ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Friday, January 13, 2012 12:39 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); LENTZ Tony (EXTERNAL AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 506 (5456), FSAR Ch. 14, Supplement 4
Attachments: RAI 506 Supplement 4 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the 18 questions in RAI No. 506 on September 28, 2011. Supplement 1 response was submitted on November 8, 2011 to provide technically correct and complete responses to 12 of the 18 questions. Supplement 2 response was submitted on November 17, 2011 to provide a revised response to Question 14.03.05-29. Supplement 3 response was submitted on December 1, 2011 to provide a revised schedule for 3 questions.

The attached file, "RAI 506 Supplement 4 Response US EPR DC.pdf" provides a technically correct and complete final response to 2 questions. Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 506 Questions 14.03.05-28 and 14.03.05-35.

The following table indicates the respective pages in the response document, "RAI 506 Supplement 4 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 506 — 14.03.05-28	2	3
RAI 506 — 14.03.05-35	4	4

The schedule for a technically correct and complete final response to the remaining 4 questions is unchanged as provided below.

Question #	Response Date
RAI 506 — 14.03.05-27	January 19, 2012
RAI 506 — 14.03.05-30	January 19, 2012
RAI 506 — 14.03.05-39	January 19, 2012
RAI 506 — 14.03.05-41	January 19, 2012

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262

Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, December 01, 2011 3:07 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); LENTZ Tony (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 506 (5456), FSAR Ch. 14, Supplement 3

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the 18 questions in RAI No. 506 on September 28, 2011. Supplement 1 response was submitted on November 8, 2011 to provide technically correct and complete responses to 12 of the 18 questions. Supplement 2 response was submitted on November 17, 2011 to provide a revised response to Question 14.03.05-29.

The schedule for providing a response to Questions 14.03.05-27, 14.03.05-28 and 14.03.05-35 has been revised as provided below. The schedule for a response to the other 3 questions remains unchanged.

Question #	Response Date
RAI 506 — 14.03.05-27	**January 19, 2012**
RAI 506 — 14.03.05-28	**January 19, 2012**
RAI 506 — 14.03.05-30	January 19, 2012
RAI 506 — 14.03.05-35	**January 19, 2012**
RAI 506 — 14.03.05-39	January 19, 2012
RAI 506 — 14.03.05-41	January 19, 2012

Sincerely,

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From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, November 17, 2011 12:11 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); LENTZ Tony (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 506 (5456), FSAR Ch. 14, Supplement 2

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the 18 questions in RAI No. 506 on September 28, 2011. Supplement 1 response to RAI 506 was submitted on November 8, 2011 to provide technically correct and complete responses to 12 of the 18 questions.

The attached file, "RAI 506 Supplement 2 Response US EPR DC.pdf" provides a technically correct and complete revised final response to Question 14.03.05-29. The response has not changed from that provided in Supplement 1, however two additional affected pages from the U.S. EPR Final Safety Analysis Report were omitted from the earlier transmittal.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to Question 14.03.05-29.

The following table indicates the respective pages in the response document, "RAI 506 Supplement 2 Response US EPR DC.pdf," that contain AREVA NP's revised response to the subject question.

Question #	Start Page	End Page
RAI 506 — 14.03.05-29	2	2

The schedule for a technically correct and complete response to the remaining 6 questions is unchanged as provided below.

Question #	Response Date
RAI 506 — 14.03.05-27	December 9, 2011
RAI 506 — 14.03.05-28	December 9, 2011
RAI 506 — 14.03.05-30	January 19, 2012
RAI 506 — 14.03.05-35	December 9, 2011
RAI 506 — 14.03.05-39	January 19, 2012
RAI 506 — 14.03.05-41	January 19, 2012

Sincerely,

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From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, November 08, 2011 4:24 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); LENTZ Tony (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 506 (5456), FSAR Ch. 14, Supplement 1

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the 18 questions in RAI No. 506 on September 28, 2011.
The attached file, “RAI 506 Supplement 1 Response US EPR DC.pdf” provides a technically correct and complete final response to 12 of the 18 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to Questions 14.03.05-25, 14.03.05-26, 14.03.05-29, 14.03.05-31, 14.03.05-32, 14.03.05-33, 14.03.05-34, 14.03.05-36, 14.03.05-37, 14.03.05-38, 14.03.05-40 and 14.03.05-42.

The following table indicates the respective pages in the response document, “RAI 506 Supplement 1 Response US EPR DC.pdf,” that contain AREVA NP’s response to the subject questions.

