ArevaEPRDCPEm Resource

From: WELLS Russell D (AREVA NP INC) [Russell.Wells@areva.com]
Sent: Tuesday, March 31, 2009 1:20 PM
To: Getachew Tesfaye
Cc: Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 56, FSAR Ch 7, Supplement 4
Attachments: RAI 56 Supplement 4 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to RAI No. 56 on November 26, 2008. AREVA NP submitted Supplement 1 to the response on January 14, 2009 to address 14 of the remaining 45 questions. AREVA NP submitted Supplement 2 to the response on February 4, 2009 to address 5 of the remaining 31 questions. AREVA NP submitted Supplement 3 to the response on March 3, 2009 to address 9 of the remaining 26 questions. The attached file, "RAI 56 Supplement 4 Response US EPR DC.pdf" provides technically correct and complete responses to 9 of the remaining 17 questions, as committed.

The following table indicates the respective pages in the response document, "RAI 56 Supplement 4 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 56 — 07.09-3	2	3
RAI 56 — 07.09-6	4	5
RAI 56 — 07.09-10	6	6
RAI 56 — 07.09-14	7	7
RAI 56 — 07.09-18	8	9
RAI 56 — 07.09-23	10	10
RAI 56 — 07.09-27	11	11
RAI 56 — 07.09-39	12	13
RAI 56 — 07.09-41	14	14

The revised schedule for technically correct and complete responses to the remaining 8 questions is provided below:

Question #	Response Date
RAI 56 — 07.09-2	June 12, 2009
RAI 56 — 07.09-4	June 12, 2009
RAI 56 — 07.09-9	June 12, 2009
RAI 56 — 07.09-26	June 12, 2009
RAI 56 — 07.09-31	June 12, 2009
RAI 56 — 07.09-40	June 12, 2009
RAI 56 — 07.09-42	June 12, 2009
RAI 56 — 07.09-43	June 12, 2009

Sincerely,

(Russ Wells on behalf of)

Ronda Pederson
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From: Pederson Ronda M (AREVA NP INC)
Sent: Tuesday, March 03, 2009 3:16 PM
To: Getachew Tesfaye
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); PANNELL George L (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 56, Supplement 3

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to RAI No. 56 on November 26, 2008. AREVA NP submitted Supplement 1 to the response on January 14, 2009 to address 14 of the remaining 45 questions. AREVA NP submitted Supplement 2 to the response on February 4, 2009 to address 5 of the remaining 31 questions. The attached file, "RAI 56 Supplement 3 Response US EPR DC.pdf" provides technically correct and complete responses to 9 of the remaining 26 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 RAI 56 Question 07.09-22.

The following table indicates the respective pages in the response document, "RAI 56 Supplement 3 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 56 — 07.09-8	2	2
RAI 56 — 07.09-13	3	4
RAI 56 — 07.09-15	5	5
RAI 56 — 07.09-16	6	8
RAI 56 — 07.09-20	9	9
RAI 56 — 07.09-21	10	10
RAI 56 — 07.09-22	11	12
RAI 56 — 07.09-24	13	13
RAI 56 — 07.09-38	14	14

The schedule for response to RAI 56 – 07.09-18 has been changed from March 3, 2009 to March 31, 2009. The schedule for technically correct and complete responses to the remaining 17 questions is unchanged, as indicated in the table provided below:

Question #	Response Date
RAI 56 — 07.09-2	March 31, 2009
RAI 56 — 07.09-3	March 31, 2009
RAI 56 — 07.09-4	March 31, 2009
RAI 56 — 07.09-6	March 31, 2009
RAI 56 — 07.09-9	March 31, 2009
RAI 56 — 07.09-10	March 31, 2009
RAI 56 — 07.09-14	March 31, 2009

RAI 56 — 07.09-18	March 31, 2009
RAI 56 — 07.09-23	March 31, 2009
RAI 56 — 07.09-26	March 31, 2009
RAI 56 — 07.09-27	March 31, 2009
RAI 56 — 07.09-31	March 31, 2009
RAI 56 — 07.09-39	March 31, 2009
RAI 56 — 07.09-40	March 31, 2009
RAI 56 — 07.09-41	March 31, 2009
RAI 56 — 07.09-42	March 31, 2009
RAI 56 — 07.09-43	March 31, 2009

Sincerely,

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From: Pederson Ronda M (AREVA NP INC)
Sent: Wednesday, February 04, 2009 2:34 PM
To: 'Getachew Tesfaye'
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); PANNELL George L (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 56, Supplement 2

Getachew,

AREVA NP Inc. (AREVA NP) submitted Response to RAI No. 56, Supplement 1 on January 14, 2009 to address 14 of the 45 questions. The attached file, "RAI 56 Supplement 2 Response US EPR DC.pdf" provides technically correct and complete responses to 5 of the remaining 31 questions, as committed.

