

ArevaEPRDCPEm Resource

From: BRYAN Martin (EXTERNAL AREVA) [Martin.Bryan.ext@areva.com]
Sent: Thursday, February 03, 2011 2:44 PM
To: Tesfaye, Getachew
Cc: DELANO Karen (AREVA); ROMINE Judy (AREVA); BENNETT Kathy (AREVA); RYAN Tom (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 414, FSAR Ch. 7 OPEN ITEM, Supplement 4
Attachments: RAI 414 Supplement 4 Response US EPR DC.pdf

Getachew,

AREVA NP provided a schedule on July 14, 2010 for a technically correct and complete response to RAI 414. Supplement 1 response was sent on October 28, 2010 to provide a revised schedule for all questions. Supplement 2 was sent on November 29, 2010 to provide a revised schedule for 6 of the remaining 7 questions. Supplement 3 was sent on January 13, 2011 to provide a revised schedule for 6 of the remaining 7 questions. Based on discussions with NRC, the attached file, "RAI 414 Supplement 4 Response US EPR DC.pdf" provides technically correct and complete responses to two of the remaining 7 questions, as committed.

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 two questions.

The following table indicates the respective pages in the response document, "RAI 414 Supplement 4 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 414 07.02-33	2	3
RAI 414 07.04-14	4	5

To allow additional time to interact with the NRC staff, a revised schedule for the remaining questions is provided.

Question #	Response Date
RAI 414 — 07.02-32	March 22, 2011
RAI 414 — 07.03-30	March 10, 2011
RAI 414 — 07.03-31	March 10, 2011
RAI 414 — 07.07-20	March 10, 2011
RAI 414 — 07.07-22	March 10, 2011

Sincerely,

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

From: BRYAN Martin (External RS/NB)
Sent: Thursday, January 13, 2011 4:35 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); PANNELL George (CORP/QP)
Subject: Response to U.S. EPR Design Certification Application RAI No. 414, FSAR Ch. 7 OPEN ITEM, Supplement 3

Getachew,

AREVA NP provided a schedule on July 14, 2010 for a technically correct and complete response to RAI 414. Supplement 1 response was sent on October 28, 2010 to provide a revised schedule for all questions. Supplement 2 was sent on November 29, 2010 to provide a revised schedule for 6 of the remaining 7 questions. To allow additional time to interact with the NRC staff, a revised schedule for these six questions is provided. The schedule for Question 07.02-32 remains the same.

A complete answer is not provided for the 7 questions. The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 414 — 07.02-32	March 01, 2011
RAI 414 — 07.03-33	February 11, 2011
RAI 414 — 07.02-30	February 11, 2011
RAI 414 — 07.03-31	February 11, 2011
RAI 414 — 07.04-14	February 11, 2011
RAI 414 — 07.07-20	February 11, 2011
RAI 414 — 07.07-22	February 11, 2011

Sincerely,

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From: BRYAN Martin (External RS/NB)
Sent: Monday, November 29, 2010 2:35 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); PANNELL George (CORP/QP)
Subject: Response to U.S. EPR Design Certification Application RAI No. 414, FSAR Ch. 7 OPEN ITEM, Supplement 2

Getachew,

AREVA NP provided a schedule on July 14, 2010 for a technically correct and complete response to RAI 414. Supplement 1 response was sent on October 28, 2010 to provide a revised schedule for all questions. To allow additional time to interact with the NRC staff, a revised schedule for six of the seven questions is provided. The schedule for Question 07.02-32 remains the same.

A complete answer is not provided for the 7 questions. The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
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RAI 414 — 07.02-32	March 01, 2011
RAI 414 — 07.03-33	January 13, 2011
RAI 414 — 07.02-30	January 13, 2011
RAI 414 — 07.03-31	January 13, 2011
RAI 414 — 07.04-14	January 13, 2011
RAI 414 — 07.07-20	January 13, 2011
RAI 414 — 07.07-22	January 13, 2011

Sincerely,

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From: BRYAN Martin (External RS/NB)
Sent: Thursday, October 28, 2010 4:53 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); PANNELL George (CORP/QP)
Subject: Response to U.S. EPR Design Certification Application RAI No. 414, FSAR Ch. 7 OPEN ITEM, Supplement 1

Getachew,

AREVA NP provided a schedule on July 14, 2010 for a technically correct and complete response to RAI 414. To allow additional time to interact with the NRC staff, a revised schedule is provided.

