tank. The design of the boric acid mixing tank allows for recirculation and sampling of the fresh boron for enrichment, as well as concentration. The boric acid mixing tank is primarily used to add boron to the boric acid storage tank using the same procedures that were discussed in the Response to Question 09.01.01-61.

FSAR Impact:

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

U.S. EPR Final Safety Analysis Report Markups

3.1.3.7 Criterion 26 – Reactivity Control System Redundancy and Capability

"Two independent reactivity control systems of different design principles shall be provided. One of the systems shall use control rods, preferably including a positive means for inserting the rods, and shall be capable of reliably controlling reactivity changes to assure that under conditions of normal operation, including anticipated operational occurrences, and with appropriate margin for malfunctions such as stuck rods, specified acceptable fuel design limits are not exceeded. The second reactivity control system shall be capable of reliably controlling the rate of reactivity changes resulting from planned, normal power changes (including xenon burnout) to assure that the acceptable fuel design limits are not exceeded. One of the systems shall be capable of holding the reactor core subcritical under cold conditions."

3.1.3.7.1 U.S. EPR Compliance

Two independent reactivity control systems are provided: rod cluster control assemblies (RCCA), which are inserted into the core by gravity; and chemical shim (boric acid). During operation, the shutdown rod banks are fully withdrawn. Using the rod control system, the operator maintains a programmed average reactor temperature compensating for reactivity effects associated with scheduled and transient load changes. The shutdown rod banks and the control banks shut down the reactor with adequate margin under normal operation and anticipated operational occurrences so that specified fuel design limits are not exceeded. The most restrictive period in the core life is assumed in all analyses for this system, and the most reactive rod cluster is assumed to be in the fully withdrawn position. Boration control via the CVCS maintains the reactor in the cold shutdown state independent of the position of the control rods and can compensate for xenon burnout transients.

Further information on RCCAs is provided in Chapter 4 and Chapter 7. Enriched b~~B~~oric acid concentration control is described in Section 9.3.4. Performance analyses under accident conditions are included in Section 15.0.

3.1.3.8 Criterion 27 – Combined Reactivity Control Systems Capability

"The reactivity control systems shall be designed to have a combined capability, in conjunction with poison addition by the emergency core cooling system, of reliably controlling reactivity changes to assure that under postulated accident conditions and with appropriate margin for stuck rods, the capability to cool the core is maintained."

3.1.3.8.1 U.S. EPR Compliance

The U.S. EPR makes and holds the core subcritical under any anticipated conditions and with appropriate margin for contingencies. The means to accomplish this are described in detail in Chapter 4 and Chapter 6. Combined use of the rod cluster control system, the safety injection system, and the extra borating system permits the

materials with irradiation are used to confirm the allowable limits calculated for operational transients. Changes in the fracture toughness properties of the reactor vessel core region plates forging, weldments, and associated heat treated zones are monitored in accordance with 10 CFR 50, Appendix H. Samples of reactor vessel plate materials are retained and catalogued in case future engineering development shows the need for further testing.

3.1.4.4 Criterion 33 – Reactor Coolant Makeup

"A system to supply reactor coolant makeup for protection against small breaks in the reactor coolant pressure boundary shall be provided. The system safety function shall be to assure that specified acceptable fuel design limits are not exceeded as a result of reactor coolant loss due to leakage from the reactor coolant pressure boundary and rupture of small piping or other small components which are part of the boundary. The system shall be designed to assure that for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available) the system safety function can be accomplished using the piping, pumps, and valves used to maintain coolant inventory during normal reactor operation."

3.1.4.4.1 U.S. EPR Compliance

The pressurizer level program accommodates changes in the reactor coolant volume for normal power changes, including the transition from hot standby to full-power operation and returning to hot standby. The pressurizer also has sufficient volume to accommodate minor RCS leakage.

Safety-related RCS makeup is provided to accommodate small leaks when the normal makeup system is unavailable and to accommodate larger leaks resulting from loss of coolant accidents. Safety-related reactor coolant makeup and safety injection are provided by the medium-head and low-head safety injection (MHSI and LHSI) accumulators, and the in-containment refueling water storage tank (IRWST). Long-term cooling is provided by recirculation of reactor coolant through the LHSI system. Further information on the LHSI system is provided in Section 6.3. The safety-related reactor coolant makeup relies on the Class 1E system and is designed to remain functional in spite of a single active component failure coincident with the loss of either the offsite or onsite power source.