The following table indicates the respective pages in the response document, "RAI 56 Supplement 2 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 56 — 07.09-29	2	3
RAI 56 — 07.09-34	4	6
RAI 56 — 07.09-36	7	9
RAI 56 — 07.09-37	10	12
RAI 56 — 07.09-44	13	14

The schedule for technically correct and complete responses to the remaining 26 questions is unchanged and provided below:

Question #	Response Date

RAI 56 - 07.09-2	March 31, 2009
RAI 56 - 07.09-3	March 31, 2009
RAI 56 - 07.09-4	March 31, 2009
RAI 56 - 07.09-6	March 31, 2009
RAI 56 - 07.09-8	March 3, 2009
RAI 56 - 07.09-9	March 31, 2009
RAI 56 - 07.09-10	March 31, 2009
RAI 56 - 07.09-13	March 3, 2009
RAI 56 - 07.09-14	March 31, 2009
RAI 56 - 07.09-15	March 3, 2009
RAI 56 - 07.09-16	March 3, 2009
RAI 56 - 07.09-18	March 3, 2009
RAI 56 - 07.09-20	March 3, 2009
RAI 56 - 07.09-21	March 3, 2009
RAI 56 - 07.09-22	March 3, 2009
RAI 56 - 07.09-23	March 31, 2009
RAI 56 - 07.09-24	March 3, 2009
RAI 56 - 07.09-26	March 31, 2009
RAI 56 - 07.09-27	March 31, 2009
RAI 56 - 07.09-31	March 31, 2009
RAI 56 - 07.09-38	March 3, 2009
RAI 56 - 07.09-39	March 31, 2009
RAI 56 - 07.09-40	March 31, 2009
RAI 56 - 07.09-41	March 31, 2009
RAI 56 - 07.09-42	March 31, 2009
RAI 56 - 07.09-43	March 31, 2009

Sincerely,

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From: Pederson Ronda M (AREVA NP INC)
Sent: Wednesday, January 14, 2009 1:26 PM
To: 'Getachew Tesfaye'
Cc: PANNELL George L (AREVA NP INC); DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 56, Supplement 1

Getachew,

The attached file, "RAI 56 Supplement 1 Response US EPR DC.pdf," provides technically correct and complete responses to 14 of the 45 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 RAI 56 Question 07.09-7.

The following table indicates the respective page(s) in the response document, "RAI 56 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 56 - 07.09-1	2	3
RAI 56 - 07.09-5	4	4
RAI 56 - 07.09-7	5	7
RAI 56 - 07.09-11	7	8
RAI 56 - 07.09-12	9	9
RAI 56 - 07.09-17	10	13
RAI 56 - 07.09-19	14	14
RAI 56 - 07.09-25	15	16
RAI 56 - 07.09-28	17	18
RAI 56 - 07.09-30	19	19
RAI 56 - 07.09-32	20	20
RAI 56 - 07.09-33	21	22
RAI 56 - 07.09-35	23	23
RAI 56 - 07.09-45	24	24

The schedule for technically correct and complete responses to the remaining 31 questions is unchanged and provided below:

Question #	Response Date
RAI 56 - 07.09-2	March 31, 2009
RAI 56 - 07.09-3	March 31, 2009
RAI 56 - 07.09-4	March 31, 2009
RAI 56 - 07.09-6	March 31, 2009
RAI 56 - 07.09-8	March 3, 2009
RAI 56 - 07.09-9	March 31, 2009
RAI 56 - 07.09-10	March 31, 2009
RAI 56 - 07.09-13	March 3, 2009
RAI 56 - 07.09-14	March 31, 2009
RAI 56 - 07.09-15	March 3, 2009
RAI 56 - 07.09-16	March 3, 2009
RAI 56 - 07.09-18	March 3, 2009
RAI 56 - 07.09-20	March 3, 2009
RAI 56 - 07.09-21	March 3, 2009
RAI 56 - 07.09-22	March 3, 2009
RAI 56 - 07.09-23	March 31, 2009
RAI 56 - 07.09-24	March 3, 2009
RAI 56 - 07.09-26	March 31, 2009
RAI 56 - 07.09-27	March 31, 2009
RAI 56 - 07.09-29	March 3, 2009
RAI 56 - 07.09-31	March 31, 2009
RAI 56 - 07.09-34	March 3, 2009