Question #	Start Page	End Page
RAI 506 — 14.03.05-25	2	2
RAI 506 — 14.03.05-26	3	3
RAI 506 — 14.03.05-29	4	4
RAI 506 — 14.03.05-31	5	5
RAI 506 — 14.03.05-32	6	6
RAI 506 — 14.03.05-33	7	7
RAI 506 — 14.03.05-34	8	8
RAI 506 — 14.03.05-36	9	9
RAI 506 — 14.03.05-37	10	10
RAI 506 — 14.03.05-38	11	11
RAI 506 — 14.03.05-40	12	12
RAI 506 — 14.03.05-42	13	13

The schedule for a technically correct and complete response to the remaining 6 questions has been revised as provided below.

Question #	Response Date
RAI 506 — 14.03.05-27	December 9, 2011
RAI 506 — 14.03.05-28	December 9, 2011
RAI 506 — 14.03.05-30	January 19, 2012
RAI 506 — 14.03.05-35	December 9, 2011
RAI 506 — 14.03.05-39	January 19, 2012
RAI 506 — 14.03.05-41	January 19, 2012

Sincerely,

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From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, September 28, 2011 5:19 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); LENTZ Tony (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 506 (5456), FSAR Ch. 14

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 506 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the 18 questions cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 506 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 506 — 14.03.05-25	2	2
RAI 506 — 14.03.05-26	3	3
RAI 506 — 14.03.05-27	4	4
RAI 506 — 14.03.05-28	5	5
RAI 506 — 14.03.05-29	6	6
RAI 506 — 14.03.05-30	7	7
RAI 506 — 14.03.05-31	8	8
RAI 506 — 14.03.05-32	9	9
RAI 506 — 14.03.05-33	10	10
RAI 506 — 14.03.05-34	11	11
RAI 506 — 14.03.05-35	12	12
RAI 506 — 14.03.05-36	13	13
RAI 506 — 14.03.05-37	14	14
RAI 506 — 14.03.05-38	15	15
RAI 506 — 14.03.05-39	16	16
RAI 506 — 14.03.05-40	17	17
RAI 506 — 14.03.05-41	18	18
RAI 506 — 14.03.05-42	19	19

A complete answer is not provided for the 18 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 506 — 14.03.05-25	November 8, 2011
RAI 506 — 14.03.05-26	November 8, 2011
RAI 506 — 14.03.05-27	November 8, 2011

RAI 506 — 14.03.05-28	November 8, 2011
RAI 506 — 14.03.05-29	November 8, 2011
RAI 506 — 14.03.05-30	November 8, 2011
RAI 506 — 14.03.05-31	November 8, 2011
RAI 506 — 14.03.05-32	November 8, 2011
RAI 506 — 14.03.05-33	November 8, 2011
RAI 506 — 14.03.05-34	November 8, 2011
RAI 506 — 14.03.05-35	November 8, 2011
RAI 506 — 14.03.05-36	November 8, 2011
RAI 506 — 14.03.05-37	November 8, 2011
RAI 506 — 14.03.05-38	November 8, 2011
RAI 506 — 14.03.05-39	November 8, 2011
RAI 506 — 14.03.05-40	November 8, 2011
RAI 506 — 14.03.05-41	November 8, 2011
RAI 506 — 14.03.05-42	November 8, 2011

Sincerely,

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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Tuesday, August 30, 2011 1:31 PM
To: ZZ-DL-A-USEPR-DL
Cc: Mills, Daniel; Zhang, Deanna; Morton, Wendell; Spaulding, Deirdre; Mott, Kenneth; Truong, Tung; Zhao, Jack; Jackson, Terry; Jaffe, David; Canova, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 506 (5456), FSAR Ch. 14

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on August 12, 2011, and discussed with your staff on August 25 and 29, 2011. Draft RAI Question 14.03.05-38 has been modified as a result of those discussions. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

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

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 3681

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D4A53D7C)

Subject: Response to U.S. EPR Design Certification Application RAI No. 506 (5456), FSAR Ch. 14, Supplement 4
Sent Date: 1/13/2012 12:39:22 PM
Received Date: 1/13/2012 12:40:02 PM
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Files	**Size**	**Date & Time**
MESSAGE	12078	1/13/2012 12:40:02 PM
RAI 506 Supplement 4 Response US EPR DC.pdf	651074	

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

Response to

Request for Additional Information No. 506(5456), Revision 0

8/30/2011

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 14.03.05 - Instrumentation and Controls - Inspections, Tests, Analyses, and Acceptance Criteria
Application Section: 2.4

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

Question 14.03.05-28:

Provide an explanation on how the ITAAC address equipment qualification requirements for mild environments.