The CVCS provides reactor coolant makeup and adjustment of the enriched boric acid concentration. The CVCS provides two flow paths for the continuous letdown and charging of RCS water. The CVCS maintains the reactor coolant system water inventory at the desired level via the pressurizer level control system and provides reactor coolant pump seal water injection and auxiliary spray for pressurizer cooldown. The CVCS is an operational system and is not required for the mitigation of

3.9.4 Control Rod Drive System

The control rod drive system (CRDS) consists of the control rods and the related components which provide the means for mechanical movement. The CRDS extends to the coupling interface with the rod cluster control assembly (RCCA). However, as stated in Section 3.9.4 of the Standard Review Plan, for electromagnetic systems designs such as the CRDS, the description in this section is limited to the control rod drive mechanism (CRDM).

The following GDC apply to the CRDS:

- GDC 1 and 10 CFR 50.55a establish requirements for the quality standards to be applied to the CRDS. Table 3.2.2-1 provides the seismic and other design classifications of the components in the CRDS.

- GDC 2 establishes requirements for the CRDS to withstand the effects of an earthquake. The seismic classification of the CRDS, in accordance with RG 1.29, is provided in Section 3.2.

- GDC 14 establishes requirements for the reactor coolant pressure boundary (RCPB) portion of the CRDS. The CRDS is designed to provide a barrier to the release of fission products to the containment through the design of the control rod drive housing and the related components that are part of the RCPB.

- GDC 26 establishes requirements for the redundancy and capability of the reactivity control systems. As described in Section 3.1.3, the reactivity control systems for the U.S. EPR are the RCCAs, which are inserted into the core by gravity, and the chemical shim (boric acid) system. Further information on the RCCAs is provided in Chapter 4 and Chapter 7. Enriched ~~B~~boric acid concentration control is described in Section 9.3.4.

- GDC 27 establishes requirements for the combined reactivity control system capability. The CRDS is one of the reactivity control systems relied on during normal operation and anticipated operational occurrences to control reactivity changes so that the fuel design limits are not exceeded. As described in Section 3.1.3, the U.S. EPR maintains the core subcritical under anticipated conditions with margin for contingencies. The means to accomplish this are described in detail in Chapter 4 and Chapter 6~~9~~.

- Pursuant to GDC 29, the CRDS, in conjunction with the reactor protection systems, is designed to have an extremely high probability of accomplishing its safety functions in the event of anticipated operational occurrences. Further information concerning the design of the protection and reactivity control systems is found in Chapter 4 and Chapter 7.

3.9.4.1 Descriptive Information of CRDS

The CRDS includes the CRDMs and the rod cluster control assemblies (RCCA), which have absorber material over the entire length of the control rods. Further descriptions

NiCrFe Alloy 600 base metal or Alloys 82/182 weld metal is not used in RCPB applications. NiCrFe Alloy 690 base metal has controlled chemistry, mechanical properties, and thermo-mechanical processing requirements that produce an optimum microstructure for resistance to intergranular corrosion. Alloy 690 is solution annealed and thermally treated to optimize the resistance to intergranular corrosion.

Alloy 690 and its weld filler metals (Alloy 52/52M/152) in contact with RCS primary coolant have limited cobalt content not exceeding 0.05 wt%. Alloy 690 in contact with RCS primary coolant has limited sulfur content not exceeding 0.02 wt%.

Code Case N-785 has been applied to CRDM materials as shown in Table 5.2-2. This code case was approved by the ASME Boiler and Pressure Vessel Standards Committee on October 12, 2009. The basis for approval of this case is derived from the fact that the chemical composition, material properties, and heat treatment requirements for SA-182/182M Grade F6NM and SA-479/479M (UNS S41500) are virtually identical.