RAI 56 - 07.09-36	March 3, 2009
RAI 56 - 07.09-37	March 3, 2009
RAI 56 - 07.09-38	March 3, 2009
RAI 56 - 07.09-39	March 31, 2009
RAI 56 - 07.09-40	March 31, 2009
RAI 56 - 07.09-41	March 31, 2009
RAI 56 - 07.09-42	March 31, 2009
RAI 56 - 07.09-43	March 31, 2009
RAI 56 - 07.09-44	March 3, 2009

Sincerely,

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From: Pederson Ronda M (AREVA NP INC)
Sent: Wednesday, November 26, 2008 3:18 PM
To: 'Getachew Tesfaye'
Cc: PANNELL George L (AREVA NP INC); DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 56, FSAR Ch 7, Revised Schedule

Getachew,

On October 10, 2008, AREVA NP provided a schedule for responding to the 45 questions in NRC's RAI No. 56. On October 22, 2008, a public meeting was held between AREVA NP Inc. and the NRC to discuss the U.S. EPR FSAR Chapter 7 and RAI No.'s 56 through 61.

A revised schedule for a technically correct and complete response to each of the 45 questions of RAI No. 56 is provided below.

Question #	Response Date
RAI 56 - 07.09-1	January 15, 2009
RAI 56 - 07.09-2	March 31, 2009
RAI 56 - 07.09-3	March 31, 2009
RAI 56 - 07.09-4	March 31, 2009
RAI 56 - 07.09-5	January 15, 2009
RAI 56 - 07.09-6	March 31, 2009
RAI 56 - 07.09-7	January 15, 2009
RAI 56 - 07.09-8	March 3, 2009
RAI 56 - 07.09-9	March 31, 2009
RAI 56 - 07.09-10	March 31, 2009

RAI 56 - 07.09-11	January 15, 2009
RAI 56 - 07.09-12	January 15, 2009
RAI 56 - 07.09-13	March 3, 2009
RAI 56 - 07.09-14	March 31, 2009
RAI 56 - 07.09-15	March 3, 2009
RAI 56 - 07.09-16	March 3, 2009
RAI 56 - 07.09-17	January 15, 2009
RAI 56 - 07.09-18	March 3, 2009
RAI 56 - 07.09-19	January 15, 2009
RAI 56 - 07.09-20	March 3, 2009
RAI 56 - 07.09-21	March 3, 2009
RAI 56 - 07.09-22	March 3, 2009
RAI 56 - 07.09-23	March 31, 2009
RAI 56 - 07.09-24	March 3, 2009
RAI 56 - 07.09-25	January 15, 2009
RAI 56 - 07.09-26	March 31, 2009
RAI 56 - 07.09-27	March 31, 2009
RAI 56 - 07.09-28	January 15, 2009
RAI 56 - 07.09-29	March 3, 2009
RAI 56 - 07.09-30	January 15, 2009
RAI 56 - 07.09-31	March 31, 2009
RAI 56 - 07.09-32	January 15, 2009
RAI 56 - 07.09-33	January 15, 2009
RAI 56 - 07.09-34	March 3, 2009
RAI 56 - 07.09-35	January 15, 2009
RAI 56 - 07.09-36	March 3, 2009
RAI 56 - 07.09-37	March 3, 2009
RAI 56 - 07.09-38	March 3, 2009
RAI 56 - 07.09-39	March 31, 2009
RAI 56 - 07.09-40	March 31, 2009
RAI 56 - 07.09-41	March 31, 2009
RAI 56 - 07.09-42	March 31, 2009
RAI 56 - 07.09-43	March 31, 2009
RAI 56 - 07.09-44	March 3, 2009
RAI 56 - 07.09-45	January 15, 2009

Sincerely,

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From: Pederson Ronda M (AREVA NP INC)
Sent: Friday, October 10, 2008 6:50 PM
To: 'Getachew Tesfaye'
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); PANNELL George L (AREVA NP INC); DUNCAN Leslie E (AREVA NP INC); WELLS Russell D (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 56 (942), FSAR Ch7

Getachew,

The attached file, "RAI 56 Response US EPR DC.pdf" provides an interim response to each of the 45 questions.

A complete answer is not provided for 45 of the 45 questions.

A complete response to each of the questions will be provided by December 1, 2008.