10 CFR 52.47(b)(1) requires inspections, tests, analyses, and acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a facility that incorporates the design certification has been constructed and will be operated in conformity with the design certification, the provisions of the Act, and the Commission's rules and regulations. In RAI 78, Question 14.03.05-4, the staff requested additional detail on how the ITAAC in Section 2.4 addresses various aspects of safety systems. In response to this RAI, the applicant identified instances in which environmental qualification is verified for Class 1E equipment exposed to harsh environments, but stated that ITAAC are not required for Class 1E equipment exposed to mild environments. The applicant is correct that qualification required for harsh environments is different than that required for mild environments (e.g., 10 CFR 50.49(c)). However, 10 CFR 50.55(a)h sets forth the qualification requirements for mild environments (i.e., IEEE Std. 603-1991, Clause 5.4). The applicant is requested to provide an explanation of how the ITAAC address equipment qualification requirements for mild environments.

Response to Question 14.03.05-28:

NUREG-0800. Section 14.3.6, Electrical Systems - Inspections, Tests, Analyses, and Acceptance Criteria, Subsection II. Acceptance Criteria states:

> Qualification of systems and components for seismic and harsh environments should be verified by ITAAC. Electrical equipment located in a "mild" environment should be discussed in the applicable sections of the COL application only. An exception is made for state-of-the-art digital instrumentation and control (I&C) equipment and digital control and protection systems located in an "other than harsh" environment. Operational experience has shown these state-of-the-art equipment and systems to be sensitive to temperature. ITAAC should be included to verify the qualification of equipment whose performance may be impacted by sensitivity to particular environmental conditions not considered by regulations to be harsh.

NUREG-0800. Section 14.3, Appendix C, Electrical Systems Review Checklist states:

> Qualification of components - qualification of SSCs for seismic and harsh environment is covered by the basic configuration ITAAC. Tier 1 should only deal with electrical equipment in harsh environments. Electrical equipment in a "mild" environment should be treated in Tier 2 only. An exception is made for I&C state-of-the-art digital equipment in "other than harsh" environment, which I&C ITAAC should cover.

U.S. EPR FSAR Tier 1, Chapter 2, Environmental Qualification commitments and inspections, tests, analyses, and acceptance criteria (ITAAC) will be revised to add an ITAAC item for environmental qualification of digital I&C Class 1E equipment located in a mild environment to the following systems:

- Protection System (Section 2.4.1, Item 6.1).
- Safety Automation System (Section 2.4.4, Item 6.1).

- Priority and Actuator Control System (Section 2.4.5, Item 6.1).
- Boron Concentration Measurement System (Section 2.4.11, Item 6.1).
- Control Rod Drive Control System (Section 2.4.13, Item 5.1).
- Hydrogen Monitoring System (Section 2.4.14, Item 6.2)
- Excore Instrumentation System (Section 2.4.17, Item 6.2).
- Incore Instrumentation System (Section 2.4.19, Item 5.2).
- Radiation Monitoring System (Section 2.4.22, Item 6.2).
- Signal Conditioning and Distribution System (Section 2.4-25, Item 6.1).
- Rod Positioning Measurement System (Section 2.4.26, Item 6.1).

FSAR Impact:

U.S. EPR FSAR Tier 1, Sections 2.4.1, 2.4.4, 2.4.5, 2.4.11, 2.4.13, 2.4.14, 2.4.17, 2.4.19, 2.4.22, 2.4.25, and 2.4.26 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.05-35:

Provide Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) to verify communications independence exists between Rod Position Measurement System and non-safety systems (i.e. Service Unit (SU)) to meet the requirements of 10 CFR 52.47(b)(1).

10 CFR 52.47(b)(1) requires, in part, that ITAAC are necessary and sufficient to provide reasonable assurance that if the ITAAC are performed and the acceptance criteria met, a facility that incorporates the design certification has been constructed and will be operated in conformity with the design certification, the provisions of the Act, and the Commission's rules and regulations. SRP Section 14.3.5 provides acceptance criteria for ITAACs related to I&C systems. SRP Section 14.3.5 states that specific areas of review for ITAACs include functional requirements of IEEE Std. 603-1991 and the General Design Criteria when implementing the safety system. The applicant proposed to use 1998 version of IEEE Std. 603 in lieu of the 1991 version. IEEE Std. 603-1998, Clause 5.6, requires, in part, independence between redundant portions of safety systems and between safety and non-safety systems. The staff reviewed the ITAACs provided in Table 2.4.26-4 for the RPMS and could not identify an ITAAC to verify that communications independence exists between the RPMS and non-safety systems (i.e. SU). As such, the staff requests the applicant to provide an ITAAC to verify communications independence exists between RPMS and non-safety systems to meet the requirements of 10 CFR 52.47(b)(1).