5.2.3.2 Compatibility with Reactor Coolant

5.2.3.2.1 Reactor Coolant Chemistry

The RCS water chemistry is controlled to minimize negative impacts of chemistry on materials integrity, fuel rod corrosion, fuel design performance, and radiation fields, and is routinely analyzed for verification. The water chemistry parameters are based on industry knowledge and industry experience as summarized in the EPRI PWR Primary Water Chemistry Guidelines (Reference 3).

The chemical and volume control system (CVCS) provides the primary means for maintaining the required volume of water in the RCS and for the addition of chemicals. The design of the CVCS allows for the addition of chemicals to the RCS to control pH, scavenge oxygen, control radiolysis reactions, and maintain corrosion product particulates within a specified range. Table 5.2-3—Reactor Coolant Water Chemistry - Control Parameters shows the control values for the reactor coolant chemistry parameters and impurity limitations during power operation. These criteria conform to the recommendations of RG 1.44 and the EPRI PWR Primary Water Chemistry Guidelines report.

Enriched boric acid with an isotopic concentration of B-10 ≥ 37 percent ~~(EBA)~~ is added to the RCS as a soluble neutron poison for core reactivity control. Lithium hydroxide enriched in lithium 7 is used as a pH control agent to maintain a slightly basic pH at operating conditions. This chemical is chosen for its compatibility with the materials and water chemistry of borated water/stainless steel/zirconium/nickel-base alloy systems. Lithium-7 is also produced in solution from the neutron irradiation of the dissolved boron in the coolant.

9.1.2.2.2 Spent Fuel Storage

The spent fuel pool provides storage space for a minimum of 10 years worth of irradiated fuel assemblies, plus the capability for a full core offload from the reactor. The spent fuel storage racks provide a maximum storage capacity of 1247 fuel assemblies. The pool is a reinforced concrete structure (refer to Section 3.8.4) with a stainless steel liner having a nominal depth of 47 feet, 3 inches (approximately 29 feet above the tops of the stored fuel assemblies). Borated water is used in the spent fuel pool and is maintained at greater than or equal to 1700 ppm boron isotopically enriched to ≥ 37 percent B-10. The concentration required for sub-criticality for spent fuel is approximately 582 ppm boron isotopically enriched to ≥ 37 percent B-10. Figure 3.8-42 through Figure 3.8-46 and Figure 3.8-50 through Figure 3.8-52 show the spent fuel pool and other related fuel handling areas. A simplified cross-section of the spent fuel pool showing elevations is provided in Figure 9.1.2-3. Fresh unirradiated fuel assemblies are either stored in the NFSF or in the fuel storage pool (or both). Unirradiated rod control clusters and thimble plug assemblies are normally stored in the fuel assemblies in the SFP.

Prior to refueling, water from the boric acid storage tank (BAST) is injected into the RCS and the refueling cavity is filled. Consequently, water stored in the BAST could mix with the SFP inventory due to fluid interchange between the SFP and refueling cavity during fuel movement. Therefore, before borating the RCS to the refueling concentration, the BAST enrichment is verified to be 40 percent +/- 1.0 percent by performing testing in accordance with Section 14.2 (test abstract #051). This test demonstrates that the addition of borated water from the BAST will not reduce the average boron enrichment of the SFP.

The underwater fuel storage racks are located in the spent fuel storage pool inside the Fuel Building. The racks meet Seismic Category I requirements. Spent fuel rack materials are compatible with the pool storage environment. Rack structural materials are corrosion-resistant and compatible with the expected water chemistry of the SFP.

The spent fuel storage racks consist of an assembly of tubes with neutron absorber plates sandwiched between the tubes. The tube assembly is supported by a stainless steel frame structure consisting of a base plate, four corner angles, bottom horizontal bands, three sets of intermediate horizontal bands equally spaced along the rack's length, and top support and bottom support grid assemblies which are welded to the external frame structure. The top and bottom grid assemblies provide lateral restraint to the tube assembly. The top grid assembly also provides axial restraint to the tubes and neutron absorber plates. Each rack module is vertically supported by 6 legs on the SFP floor without anchoring. The grid structures are designed so that a fuel assembly cannot be inserted between the cells.