Sincerely,

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Cell: 434-841-8788

From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Friday, September 12, 2008 5:44 PM
To: ZZ-DL-A-USEPR-DL
Cc: Deanna Zhang; Terry Jackson; Michael Canova; Joseph Colaccino; John Rycyna; Mario Gareri
Subject: U.S. EPR Design Certification Application RAI No. 56 (942), FSAR Ch7

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on August 26, 2008, and on September 5, 2008, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

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

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 355

Mail Envelope Properties (1F1CC1BBDC66B842A46CAC03D6B1CD41014D67AF)

Subject: Response to U.S. EPR Design Certification Application RAI No. 56, FSAR Ch 7, Supplement 4
Sent Date: 3/31/2009 1:19:30 PM
Received Date: 3/31/2009 1:19:33 PM
From: WELLS Russell D (AREVA NP INC)

Created By: Russell.Wells@areva.com

Recipients:
"Pederson Ronda M (AREVA NP INC)" <Ronda.Pederson@areva.com>
Tracking Status: None
"BENNETT Kathy A (OFR) (AREVA NP INC)" <Kathy.Bennett@areva.com>
Tracking Status: None
"DELANO Karen V (AREVA NP INC)" <Karen.Delano@areva.com>
Tracking Status: None
"Getachew Tesfaye" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	15412	3/31/2009 1:19:33 PM
RAI 56 Supplement 4 Response US EPR DC.pdf	94332	

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

Response to

Request for Additional Information No. 56, Supplement 4

9/12/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 07.09 - Data Communication Systems
Application Section: Section 7.1
ICE1 Branch

Question 07.09-3:

Demonstrate how the data communications system within the SICS meets IEEE Std. 603-1991, Clause 5.6.3, and 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 24. Specifically, provide information regarding the design of hardwired connections and isolation devices between the SICS and non-safety-related I&C systems.

Clause 5.6.3 of IEEE Std. 603-1991 requires the safety system be designed such that credible failures in and consequential actions by other systems shall not prevent the safety systems from performing the intended safety functions. 10 CFR Part 50, Appendix A, GDC 24, "Separation of Protection and Control Systems," requires the protection system to be separated from control systems to the extent that failure of any single control system component or channel, or failure or removal from service of any single protection system component or channel which is common to the control and protection systems leaves intact a system satisfying all reliability, redundancy, and independence requirements of the protection system.

The DC FSAR, Tier 2, Section 7.1.1.3.1 states that the hardwired connections to non-safety-related I&C systems may be used as required by the SICS human factors design and are isolated. Provide the design details of the hardwired connections (e.g., connection medium, signal parameters, etc.) and where they are used to communicate with non-safety-related I&C systems. In addition, what types of isolation devices are used between the SICS and the non-safety-related I&C systems? Provide design information for these isolation devices, including a description of any type testing completed and how the devices address the acceptance criteria in Branch Technical Position 7-11 in the Standard Review Plan.

Response to Question 07.09-3:

U.S. EPR FSAR Tier 2, Section 7.1 defines a hardwired signal as "a signal that does not use a data communications protocol", and it can use either fiber optic cabling or copper cable as a transmission medium.

If fiber optic cable is used, then the cable itself serves as the isolation device. Branch Technical Position (BTP) 7-11 lists fiber optic cable as an acceptable means for providing electrical isolation.

If copper cable is used, then a Class 1E isolation device is used on the connection and is classified as part of the safety system. The specific isolation device is not specified to support the design certification; instead, specific devices will be selected as part of the detailed design of each power plant that references the U.S. EPR design certification. The qualified isolation device will be designed, implemented, and tested to conform to the guidance of Regulatory Guide (RG) 1.75. U.S. EPR FSAR Tier 2, Section 7.1.2.4.5 provides the commitment for the safety information and control system (SICS) to conform to the guidance of RG 1.75, while U.S. EPR FSAR Tier 2, Section 7.1.2.5.9 provides the commitment for the SICS to conform to the guidance of BTP 7-11.

BTP 7-11 suggests that the testing of electrical isolation devices should be performed in terms of the identified maximum credible fault (MCF) voltages and currents, and states that "the determination of specific MCF characteristics is plant-specific." This is supported by IEEE 384-1992, which suggests that the MCF characteristics take into consideration the circuit location and routing that may differ from plant to plant.

Test results for electrical isolation devices will not be supplied in support of design certification because MCF characteristics vary from plant to plant. Isolation device test results will be made available for NRC audit when:

1. Specific types of isolation devices have been selected for use in a specific power plant.
2. MCF voltages and currents have been identified for the devices' locations in that plant.
3. Test results are available for the selected devices that bound the identified MCF characteristics.

FSAR Impact:

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

Question 07.09-6:

Address the complete acceptance criteria of NUREG-0800, the Standard Review Plan (SRP), Section 7.9 Data Communications Systems.