A complete answer is not provided for the 7 questions. The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 414 — 07.02-32	March 01, 2011
RAI 414 — 07.03-33	November 29, 2010
RAI 414 — 07.02-30	November 29, 2010
RAI 414 — 07.03-31	November 29, 2010
RAI 414 — 07.04-14	November 29, 2010
RAI 414 — 07.07-20	November 29, 2010
RAI 414 — 07.07-22	November 29, 2010

Sincerely,

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Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Wednesday, July 14, 2010 6:32 PM
To: 'Tefsaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); RYAN Tom (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 414, FSAR Ch. 7 OPEN ITEM

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 414 Response US EPR DC.pdf" provides a schedule since technically correct and complete responses to the 7 questions are not provided.

The following table indicates the respective pages in the response document, "RAI 414 Response US EPR DC.pdf" that contain AREVA NP's responses to the subject questions.

Question #	Start Page	End Page
RAI 414 — 07.02-32	2	2
RAI 414 — 07.03-33	3	3
RAI 414 — 07.02-30	4	6
RAI 414 — 07.03-31	7	8
RAI 414 — 07.04-14	9	9
RAI 414 — 07.07-20	10	10
RAI 414 — 07.07-22	11	11

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

Question #	Response Date
RAI 414 — 07.02-32	October 28, 2010
RAI 414 — 07.03-33	October 28, 2010
RAI 414 — 07.02-30	October 28, 2010
RAI 414 — 07.03-31	October 28, 2010
RAI 414 — 07.04-14	October 28, 2010
RAI 414 — 07.07-20	October 28, 2010
RAI 414 — 07.07-22	October 28, 2010

Sincerely,

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From: Tefsaye, Getachew [mailto:Getachew.Tefsaye@nrc.gov]
Sent: Tuesday, June 15, 2010 4:58 PM
To: ZZ-DL-A-USEPR-DL
Cc: Truong, Tung; Morton, Wendell; Spaulding, Deirdre; Mott, Kenneth; Jackson, Terry; Canova, Michael; Colaccino, Joseph; ArevaEPRDCPEM Resource
Subject: U.S. EPR Design Certification Application RAI No. 414(4394,4398,4752,4548), FSAR Ch. 7 OPEN ITEM

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on June 8, 2010, and on June 15, 2010, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The question in this RAI is an OPEN ITEM in the safety evaluation report for Chapter 7 for Phases 2 and 3 reviews. As such, the schedule we have established for your application assumes technically correct and complete responses prior to the start of Phase 4 review. For any RAI that cannot be answered prior to the start of Phase 4 review, it is expected that a date for receipt of this information will be provided 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: 2507

Mail Envelope Properties (199EBB4D1CD9644D9472AA84D5D8EFA71935AE)

Subject: Response to U.S. EPR Design Certification Application RAI No. 414, FSAR Ch. 7
OPEN ITEM, Supplement 4
Sent Date: 2/3/2011 2:43:45 PM
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From: BRYAN Martin (EXTERNAL AREVA)

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

Response to

**Request for Additional Information No. 414(4394, 4398, 4752, 4548), Revision 1,
Supplement 4**

6/15/2010

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 07.02 - Reactor Trip System

SRP Section: 07.03 - Engineered Safety Features Systems

SRP Section: 07.04 - Safe Shutdown Systems

SRP Section: 07.07 - Control Systems

Application Section: FSAR Chapter 7

QUESTIONS for Instrumentation, Controls and Electrical Engineering 1

(AP1000/EPR Projects) (ICE1)

Question 07.02-33:**OPEN ITEM**

Identify how many buttons must be pressed to send a reactor trip signal from the Main Control Room and the Remote Shutdown Station.

Clause 6.2.1 of IEEE Std. 603-1991 states that means shall be provided in the control room to implement manual initiation at the division level of the automatically initiated protective actions. The means provided shall minimize the number of discrete operator manipulations and shall depend on the operation of a minimum of equipment consistent with the constraints of 5.6.1. Section 7.2.1.2.22 of U.S. EPR FSAR states the capability for manual reactor trip is provided to the operator through the Safety Information and Control System in both the Main Control Room and Remote Shutdown Station, and at each location, four manual reactor trip buttons are provided to correspond to the four Protection System divisions. In the Main Control Room, how many buttons must be pressed to send a trip signal? In the Remote Shutdown Room, how many buttons must be pressed to send a trip signal? Figure 7.2-3 of U.S. EPR FSAR shows manual reactor trip logic for one division. Please provide a logic diagram that incorporates how many divisional buttons must be pushed to initiate a reactor trip for both MCR and RSS. In the applicant's response, please update both U.S. EPR FSAR and U.S. EPR Digital Protection System Technical Report.

Response to Question 07.02-33:Reactor Trip Devices

As shown in U.S. EPR FSAR Tier 2, Figure 7.2-4, the reactor trip (RT) breakers are arranged in a "one out of two taken twice" configuration. This requires opening of RT breakers in the logical equation (1 or 2) and (3 or 4) to achieve a RT. Two buttons must be pressed for the RT breakers to de-energize the control rod drive mechanisms (CRDMs), one in Divisions 1 or 2 and one in Divisions 3 or 4.