This equipment consists of fuel assembly handling devices such as the refueling machine, FTTF, new fuel elevator, spent fuel machine, auxiliary crane, Spent Fuel Cask Transfer Facility, and fuel racks. The areas associated with the fuel handling equipment are the refueling cavity consisting of the reactor cavity, the core internal storage area and the reactor building transfer compartment, and the fuel pool consisting of the transfer pit, the loading pit and the spent fuel storage pool, loading hall, and the new fuel storage area.

Figures showing the overall system arrangement in the RB and FB are provided in Section 3.8. Section 3.8.4.1 describes the FB as a Seismic Category I structure. The loading hall and cask loading pit are integral to the FB concrete structure and are designed as Seismic Category I structures. Section 3.8.4.2 identifies the applicable codes and standards used for the design of Seismic Category I structures other than the RB and Reactor Containment Building. Section 3.8.4.4.1 lists the general design procedures applicable to other Seismic Category I structures. The design of anchors and embedments conforms to the requirements of ACI 349-06. The results of seismic analyses for Seismic Category I structures are given in Section 3.7.

9.1.4.2.1 General Description

The fuel handling equipment can handle a fuel assembly underwater from the time a new fuel assembly is lowered into the underwater fuel storage area until the irradiated fuel assembly is placed in a spent fuel cask for shipment from the site. Underwater transfer of spent fuel assemblies provides radiation shielding and cooling for removal of decay heat. The enriched boric acid concentration in the water is sufficient to preclude criticality.

The reactor cavity, the core internal storage compartment, and the reactor building pool transfer compartment are flooded only for refueling during plant shutdowns. The SFP remains full of water and is always accessible to operating personnel.

New Fuel Handling and Storage

New fuel containers are received in the FB loading bay. Typically, each container carries two fuel assemblies. New fuel containers are raised one at a time through a floor opening to the new fuel examination area located at Elevation +48 feet, 6.75 inches with the use of the auxiliary crane. The new fuel assemblies are removed from the container for individual examination using the auxiliary crane and new fuel handling tool. The new fuel assembly is raised through the floor opening until the fuel assembly lower end clears the fuel pool operating floor level (+64 feet) and is then moved and either lowered in the new fuel dry storage area or in the new fuel elevator basket. This process is repeated for the remaining new fuel containers. The new fuel elevator lowers the fuel assembly into the spent fuel storage pool for underwater storage. Administrative controls prevent movement of a new fuel assembly over the

stripped gas sample to determine the dissolved hydrogen concentration. Both the online analyzer and grab sample are taken from a letdown sample point upstream of the coolant purification and hydrogenation systems.

During the startup of the gassing unit, hydrogen is not admitted until the gas separator reaches its operating level. At that time, the water jet pump, which exhausts gas from the gas separator and injects it into the mixing element, is placed into operation. A branch line from the charging pump discharge line supplies the propellant liquid for the water jet pump. After the gas separator reaches its operating water level, the gas distribution system injects hydrogen into the gas separator. The gassing unit contains connections for adding hydrogen and for venting and flushing with nitrogen.

If the hydrogen forms larger gas bubbles, the charging pump suction provides a mixing element that makes sure only small bubbles enter the pump. Since out-gassing of dissolved gases can not be avoided when the pump is not operating, venting lines with motor-operated isolation valves are installed at the charging pump suction. This vent valve is opened when the charging pump is started and is closed after the charging pump has been operating for approximately 60 seconds.

Reactor Makeup and Inventory Control

During normal operation, the RCS inventory is maintained at a constant value by varying the letdown flow with a constant charging flow.

During a power increase, the reactor coolant expands as its temperature rises. Depending on the power level, the pressurizer absorbs these expansions as the level setpoint varies in a range designed for this purpose. If the pressurizer level increases above its setpoint, then the HP reducing valve opens to increase the letdown flow and reduce the pressurizer level to its setpoint. This excess water is drained to the VCT.

If the level in the VCT increases above its upper setpoint, a three-way valve partially diverts some of the letdown flow to the CSSS. If the level continues to increase above the upper setpoint, the total letdown flow is diverted to the CSSS tanks.