10 CFR 52.47(a)(9) requires, in part, that for applications for light-water cooled nuclear power plants, an evaluation of the standard plant design against the SRP revision in effect 6 months before the docket date of the application. The evaluation required by this section shall include an identification and description of all differences in design features, analytical techniques, and procedural measures proposed for a facility and those corresponding features, techniques, and measures given in the SRP acceptance criteria. Where such a difference exists, the evaluation shall discuss how the alternative proposed provides an acceptable method of complying with those rules or regulations of commission, or portions thereof that underlie the corresponding SRP acceptance criteria. SRP, Section 7.9, "Data Communications Systems," provides the performance and reliability design considerations. This includes verification that the protocol selected for the DCS meets the performance requirements of all supported systems. Data rates, data bandwidths, and data precision requirements for normal and off-normal operation, including the impact of environmental extremes should be considered. There should be sufficient excess capacity margins to accommodate likely future increases in DCS demands or software or hardware changes to equipment attached to the DCS. The potential hazards to the DCS and from the DCS should be considered. Unneeded but included DCS functions should be reviewed to assure that they cannot be inadvertently activated and thereby prevent operation of the safety functions. The effects of error detection and recovery should be reviewed. Error detection should be at least as good as four byte cyclic redundancy check (CRC). The effects of DCS equipment malfunction or failure that generates erroneous signals, either in content or rate, should be examined. Corrupted messages (missing or corrupted packets), missing messages and duplicate messages should be detected and repaired. The error performance should be specified. Vendor test data and in situ test results should be reviewed to verify the performance. Analytical justifications of DCS capacity should be reviewed for correctness.

The DC FSAR, Tier 2, Section 7.1.1.3.1, provides the summary of data communications implemented within the SICS. The data communications summary only provides the description of the type of connection (i.e. point-to-point), indication of whether the connection is bi-directional or uni-directional, and the type of protocol used, but does not address the performance and reliability criteria. Provide the information addressing the performance and reliability criteria of SRP, Section 7.9, for the data communications systems within the SICS.

Response to Question 07.09-6:

10 CFR 52.47(a)(9) requires the applicant to address the “SRP acceptance criteria.” The material quoted in this question regarding network performance and reliability is in SRP 7.9 Section III, “Review Procedures.” This material is not in SRP 7.9 Section II, “Acceptance Criteria. SRP Section 7.9 acceptance criteria are addressed in the U.S. EPR Tier 2 FSAR as described in ANP-10292, “U.S. EPR Conformance with SRP Acceptance Criteria,” (ML073480209).

The information requested in this question depends on the specific equipment and software used in the data communication networks. Accordingly, this information is an output of the detailed design of each power plant that references the U.S. EPR Design Certification. It is not

appropriate to submit these details to support the design certification; instead, this information will be available for NRC audit on a project-specific basis.

FSAR Impact:

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

Question 07.09-10:

Demonstrate how the isolation devices used between the interface of the SAS and non-safety systems are designed to meet IEEE Std. 603-1991, Clause 5.6.3.

DC FSAR, Tier 2, Section 7.1.1.4.2, states that within the SAS, the functional units, CUs and MSIs, generally consist of subracks, I/O modules, function processors, communication modules, optical link modules, and qualified isolation devices. IEEE 603-1991, Clause 5.6.3, requires independence between safety systems and other systems such that credible failures in and consequential actions by other systems shall not prevent the safety systems from completing their intended safety functions. Describe what qualified isolation devices are used within the SAS. Provide the design of these qualified isolation devices and demonstrate how this design supports the requirements of IEEE Std. 603-1991, Clause 5.6.3.

Response to Question 07.09-10:

Specific isolation devices are not specified to support the design certification; instead, specific devices will be selected as part of the detailed design of each power plant that references the U.S. EPR design certification. The qualified isolation device will be designed, implemented, and tested to conform to the guidance of Regulatory Guide (RG) 1.75. U.S. EPR FSAR Tier 2, Section 7.1.2.4.5 provides the commitment for the safety automation system (SAS) to conform to the guidance of RG 1.75, while U.S. EPR FSAR Tier 2, Section 7.1.2.5.9 provides the commitment for the SAS to conform to the guidance of Branch Technical Position (BTP) 7-11.

The acceptability of the selected isolation devices will be demonstrated through qualification testing. BTP 7-11 suggests that testing of electrical isolation devices should be performed in terms of the identified maximum credible fault (MCF) voltages and currents, and states that “the determination of specific MCF characteristics is plant-specific.” This is supported by IEEE 384-1992, which suggests that the MCF characteristics take into consideration the circuit location and routing that may differ from plant to plant.

Test results for electrical isolation devices will not be supplied in support of design certification because MCF characteristics vary from plant to plant. Isolation device test results will be made available for NRC audit when:

1. Specific types of isolation devices have been selected for use in a specific power plant.
2. MCF voltages and currents have been identified for the devices’ locations in that plant.
3. Test results are available for the selected devices that bound the identified MCF characteristics.