Response to Question 14.03.05-35:

U.S. EPR FSAR, Tier 1, Section 2.4.26 will be revised to include an ITAAC item to verify communications independence exists between RPMS and non-Class 1E equipment. U.S. EPR FSAR, Tier 2, Section 7.1.1.6.4 will be revised to address communications independence between RPMS and non-safety related equipment.

U.S. EPR FSAR, Tier 1, Section 2.4.26 will be revised to include ITAAC items to verify communications messages are sent with a specific protocol and RPMS function processors receive only the pre-defined message

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.4.26 and Tier 2, Section 7.1.1.6.4 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

4.26 PS self-test features are capable of detecting faults consistent with the requirements of the PS.

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

5.0 Electrical Power Design Features

5.1 ~~Class 1E PS~~The components designated as Class 1E in Table 2.4.1-1 are powered from a Class 1E division as listed in Table 2.4.1-1 in a normal or alternate feed condition.

6.0 Environmental Qualifications

6.1 Components listed as Class 1E in Table 2.4.1-2 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.

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

Table 2.4.1-7 lists the PS ITAAC.

14.03.05-28

Table 2.4.1-7—Protection System ITAAC (~~12~~ 15 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.27	During data communication, the PS function processors receive only the pre-defined messages for that specific function processor. Other messages are ignored.	a. An analysis will be performed.	a. A report determines the test specification for the PS function processors to verify that only pre-defined messages for that specific function processor and other messages are ignored.
		b. A test will be performed.	b. A report concludes that the PS function processors receive only the pre-defined messages for that specific function processor. Other messages are ignored.
5.1	~~Class1E PS~~The components designated as Class 1E in Table 2.4.1-1 are powered from a Class 1E division as listed in Table 2.4.1-1 in a normal or alternate feed condition.	a. Testing will be performed ~~for components identified as Class 1E in Table 2.4.1-1~~ by providing a test signal in each normally aligned division.	a. The test signal provided in the normally aligned division is present at the respective Class 1E components identified in Table 2.4.1-1.
		b. Testing will be performed ~~for components identified as Class 1E in Table 2.4.1-1~~ by providing a test signal in each division with the alternate feed aligned to the divisional pair.	b. The test signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E components identified in Table 2.4.1-1.
6.1	Components listed as Class 1E in Table 2.4.1-2 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components listed as Class 1E in Table 2.4.1-2 to perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Environmental Qualification Data Packages (EQDP) conclude that components listed as Class 1E in Table 2.4.1-2 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions including the time required to perform their function.

14.03.05-28

Table 2.4.1-7—Protection System ITAAC (~~12~~ 15 Sheets)

Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
	b. Components listed as Class 1E in Table 2.4.1-2 will be inspected to verify installation in accordance with the EQDP requirements.	b. Inspection reports conclude that components listed as Class 1E in Table 2.4.1-2 are installed per the EQDP requirements.

14.03.05-28

Next File

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

4.16 Deleted.

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

4.18 The SAS performs the automatic functions listed in Table 2.4.4-5—Safety Automation System Automatic Functions.

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

4.20 SAS self-test features are capable of detecting faults consistent with the requirements of the SAS.

5.0 Electrical Power Design Features

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

6.0 Environmental Qualification

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

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

Table 2.4.4-6 lists the SAS ITAAC.

14.03.05-28

Table 2.4.4-6—Safety Automation System ITAAC (11 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
6.1	Components listed as Class 1E in Table 2.4.4-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components listed as Class 1E in Table 2.4.4-1 to perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Environmental Qualification Data Packages (EQDP) conclude that components listed as Class 1E in Table 2.4.4-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions including the time required to perform their function.
		b. Components listed as Class 1E in Table 2.4.4-1 will be inspected to verify installation in accordance with the EQDP requirements.	b. Inspection reports conclude that components listed as Class 1E in Table 2.4.4-1 are installed per the EQDP requirements.

14.03.05-28

Next File

4.6 Locking mechanisms are provided on the PACS cabinet doors. Opened PACS cabinet doors are indicated in the MCR.

4.7 The equipment for each PACS division is distinctly identified and distinguishable from other identifying markings placed on the equipment, and the identifications do not require frequent use of reference material.