If the charging flow is greater than the letdown flow, the level in the VCT may reach the low-level setpoint. In this event, the VCT level decreases below the low-level setpoint and the VCT level is automatically adjusted. A signal initiates an automatic makeup from the reactor boron and water makeup system. This makeup automatically injects boric acid and demineralized water at rates such that the boron concentration of the makeup water corresponds to the RCS boron concentration. In the event the VCT level reaches its low-low level, the charging pump suction automatically switches to the IRWST.

Two boric acid storage tanks are provided and separated by MOVs. Each tank is initially filled with four percent boric acid (approximately 7000 ppm boron) with an

isotopic concentration of B-10 ≥ 37 percent and has an available volume of approximately 3250 ft^3. Each tank has its own boric acid makeup pump for providing the required amount of boric acid to the charging pump suction. A tritium grab sample measurement point is located at the discharge of each boric acid makeup pump (Refer to Section 11.5.4.14 and Table 11.5-1, Monitor R-45). A flow diagram of the reactor boron and water makeup system (RBWMS) is shown in Figure 9.3.4-4—Reactor Boron and Water Makeup System.

The demineralized water pumps that take suction from the storage tanks in the CSSS provide the demineralized water. There are six coolant storage tanks (11 through 16). Each has an available volume of approximately 4061 ft^3. A flow diagram of the CSSS is shown in Figure 9.3.4-5—Coolant Supply and Storage System.

Initially, tanks 11 through 14 are full of demineralized water and tanks 15 and 16 are empty. As reactor coolant makeup is required, the aligned boric acid storage tank provides boric acid and the CSSS tanks provide demineralized water in sequence starting with tank 14 and ending with tank 11.

As adjustments to the RCS boron concentration are required because of plant conditions (i.e., plant heatup, startup, shutdown, load follow, and to compensate for fuel burnup), demineralized water is added or a blended makeup is performed. This added water to the RCS results in the increase of the VCT level above its setpoint, which requires the discharge of reactor coolant to the CSSS. As reactor coolant discharges, water transfers sequentially into tank 16 of the CSSS first and then into tank 15. When tank 16 is approximately 55 percent full, a signal is initiated to generate processing water from the tank in the coolant treatment system (CTS). The CTS produces demineralized water and recovers the boron for reuse.

Refer to Section 12.3.6.5.3 for coolant supply and storage system design features which demonstrate compliance with the requirements of 10 CFR 20.1406.

Coolant Treatment and Boron Recovery

The CVCS discharges water to the CSSS, which contains boron ranging from refueling concentration to approximately zero ppm. The CTS processes this water. A flow diagram of the CTS is shown in Figure 9.3.4-6—Coolant Treatment System.

In general, evaporation separates the coolant into a concentrated boric acid solution at four percent H_3BO_3 and demineralized water. Due to the low vapor pressure of boric acid at the boiling temperature of water, the vapor generated by the evaporator has a low boric acid concentration. The vapor passes through a series of trays in the boric acid column, which further removes boric acid from the vapor.

leakage control and detection systems in the CVCS and implementation of appropriate leakage control program.

- The CVCS isolates components or piping so that the CVCS safety function is not compromised. Design provisions include the capability to identify and isolate the leakage or malfunction, and to isolate the non-safety-related portions of the system.

10 CFR 50.63 identifies the requirements for withstanding or coping with, and recovering from an SBO event.

- The CVCS provides automatic isolation of the letdown line at the onset of an SBO event.

- The interface between the reactor boron system and the gaseous waste processing system includes two isolation valves. The design of these two isolation valves satisfies RG 1.143, Regulatory Position C.5, as it relates to radwaste classifications so that the radiological release/quantity criterion is met.

9.3.4.4 Inspection and Testing Requirements

The CVCS components are inspected and tested as part of the initial test program. Refer to Section 14.2 (test abstracts #002, #003, #004, #005, #006, #007, #008, #009, #010, #011, #126, #173 and #176) for initial plant startup test program. Section 5.2 and Section 6.6 provide the ASME Boiler and Pressure Vessel Code, Section XI (Reference 2) requirements that are appropriate for the CVCS.

Periodic testing of the boron concentration and enrichment in the boric acid storage tank is performed to demonstrate that sufficient boron of ≥ 37 percent enrichment is available.