FSAR Impact:

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

Question 07.09-14:

Address the acceptance criteria of NUREG-0800, the Standard Review Plan (SRP), Section 7.9, "Data Communications Systems (DCS)," for the data communications systems within the Safety Automation System (SAS).

10 CFR 52.47(a)(9) requires, in part, that for applications for light-water cooled nuclear power plants, an evaluation of the standard plant design against the SRP revision in effect 6 months before the docket date of the application. The evaluation required by this section shall include an identification and description of all differences in design features, analytical techniques, and procedural measures proposed for a facility and those corresponding features, techniques, and measures given in the SRP acceptance criteria. Where such a difference exists, the evaluation shall discuss how the alternative proposed provides an acceptable method of complying with those rules or regulations of commission, or portions thereof that underlie the corresponding SRP acceptance criteria. SRP, Section 7.9, states that the real-time performance should be reviewed with SRP Branch Technical Position 7-21. Data rates, data bandwidths, and data precision requirements for normal and off-normal operation, including the impact of environmental extremes should be considered. There should be sufficient excess capacity margins to accommodate likely future increases in DCS demands or software or hardware changes to equipment attached to the DCS. The potential hazards to the DCS and from the DCS should be reviewed. Unneeded but included DCS functions should be reviewed to assure that they cannot be inadvertently activated and thereby prevent operation of the safety functions. The effects of error detection and recovery should be considered. Error detection should be at least as good as four byte cyclic redundancy check. The effects of DCS equipment malfunction or failure that generates erroneous signals, either in content or rate, should be examined. Corrupted messages (missing or corrupted packets), missing messages and duplicate messages should be detected and repaired. The error performance should be specified. Vendor test data and in situ test results should be reviewed to verify the performance.

DC FSAR, Tier 2, Section 7.1.1.4.2, provides the summary of data communications implemented within the SAS. The data communications summary only provides the description of the type of connection (i.e. point-to-point), indication of whether the connection is bi-directional or uni-directional, and the type of protocol used, but does not address the performance and reliability criteria. Provide the information addressing the performance and reliability criteria of SRP Section 7.9 for the data communications within the SAS and between the SAS and non-safety I&C systems.

Response to Question 07.09-14:

See the Response to Question 07.09-6.

FSAR Impact:

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

Question 07.09-18:

Address the acceptance criteria of NUREG-0800, the Standard Review Plan (SRP), Section 7.9, "Data Communications Systems (DCS)," for the data communications systems used in the protection system.

10 CFR 52.47(a)(9) requires, in part, that for applications for light-water cooled nuclear power plants, an evaluation of the standard plant design against the SRP revision in effect 6 months before the docket date of the application. The evaluation required by this section shall include an identification and description of all differences in design features, analytical techniques, and procedural measures proposed for a facility and those corresponding features, techniques, and measures given in the SRP acceptance criteria. Where such a difference exists, the evaluation shall discuss how the alternative proposed provides an acceptable method of complying with those rules or regulations of commission, or portions thereof that underlie the corresponding SRP acceptance criteria. SRP, Section 7.9, provides the performance and reliability design considerations. This includes verification that the protocol selected for the DCS meets the performance requirements of all supported systems. Data rates, data bandwidths, and data precision requirements for normal and off-normal operation, including the impact of environmental extremes should be reviewed. There should be sufficient excess capacity margins to accommodate likely future increases in DCS demands or software or hardware changes to equipment attached to the DCS. The potential hazards to the DCS and from the DCS should be considered. Unneeded but included DCS functions should be reviewed to assure that they cannot be inadvertently activated and thereby prevent operation of the safety functions. The effects of error detection and recovery should be considered. Error detection should be at least as good as four byte cyclic redundancy check (CRC). The effects of DCS equipment malfunction or failure that generates erroneous signals, either in content or rate, should be examined. Corrupted messages (missing or corrupted packets), missing messages and duplicate messages should be detected and repaired. The error performance should be specified. Vendor test data and in situ test results should be verify the performance. Provide information addressing the performance and reliability criteria of SRP Section 7.9 for the data communications networks and components used within the PS.