4.8 The PACS provides a position indication signal to the safety information and control system (SICS) for each containment isolation valve (Type B post-accident monitoring (PAM) variable) listed in Table 2.4.5-2.

4.9 Non-Class 1E PACS communication module associated with Class 1E equipment will not cause a failure of a PACS priority module when subjected to EMI, RFI, ESD and power surges.

4.10 The capability of 100% combinatorial testing of the PACS priority module is provided to preclude a software common cause failure.

4.11 The PACS is designed so that safety-related functions required for an anticipated operational occurrence (AOO) or postulated accident (PA) are performed in the presence of the following:

- Single detectable failures within the PACS.
- Failures caused by the single failure.
- Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function.

5.0 Electrical Power Design Features

5.1 ~~Class 1E PACS~~ The components designated as Class 1E in Table 2.4.5-1 are powered from a Class 1E division as listed in Table 2.4.5-1 in a normal or alternate feed condition.

6.0 Environmental Qualification

6.1 Components listed as Class 1E in Table 2.4.5-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.

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

Table 2.4.5-3~~2~~ lists the PACS ITAAC.

14.03.05-28

Table 2.4.5-3—Priority and Actuator Control System ITAAC
(5 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
5.1	~~Class 1E PACS~~ The components designated as Class 1E in Table 2.4.5-1 are powered from a Class 1E division as listed in Table 2.4.5-1 in a normal or alternate feed condition.	a. Testing will be performed ~~for components identified as Class 1E in Table 2.4.5-1~~ by providing a test signal in each normally aligned division. b. Testing will be performed ~~for components identified as Class 1E in Table 2.4.5-1~~ by providing a test signal in each division with the alternate feed aligned to the divisional pair.	a. The test signal provided in the normally aligned division is present at the respective Class 1E components identified in Table 2.4.5-1. b. The test signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E components identified in Table 2.4.5-1.
6.1	Components listed as Class 1E in Table 2.4.5-1 will perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components listed as Class 1E in Table 2.4.5-1 to perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions. b. Components listed as Class 1E in Table 2.4.5-1 will be inspected to verify installation in accordance with the EQDP requirements.	a. Environmental Qualification Data Packages (EQDP) conclude that components listed as Class 1E in Table 2.4.5-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions including the time required to perform their function. b. Inspection reports conclude that components listed as Class 1E in Table 2.4.5-1 are installed per the EQDP requirements.

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6.0 Environmental Qualifications

6.1 Components designated as harsh environment in Table 2.4.11 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.

6.2 Components designated as mild environment in Table 2.4.11-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.

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

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Table 2.4.11-3 lists the BCMS ITAAC.

Table 2.4.11-3—Boron Concentration Measurement System ITAAC (2 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
6.1	Components designated as harsh environment in Table 2.4.11-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components designated as harsh environment in Table 2.4.11-1 to perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Environmental Qualification Data Packages (EQDP) conclude that components designated as harsh environment in Table 2.4.11-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions including the time required to perform their function.
		b. Components designated as harsh environment Table 2.4.11-1 will be inspected to verify installation in accordance with the EQDP requirements.	b. Inspection reports conclude that components designated as harsh environment in Table 2.4.11-1 are installed per the EQDP requirements.
6.2	Components designated as mild environment in Table 2.4.11-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components designated as mild environment in Table 2.4.11-1 to perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Environmental Qualification Data Packages (EQDP) conclude that components designated as mild environment in Table 2.4.11-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions including the time required to perform their function.
		b. Components designated as mild environment Table 2.4.11-1 will be inspected to verify installation in accordance with the EQDP requirements.	b. Inspection reports conclude that components designated as mild environment in Table 2.4.11-1 are installed per the EQDP requirements.

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- Failures caused by the single failure.
- Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function.

5.0 Environmental Qualifications

5.1 Components listed as Class 1E in Table 2.4.13-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.

~~5.0~~6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.13-~~3~~ 4 lists the CRDCS ITAAC.