9.3.4.5 Instrumentation Requirements

The instrumentation and control (I&C) functions are normally performed from the MCR by the Process Information and Control System (PICS). In the event the PICS is not available, CVCS actuators that provide a safety function are operated from the Safety Information and Control System (SICS).

Process control instrumentation is provided to acquire data concerning key parameters about the CVCS.

The instrumentation furnishes input signals to monitor or generate alarms. Indications or alarms are provided for pressure, temperature, flow, level and boron concentration. The instrumentation also supplies input signals for control purposes. Specific control functions are described as follows:

4.0 DATA REQUIRED

4.1 Fuel pool spray system initial functional data including the following:

4.1.1 Spray flow.

4.1.2 Spent fuel pool fill flow.

4.1.3 Fluid temperature.

4.1.4 Fuel pool level changes during design conditions.

- Spent fuel pool fill operation.
- Spent fuel pool spray operation.

4.2 Record spray patterns (pictures, marked up drawings, etc.).

5.0 ACCEPTANCE CRITERIA

5.1 The fuel pool fill/spray system meets design requirements:

5.1.1 Verify that valve performance meets design requirements.

5.1.2 Verify that the spray flow rate meets minimum/maximum design limitations.

5.2 Verify that the fuel pool fill/spray system does not indicate evidence of water hammer when flow is initiated or terminated.

14.2.12.6 General Supply Systems

14.2.12.6.1 Boron Recovery~~Reserved~~ (Test #051)

1.0 OBJECTIVE

1.1 To perform testing to demonstrate that the coolant supply and storage system can be operated as designed, to recover enriched boric acid and to makeup to the boric acid storage tank (BAST).

2.0 PREREQUISITES

2.1 Construction activities on the following systems have either been completed or exceptions have been recorded and the impact on the system performance has been determined.

2.1.1 Coolant Supply and Storage System.

2.1.2 Reactor Boron and Water Makeup System.

2.2 Test instrumentation is available and calibrated. A record of calibrated test instrumentation used with individual tracking number and calibration due date shall be recorded in the official test record.

Note: It is important not to perform this test too early due to the potential of having to waste the contents of the BAST if the tank becomes contaminated with material that exceeds the reactor coolant chemistry limits. During hot functional testing (HFT), it is desirable to borate the RCS in order to create a

passivation layer on internal surfaces but it is not necessary to use enriched boron. If the boric acid in the RCS meets chemistry requirements, it is possible to use the coolant supply and storage system (CSSS) to concentrate the boric acid and add enriched boric acid using the reactor boron and water makeup system (RBWMS) to reach the target BAST boron-10 isotopic enrichment of 40 percent.

2.3 The following preoperational tests have been completed and the overall schedule supports maintaining enriched boric acid in the BAST.

2.3.1 Coolant Supply and Storage System (Test #006).

2.3.2 Reactor Boron and Water Makeup System (Test #007).

Note: When determining if the reactor coolant is suitable for recycling, it is essential to realize that some trace contaminants will concentrate in a ratio similar to the initial/final boron concentration.

2.4 Verify that HFT is complete and the reactor coolant meets the chemistry requirements for recycling the boric acid.

3.0 TEST METHOD

3.1 Operate the CSSS using the evaporators until the concentrated boric acid is between 7000 ppm and 7300 ppm.

3.2 Confirm that the CSSS tank fluid that is to be transferred to the BAST meets RCS chemistry requirements.

3.3 Determine the boron-10 isotopic enrichment of the CSSS tank fluid that is to be transferred to the BAST.

3.4 Determine the amount of high enriched boric acid that has to be added to the BAST to bring the contents of the BAST plus the CSSS tank volume that is to be transferred to the BAST to a boron-10 isotopic enrichment of 40 ± 1.0 percent.

3.5 Add the contents of the CSSS tank volume that is to be transferred to the BAST to the BAST and verify that the contents are adequately mixed.

3.6 Add the amount of high enriched boric acid that has to be added to the BAST that was previously calculated and verify the contents are adequately mixed.

3.7 Measure the BAST boron-10 isotopic enrichment.

3.8 Determine the amount of high enriched boric acid that has to be added to the BAST to bring the BAST to a boron-10 isotopic enrichment of 40 ± 1.0 percent.