Section 6 of the AREVA NP Topical Report ANP-10281 “U.S. EPR Digital Protection System Topical Report” provides a description of the network topologies implemented within the protection system. This topical report does not describe the network configurations implemented within these topologies. In addition, this topical report does not provide information on meeting the performance and reliability criteria described in SRP, Section 7.9. In addition, GDC 29 requires the protection system to be able to perform required safety functions in the presence of any anticipated operational occurrence. Describe how the data communications systems design implemented in the protection system adequately supports the reactor trip and engineered safety features actuation system functions that are necessary to sense accident conditions and anticipated operational occurrences in order to initiate protective actions consistent with the accident analysis presented in the FSAR Tier 2, Chapter 15. Provide the detailed network design, including network configurations (i.e. data rates, data precision, bandwidth capacity) in the PS. Provide details regarding system testing of the communications network within the PS.

Response to Question 07.09-18:

See the Response to Question 07.09-6.

FSAR Impact:

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

Question 07.09-23:

Demonstrate how electrical isolation is maintained between redundant divisions to meet IEEE Std. 603-1991, Clause 5.6.1 requirements.

IEEE Std. 603-1991, Clause 5.6.1, requires redundant portions of a safety system provided for a safety function to be independent of and physically separated from each other to the degree necessary to retain the capability to accomplish the safety function during and following any design basis event requiring that safety function.

DC FSAR, Tier 2, Section 7.1.1.6.4, provides a description of the independence requirements for redundant divisions. This section states that electrical isolation is required for hardwired and data connections and is provided through the use of qualified isolation devices and fiber optic cable. The staff finds that insufficient information has been provided regarding how electrical isolation is achieved to meet IEEE Std. 603-1991, Clause 5.6.1. Provide additional information regarding how electrical isolation between redundant divisions is achieved. Specifically, provide design and equipment qualification information regarding the qualified isolation devices used.

Response to Question 07.09-23:

See the Response to Question 07.09-3.

FSAR Impact:

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

Question 07.09-27:

Demonstrate how IEEE Std. 603-1991, Clause 5.6.3, and 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 24 requirements are met. Specifically, provide the detailed design of the qualified isolation device used between the Process Information and Control System (PICS) and the safety system.

IEEE Std. 603-1991, Clause 5.6.3, requires independence between safety systems and other systems such that credible failures in and consequential actions by other systems shall not prevent the safety systems from completing their intended safety functions. GDC 24, "Separation of Protection and Control Systems" requires the protection system to be separated from control systems to the extent that failure of any single control system component or channel, or failure or removal from service of any single protection system component or channel which is common to the control and protection systems leaves intact a system satisfying all reliability, redundancy, and independence requirements of the protection system. Interconnection of the protection and control systems shall be limited so as to assure that safety is not significantly impaired.

DC FSAR, Tier 2, Section 7.5.2.2.4, states if any Post Accident Monitoring Type A, B, and C variable is bypassed or rendered inoperable, the Protection System and the Safety Automation System provide the appropriate display signals to the PICS. Outputs to PICS from safety systems are supplied through qualified isolation devices. Demonstrate how the qualified isolation devices used to supply outputs from the safety systems to the PICS meet IEEE Std. 603-1991, Clause 5.6.3, and GDC 24 requirements. Provide specific design and testing details regarding these qualified isolation devices.

Response to Question 07.09-27:

Signals from the safety automation system (SAS) and the protection system (PS) to the PICS are sent through monitoring and service interface (MSI) computers. Fiber optic cabling provides electrical isolation and the MSI computers provide communication independence for these connections. U.S. EPR FSAR Tier 2, Section 7.1.1.6.4 describes independence between safety and non-safety-related instrumentation and controls (I&C) systems.

Design and testing details cannot be provided until specific equipment is selected for use in a particular power plant. Therefore, these details will not be submitted to support the design certification. This information will be available for audit on a project-specific basis when equipment has been selected for use rather than in the design certification application.

FSAR Impact:

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

Question 07.09-39:

Demonstrate how the Maintenance Service Interface (MSI) meets IEEE Std. 603-1991, Clause 5.3, 5.4, and 5.6.3, and 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 21.

IEEE Std. 603-1991, Clause 5.3, requires components and modules to be of a quality that is consistent with minimum maintenance requirements and low failure rates. Safety system equipment shall be designed, manufactured, inspected, installed, tested, operated, and maintained in accordance with a prescribed quality assurance program. IEEE Std. 603-1991, Clause 5.4, requires safety system equipment to be qualified by type test, previous operating experience, or analysis, or any combination of these three methods, to substantiate that it will be capable of meeting, on a continuing basis, the performance requirements as specified in the design basis. Qualification of Class 1E equipment shall be in accordance with the requirements of IEEE Std. 323-1983. In addition, GDC 21, "Protection system reliability and testability" requires the protection system to be designed for high functional reliability and inservice testability commensurate with the safety functions to be performed.