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Table 2.4.13-~~3~~4—Control Rod Drive Control System ITAAC
(2 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.4	The CRDCS limits the RCCA bank withdrawal rate to a maximum value of 30 in per minute or less.	~~Tests~~ A test will be performed ~~to determine the maximum RCCA bank withdrawal rate~~using test signals.	The CRDCS limits the RCCA bank withdrawal rate to a maximum value of 30 inches per minute or less.
4.5	The CRDCS provides output signals to the recipients listed in Table 2.4.13-3.	A test will be performed using test signals.	The CRDCS provides output signals to the recipients listed in Table 2.4.13-3.
4.6	The CRDCS is designed so that safety-related functions required for an AOO or PA are performed in the presence of the following: • Single detectable failures within the CRDCS. • Failures caused by the single failure. • Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function.	A failure modes and effects analysis will be performed on the CRDCS at the level of replaceable modules and components.	A report concludes that the CRDCS is designed so that safety-related functions required for an AOO or PA are performed in the presence of the following: • Single detectable failures within the CRDCS. • Failures caused by the single failure. • Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function.
5.1	Components listed as Class 1E in Table 2.4.11-1 will perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components listed as Class 1E in Table 2.4.11-1 to perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions. b. Components listed as Class 1E in Table 2.4.11-1 will be inspected to verify installation in accordance with the EQDP requirements.	a. Environmental Qualification Data Packages (EQDP) conclude that components listed as Class 1E in Table 2.4.11-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions including the time required to perform their function. b. Inspection reports conclude that components listed as Class 1E in Table 2.4.11-1 are installed per the EQDP requirements.

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environmental conditions, containment test conditions, anticipated operational occurrences (AOO), and accident and post-accident environmental conditions.~~in the environments that exist during and following design basis events.~~

6.2 Components designated as mild environment in Table 2.4.14-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.

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7.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.14-~~2~~ 3 lists the HMS ITAAC.

Table 2.4.14-~~2~~3—Hydrogen Monitoring System ITAAC (~~2~~ 4 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
6.2	Components designated as mild environment in Table 2.4.14-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components designated as mild environment in Table 2.4.14-1 to perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Environmental Qualification Data Packages (EQDP) conclude that components designated as mild environment in Table 2.4.14-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions including the time required to perform their function.
		b. Components designated as mild environment in Table 2.4.14-1 will be inspected to verify installation in accordance with the EQDP requirements.	b. Inspection reports conclude that components designated as mild environment in Table 2.4.14-1 are installed per the EQDP requirements.

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6.0 Environmental Qualifications

6.1 Components designated as harsh environment ~~listed as Class 1E~~ in Table 2.4.17-1 ~~that are designated as harsh environment,~~ will perform their function under normal environmental conditions, containment test conditions, anticipated operational occurrences, and accident and post-accident environmental conditions.~~in the environments that exist during and following design basis events.~~

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6.2 Components designated as mild environment in Table 2.4.17-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.

7.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.17-3 lists the EIS ITAAC.

Table 2.4.17-3—Excore Instrumentation System ITAAC
(2 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
6.2	Components designated as mild environment in Table 2.4.17-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components designated as mild environment in Table 2.4.17-1 to perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Environmental Qualification Data Packages (EQDP) conclude that components designated as mild environment in Table 2.4.17-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions including the time required to perform their function.
		b. Components designated as mild environment in Table 2.4.17-1 will be inspected to verify installation in accordance with the EQDP requirements.	b. Inspection reports conclude that components designated as mild environment in Table 2.4.17-1 are installed per the EQDP requirements.

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environmental conditions, containment test conditions, anticipated operational occurrences, and accident and post-accident environmental conditions.~~in the environments that exist during and following design basis events.~~

5.2 Components designated as mild environment in Table 2.4.19-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.

6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.19-3 lists the ICIS ITAAC.

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Table 2.4.19-3—Incore Instrumentation System ITAAC
(2 Sheets)

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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
5.2	Components designated as mild environment in Table 2.4.19-1 will perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components designated as mild environment in Table 2.4.19-1 to perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Environmental Qualification Data Packages (EQDP) conclude that components designated as mild environment in Table 2.4.19-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions including the time required to perform their function.
		b. Components designated as mild environment in Table 2.4.19-1 will be inspected to verify installation in accordance with the EQDP requirements.	b. Inspection reports conclude that components designated as mild environment in Table 2.4.19-1 are installed per the EQDP requirements.

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5.0 Electrical Power Design Features

5.1 The components designated ~~identified~~ as Class 1E in Table 2.4.22-1 are powered from the Class 1E division as listed in Table 2.4.22-1 in a normal or alternate feed condition.

6.0 Environmental Qualifications

6.1 Components designated as harsh environment in Table 2.4.22-1~~, that are designated as harsh environment,~~ will perform their function under normal environmental conditions, containment test conditions, anticipated operational occurrences, and accident and post-accident environmental conditions.~~in the environments that exist during and following design basis events.~~

6.2 Components designated as mild environment in Table 2.4.22-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.

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7.0 Equipment and System Performance

7.1 Deleted.

8.0 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.22-3 lists the RMS ITAAC.