3.9 If the BAST boron-10 isotopic enrichment is greater than 39 percent, determine the amount of high enriched boric acid that has to be added

to the BAST to bring the BAST to a boron-10 isotopic enrichment of 40 ± 1.0 percent; add the calculated amount to the BAST without verifying the final enrichment.

3.10 If the BAST boron-10 isotopic enrichment is less than or equal to 39 percent, determine the amount of high enriched boric acid that has to be added to the BAST to bring the BAST to a boron-10 isotopic enrichment of 40 ± 1.0 percent, then add the calculated amount to the BAST and measure the final enrichment.

4.0 DATA REQUIRED

4.1 Boron concentration of the CSSS.

4.2 Boron-10 isotopic enrichment of the CSSS.

4.3 Initial boron concentration of the BAST.

4.4 Initial boron-10 isotopic enrichment of the BAST.

4.5 Number of gallons of highly enriched boric acid that must be added to the BAST.

4.6 Final boron concentration of the BAST.

4.7 Final boron-10 isotopic enrichment of the BAST.

5.0 ACCEPTANCE CRITERIA

5.1 BAST boron concentration is between 7000 ppm and 7300 ppm.

5.2 BAST boron-10 isotopic enrichment is 40 ± 1.0 percent.

14.2.12.6.2 Safety Chilled Water System (Test #052)

1.0 OBJECTIVE

1.1 To demonstrate proper operation of the safety chilled water system (SCWS).

1.2 To demonstrate electrical independence and redundancy of power supplies.

1.3 To demonstrate proper operation of safety chilled water pumps in single and parallel operation.

1.4 To verify that radiation monitors respond as designed to check sources.

1.5 To verify that the Division 1 and 4 chillers responds to a load limiting signal during a SBO. It is acceptable to simulate SBO bus loading using offsite power and a PICS signal from a simulated SBO event.

2.0 PREREQUISITES

2.1 Construction activities on the SCWS have been completed.

2.2 SCWS instrumentation, including radiation monitors, has been calibrated and is functional for performance of the following test.

Table 14.2-1—List of Initial Tests for the U.S. EPR
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Test #	Test Name	FSAR or COLA Test	Applicable Section of RG 1.68, Revision 3	Other ~~RG~~ Requirement
036	Control Rod Drive Mechanism Control	FSAR	Appendix A, 1.b.(1)	
037	Pressurizer Safety Relief Valves	FSAR	Appendix A, 1.a.(2)(d) & 5.t	
038	Fuel Handling System	FSAR	Appendix A, 1.m.(2)	
039	Fuel Transfer System Operation and Leak Test	FSAR	Appendix A, 1.m.(3) & (5)	
040	Containment Polar Crane	FSAR	Appendix A, 1.o.(1), (2), & (3)	NUREG-0554 NUREG-0612 ASME NOG-1
041	Fuel Building Cranes	FSAR	Appendix A, 1.m.(2)	NURGE-0554 NUREG-0612 ASME-NOG-1
042	Turbine Building Crane	FSAR	Appendix A, 1.n	
043	Raw Water Supply System	COLA	Appendix A, 1.n	
044	Reactor Containment Building Doors	FSAR	Appendix A, 1.h & 1.i	
045	Seal Water Supply System	FSAR	Appendix A, 1.n.(8)	
046	Component Cooling Water System	FSAR	Appendix A, 1.d.(11) & 1.n.(3)	
047	~~Reserved~~Spent Fuel Cask Transfer Facility	FSAR	Appendix A, 1.m. (1)	
048	Essential Service Water System	FSAR	Appendix A, 1.d.(11) & 1.n.(1)	
049	Ultimate Heat Sink	FSAR	Appendix A, 1.d.(10) & 1.h.(10)	
050	~~Reserved~~ Fuel Pool Fill and Spray (ELAP)	FSAR		NRC Order EA-12-049
051	Boron Recovery~~Reserved~~	FSAR	Appendix A, 1.o(12)	
052	Safety Chilled Water System	FSAR	Appendix A, 1.n.(14)	