FSAR Tier 2, Section 7.1.1.6.4, provides a description of the communications independence principles applied to the I&C design. This section states that the MSI provide the following communications features:

- Communication modules separate from the function processors for the purpose of handling communications to the GWs
- Communications between the function processors and communications modules are implemented with separate send and receive data channels
- The function processors and communications modules operate cyclically and asynchronous to each other.

The staff finds that the the specific hardware design (i.e. processors) has not been provided to the NRC. For the software design, the Topical Report EMF-2110, Revision 1, TELEPERM XS: A Digital Reactor Protection System [Adams Accession No. ML003732662] states that the SPACE tool, is used to create the software for the MSI, but does not provide additional information regarding the software design and qualification process used in the MSI. Demonstrate that the MSI hardware and software design, as well as equipment qualification process meet IEEE Std. 603-1991, Clause 5.3, 5.4, and GDC 21.

Response to Question 07.09-39:

This question requests information regarding specific versions of Teleperm XS (TXS) equipment and software that cannot be provided until specific equipment is selected for use in a particular power plant.

AREVA NP acknowledges that the NRC staff expects to review the specific versions of the TXS platform used in an as-built system, as well as the procedures and processes used in platform development. However, the NRC staff review of the specific versions of the TXS platform used in an as-built system will be more useful if performed on a project-specific basis, when a specific version of the platform is selected for use, rather than in a design certification application.

The Response to RAI 59, Question 07.01-7 provides an example of the type of information that can be submitted on a project-specific basis to support evolution of the TXS platform (including the requested information regarding MSI design and qualification).

AREVA NP notes that design certification is intended to support combined construction and operating licenses for several future power plants. Accordingly, the U.S. EPR FSAR design certification application is intended to support current and future versions of the TXS platform, and it is not appropriate to submit information for design certification representing a specific and limited time in the evolution of the TXS platform. Instead, design ITAAC that provide commitment to a prescribed detailed design process accommodates the evolution of the TXS platform.

This approach is consistent with the NRC's review process described in the Standard Review Plan (SRP) 7.0, which states:

> "Review of DC applications should normally extend to cover detailed design. However, for digital computer-based I&C systems, it may be premature to complete final design details at the DC stage. Waiting until the COL stage to complete the final design of such systems allows the COL applicant/licensee to use the most recent technology for each plant. Therefore, the review of DC applications for digital computer-based I&C systems may be limited to (1) a detailed review at the functional block diagram level, (2) a review of the applicant/licensee's commitment to prescribed limits, parameters procedures, and attributes for the detailed design process, and (3) ITAAC adequate to demonstrate that the as-built facility conforms to these commitments."

FSAR Impact:

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

Question 07.09-41:

Demonstrate how electrical and communications isolation for hardwired connections between the safety and non-safety I&C systems is accomplished.

IEEE Std. 603-1991, Clause 5.6.3, requires the safety system be designed such that credible failures in and consequential actions by other systems shall not prevent the safety systems from performing their intended safety functions.

DC FSAR, Tier 2, Section 7.1.1.6.4, states that for hardwired signals, qualified isolation devices are used with the safety-related I&C systems for signal to and from the non-safety-related I&C systems. The Topical Report EMF-2110, Revision 1, TELEPERM XS: A Digital Reactor Protection System [Adams Accession No. ML003732662] was submitted and approved by the NRC. This topical report states that for single wire signal transmission, independence between class 1E circuits and non class 1E circuits will be achieved by one of the following ways

a. Via a Class 1E electrical isolation device if the Class 1E signal is electrically connected to any equipment in the safety actuation channel.

b. Via the Class 1E Monitoring and Service Interface computer without an additional isolation device.

Verify that the single wire signal transmission electrical isolation principles between Class 1E and non-Class 1E equipment applies to the U.S. EPR I&C design for hardwired signals to and from non-safety-related I&C systems. In addition, provide the detailed design of this Class1E electrical isolation device to demonstrate how it meets IEEE Std. 603-1991, Clause 5.6.3.

Response to Question 07.09-41:

The electrical isolation principles stated in this question apply to the U.S. EPR design.

Specific isolation device designs are not specified to support the design certification; instead, specific devices will be selected as part of the detailed design of each power plant that references the U.S. EPR design certification. The qualified isolation device must be designed, implemented, and tested to conform to the guidance of Regulatory Guide (RG) 1.75. U.S. EPR FSAR Tier 2, Section 7.1.2.4.5 provides the commitment to conform to the guidance of RG 1.75, while U.S. EPR FSAR Tier 2, Section 7.1.2.5.9 provides the commitment to conform to the guidance of Branch Technical Position (BTP) 7-11.

FSAR Impact:

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