The RT contactors are shown in Figure 7.2-4. There are 23 sets of four contactors, each arranged in a standard two-out-of-four configuration. Two buttons must be pressed for the trip contactors to de-energize the CRDMs, in any two of the four divisions.

Main Control Room

As indicated in Section 7.6 of Reference 1, any two of four dedicated RT buttons in the main control room (MCR) together will actuate an RT. This is because the MCR RT buttons act on both the RT breakers and RT contactors, as illustrated in Figure 7-4 of Reference 1.

Remote Shutdown Station

As illustrated in Figure 7-4 of Reference 1, the four RT buttons in the remote shutdown station (RSS) act only on the RT breakers. Because of the RT breaker "one out of two taken twice" arrangement, the same logical arrangement applies to the four RT buttons: Div 1 or Div 2 and Div 3 or Div 4 to achieve RT.

U.S. EPR FSAR Tier 2, Section 7.2.1.2.22 will be revised to add the summary of manual RT buttons pressed to initiate the RT in both MCR and RSS.

References:

1. ANP-10309P, Revision 0, "U.S. EPR Digital Protection System Technical Report," AREVA NP Inc., November 2009.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 7.2.1.2.22 will be revised as described in the response and indicated on the enclosed markup.

Question 07.04-14:**OPEN ITEM****Follow-up to RAI 309, Question 07.09-60.**

The applicant provided information in response to the RAI 309 Question 07.09-60, which needs to be included in the U.S. EPR FSAR.

In its original RAI, the staff requested the applicant to demonstrate how the various data networks in the main control room (MCR), in the event of a control room fire, would not affect the capability to achieve safe shutdown, given that the plant data network, the terminal data network, and other components are shared between the MCR workstations and the Remote Shutdown Station (RSS) workstations.

10 CFR 50, Appendix R, III.G, "Fire Protection of Safe Shutdown Capability," requires, in part, fire protection features be provided for structures, systems, and components important to safe shutdown. Tier 2, Section 9.5.1.1 of the U.S. EPR Final Safety Analysis Report (FSAR) states that because of the MCR physical configuration, for a fire in the MCR, an independent alternative shutdown capability (RSS) that is physically and electrically independent of the MCR is used to achieve safe shutdown conditions. Tier 2, Section 7.1.1.3.1 and Section 7.1.1.3.2 of the U.S. EPR FSAR describe the capabilities of the SICS and PICS to achieve both hot and cold shutdown conditions from the RSS in case of a fire in the MCR. However, Tier 2, Figure 7.1-5 "Process Information and Control System Architecture" depicts the terminal data network being shared by both the MCR operator workstations and the RSS operator workstations. In addition, the terminal data network is connected to the plant data network through Process Units (PUs). Demonstrate that in the event of a fire in the MCR, the terminal data network, and the plant data network will not be impacted such that the RSS workstations maintain the capability for hot and cold shutdown to meet the requirements of 10 CFR 50, Appendix R, III.G.

The applicant provided a response to RAI 309 Question 07.09-60 and stated in part that the PUs and plant data network are physically located in a separate fire area from the MCR, and are therefore unaffected by fire in the MCR. The terminal data network hardware is located so that damage from a fire event in the MCR will be limited to network components required for the operation of MCR workstations and have no impact on the overall functionality of the terminal data network. Portions of the network required for operation from the RSS are located in a separate fire area from the MCR, so damage from a fire event in the MCR will be limited to the workstations in the MCR and will not impact the ability to safely shutdown the plant from the PICS workstations in the RSS.

The staff requests that this information be included in the U.S. EPR FSAR.

Response to Question 07.04-14

The following paragraph will be added to U.S. EPR FSAR Tier 2, Section 7.1.1.3.2:

"The PUs and plant data network are physically located in a separate fire area from the MCR, and are therefore unaffected by fire in the MCR. The terminal data network hardware is located so that damage from a fire event in the MCR will be limited to network components required for the operation of MCR workstations and have no impact on the

overall functionality of the terminal data network. Portions of the network required for operation from the RSS are located in a separate fire area from the MCR, so damage from a fire event in the MCR will be limited to the workstations in the MCR and will not impact the ability to safely shutdown the plant from the PICS workstations in the RSS.”