Table 2.4.22-3—Radiation Monitoring System ITAAC
(2 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
6.2	Components designated as mild environment in Table 2.4.22-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components designated as mild environment in Table 2.4.22-1 to perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Environmental Qualification Data Packages (EQDP) conclude that components designated as mild environment in Table 2.4.22-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions including the time required to perform their function.
		b. Components designated as mild environment in Table 2.4.22-1 will be inspected to verify installation in accordance with the EQDP requirements.	b. Inspection reports conclude that components designated as mild environment in Table 2.4.22-1 are installed per the EQDP requirements.
7.1	Deleted.	Deleted.	Deleted.

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4.6 Locking mechanisms are provided on the SCDS cabinet doors. Opened SCDS cabinet doors are indicated in the MCR.

4.7 The SCDS is designed so that safety-related functions required for an anticipated operational occurrence (AOO) or postulated accident (PA) are performed in the presence of the following:

- Single detectable failures within the SCDS.
- Failures caused by the single failure.
- Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function.

5.0 Electrical Power Design Features

5.1 ~~Class 1E SCDS~~ The components designated as Class 1E in Table 2.4.25-1 are powered from a Class 1E division as listed in Table 2.4.25-1 in a normal or alternate feed condition.

6.0 Environmental Qualifications

6.1 Components listed as Class 1E in Table 2.4.25-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.

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

Table 2.4.25-4 lists the SCDS ITAAC.

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Table 2.4.25-4—Signal Conditioning and Distribution System ITAAC (4 Sheets)

	Commitment Wording	Inspection, Tests, Analyses	Acceptance Criteria
5.1	~~Class 1E SCDS~~ The components designated as Class 1E in Table 2.4.25-1 are powered from a Class 1E division as listed in Table 2.4.25-1 in a normal or alternate feed condition.	a. Testing will be performed ~~for components identified as Class 1E in Table 2.4.25-1~~ by providing a test signal in each normally aligned division.	a. The test signal provided in the normally aligned division is present at the respective Class 1E component identified in Table 2.4.25-1.
		b. Testing will be performed ~~for components identified as Class 1E in Table 2.4.25-1~~ by providing a test signal in each division with the alternate feed aligned to the divisional pair.	b. The test signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E components identified in Table 2.4.25-1.
6.1	Components listed as Class 1E in Table 2.4.25-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components listed as Class 1E in Table Table 2.4.25-1 to perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Environmental Qualification Data Packages (EQDP) conclude that components listed as Class 1E in Table 2.4.25-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions including the time required to perform their function.
		b. Components listed as Class 1E in Table 2.4.25-1 will be inspected to verify installation in accordance with the EQDP requirements.	b. Inspection reports conclude that components listed as Class 1E in Table 2.4.25-1 are installed per the EQDP requirements.

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5. Installation and Commissioning Phase.

6. Final Documentation Phase.

4.4 ~~The~~ RPMS equipment listed as Class 1E listed in Table 2.4.26-1 can ~~perform its safety~~ function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

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

4.6 CPU state switches are provided at the RPMS cabinets to restrict modifications to the RPMS software.

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4.7 Communications independence is provided between RPMS equipment and non-Class 1E equipment.

4.8 Locking mechanisms are provided on the RPMS cabinet doors. Opened RPMS cabinet doors are indicated in the MCR.

4.9 The RPMS is designed so that safety-related functions required for an anticipated operational occurrence (AOO) or postulated accident (PA) are performed in the presence of the following:

- Single detectable failures within the RPMS.
- Failures caused by the single failure.
- Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function.

4.10 Electrical isolation is provided on connections between RPMS equipment and non-Class 1E equipment.

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4.11 The RPMS uses TXS system communication messages that are sent with a specific protocol.

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

5.0 Electrical Power Design Features

5.1 ~~Class 1E RPMS~~ The components designated as Class 1E in Table 2.4.26-1 are powered from a Class 1E division as listed in Table 2.4.26-1 in a normal or alternate feed condition.