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 7.1.1.3.2 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

07.04-14

terminal data network. These networks implement periodic communications and message validation for robust data communications. Remote access of the PICS is not possible. The PUs and plant data network are physically located in a separate fire area from the MCR, and are therefore unaffected by fire in the MCR. The terminal data network hardware is located so that damage from a fire event in the MCR will be limited to network components required for the operation of MCR workstations and have no impact on the overall functionality of the terminal data network. Portions of the network required for operation from the RSS are located in a separate fire area from the MCR, so damage from a fire event in the MCR will be limited to the workstations in the MCR and will not impact the ability to safely shutdown the plant from the PICS workstations in the RSS.

Power Supply

The PICS is powered from the 12-hour uninterruptible power supply (12hr UPS). The 12hr UPS provides backup power with 12-hour batteries and the SBODGs during a LOOP.

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

7.1.1.4 Level 1 - System Automation

7.1.1.4.1 Protection System

The PS is an integrated digital reactor protection system (RPS) and ESF actuation system. The PS detects plant conditions that indicate the occurrence of AOO and postulated accidents, and it actuates the safety-related process systems required to mitigate the event.

Classification

The PS is classified as safety-related.

Functions

The PS performs these functions:

- Actuation of reactor trip.
- Actuation of ESF systems.
- Processing Type A-C PAM variables for display on the SICS.
- Interlocks.

The MSIs provide a communication path between the RCSL and other I&C systems via the GWs for both display of information and transfer of manual commands. The MSIs also provide a path to the SU for testing and maintenance of the various functional units of the RCSL.

Redundant GWs are provided to interface to the plant data network.

The SU provides the ability to monitor, service, and test the RCSL.

Equipment

The RCSL is implemented with the TXS digital I&C platform.

The AUs, CUs, DUs and MSIs generally consist of subracks, I/O modules, function processors, and communication modules, and optical link modules. SUs and GWs are non-safety-related and consist of industrial grade computers. Fiber optic and copper cable is used for the various data and hardwired connections.

07.04-14

Qualification Requirements

The RCSL equipment is located in Safeguard Buildings that provide a mild environment during and following design basis events. Equipment selected for use in the RCSL will be rated by the manufacturer (or otherwise reasonably expected) to operate under the mild environmental conditions expected to exist at its location during the events that the equipment is expected to be used.

~~There are no qualification requirements for the RCSL equipment.~~

Quality Requirements

For the RCSL equipment the quality requirements will be consistent with the Quality Assurance Plan for non-safety-related equipment as described in Addendum A of Topical Report ANP-10266.

~~There are no quality requirements for the RCSL equipment.~~

Diversity Requirements

There are no diversity requirements for the RCSL equipment.

Data Communications

Data communications implemented in the RCSL are:

- AU-CU – bi-directional, point-to-point data connections implemented with the TXS Profibus protocol.

There are no operating bypasses associated with this function; any automatic SI actuation will result in RT.

Automatic actuation of the SIS is described in Section 7.3, and the logic for generation of the SI signal is shown in Figure 7.3-2—SIS Actuation. The logic combining the safety injection signal with the remainder of the RT signals is shown in Figure 7.2-24—RT Signal Generation.

7.2.1.2.21 Reactor Trip on Emergency Feedwater System Actuation

This function is provided to trip the reactor when the emergency feedwater system (EFWS) is actuated by the PS due to low SG level.

In each division of the PS, when an EFWS actuation signal is generated due to low SG level (regardless of the EFWS train to be initiated), an RT signal is also generated in the same division.

The P13 permissive condition bypasses the RT on EFWS actuation function at low temperatures as measured in the hot legs. This bypass is automatically removed as hot leg temperature increases above the P13 setpoint. Generation of the P13 permissive signal is described in Section 7.2.1.3.

Automatic actuation of the EFWS is described in Section 7.3, and the logic for generation of the EFWS actuation signal is shown in Figure 7.3-3. The logic combining the EFWS actuation signal with the remainder of the RT signals is shown in Figure 7.2-24.

7.2.1.2.22 Manual Reactor Trip

The capability for manual RT is provided to the operator through the SICS in both the MCR and RSS. At each location, four manual RT buttons are provided to correspond to the four PS divisions. Manual RT from the MCR is hardwired to bypass the electronics of the PS and act directly on the undervoltage coils of the RT breakers. The MCR initiation signal is also acquired by the PS and processed with the automatic RT functions. Manual RT from the RSS is hardwired to bypass the electronics of the PS and act directly on the shunt trip coils of the RT breakers. Manual RT initiation is illustrated in Figure 7.2-3. Manual RT is described further in Reference 1. The logic combining the manual RT signal from the MCR with the automatic RT signals is shown in Figure 7.2-24.

07.02-33



In the MCR, any two of four dedicated manual RT buttons together will actuate an RT, in the RSS, the following combination of the dedicated manual RT buttons in the RSS will actuate an RT: (Div 1 or Div 2) and (Div 3 or Div 4).