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Table 2.4.26-4—Rod Position Measurement System ITAAC
(4 Sheets)

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Commitment Wording		Inspection, Tests, Analyses	Acceptance Criteria
4.7	Communications independence is provided between RPMS equipment and non-Class 1E equipment.	Tests will be performed using test signals, analyses, or a combination of tests using test signals and analyses.	Communications independence between RPMS equipment and non-Class 1E equipment is provided by: • Data communications between RPMS function processors and non-Class 1E equipment is through a Monitoring and Service Interface (MSI). • The MSI does not interface directly with a network. • Separate communication modules interface directly with the network. • Separate send and receive data channels are used in both the communications module and the MSI. • The MSI operates in a strictly cyclic manner. The MSI operates asynchronously from the communications module.
4.8	Locking mechanisms are provided on the RPMS cabinet doors. Opened RPMS cabinet doors are indicated in the MCR.	a. An inspection will be performed. b. A test will be performed. c. A test will be performed.	a. Locking mechanisms exist on the RPMS cabinet doors. b. The locking mechanisms on the RPMS cabinet doors operate properly. c. Opened RPMS cabinet doors are indicated in the MCR when an RPMS cabinet door is in the open position.

Table 2.4.26-4—Rod Position Measurement System ITAAC
(4 Sheets)

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Commitment Wording		Inspection, Tests, Analyses	Acceptance Criteria
4.11	The RPMS uses TXS system communication messages that are sent with a specific protocol.	An inspection will be performed on RPMS equipment to verify that RPMS communication messages are sent with a specific protocol.	The TXS system communication messages use a specific protocol structure and message error determination. Messages are validated by the following series of checks: • Message header check contains the following: - Protocol version - Sender ID - Receiver ID - Message ID - Message type - Message length • Message age is monitored. • Message cyclic redundancy check is performed so that if one of the checks fails, the affected data are marked with an error status.
4.12	During data communication, the RPMS function processors receive only the pre-defined messages for that specific function processor. Other messages are ignored.	a. An analysis will be performed.	a. A report determines the test specification for the RPMS function processors to verify that only pre-defined messages for that specific function processor and other messages are ignored.
		b. A test will be performed.	b. A report concludes that the RPMS function processors receive only the pre-defined messages for that specific function processor. Other messages are ignored.

Table 2.4.26-4—Rod Position Measurement System ITAAC
(4 Sheets)

Commitment Wording		Inspection, Tests, Analyses	Acceptance Criteria
5.1	~~Class 1E RPMS~~ The components designated as Class 1E in Table 2.4.26-1 are powered from a Class 1E division as listed in Table 2.4.26-1 in a normal or alternate feed condition.	a. Testing will be performed ~~for components identified as Class 1E in Table 2.4.26-1~~ by providing a test signal in each normally aligned division.	a. The test signal provided in the normally aligned division is present at the respective Class 1E components identified in Table 2.4.26-1.
		b. Testing will be performed ~~for components identified as Class 1E in Table 2.4.26-1~~ by providing a test signal in each division with the alternate feed aligned to the divisional pair.	b. The test signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E components identified in Table 2.4.26-1.
6.1	Components listed as Class 1E in Table 2.4.26-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components listed as Class 1E in Table 2.4.26-1 to perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions.	a. Environmental Qualification Data Packages (EQDP) conclude that components listed as Class 1E in Table 2.4.26-1 can perform their function under normal environmental conditions, AOOs, and accident and post-accident environmental conditions including the time required to perform their function.
		b. Components listed as Class 1E in Table 2.4.26-1 will be inspected to verify installation in accordance with the EQDP requirements.	b. Inspection reports conclude that components listed as Class 1E in Table 2.4.26-1 are installed per the EQDP requirements.

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- Communications independence.

The safety-related I&C systems are physically separated from non-safety-related I&C systems.

Electrical isolation is provided for both hardwired and data communications between safety-related and non-safety-related I&C. For hardwired signals, qualified isolation devices are used with the safety-related I&C systems for signals to and from the non-safety-related I&C. Fiber optic cable is used for data connections between safety-related and non-safety-related I&C.

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Class 1E communication independence is provided between the PS, ~~and~~ SAS, and RPMS and the following non-safety-related components:

- QDS (PS only).
- GW.
- SU.

Connection between the MSI and QDS

The connection between the MSI and the QDS is limited to one-way data communication from the MSI to the QDS. This is accomplished via a segment that is physically restricted to unidirectional communication (transmit only port connected to receive only port). This interface is described in more detail in ANP-10309P (Reference 6).

Communications independence is achieved by physically limiting communication to one way from the MSI to the QDS.

Connection between the MSI and GWs

The connection between the MSI and the GW is limited to one-way data communication from the MSI to the GW. This is accomplished via a segment that is physically restricted to unidirectional communication (transmit only port connected to receive only port). This interface is described in more detail in ANP-10309P.

Communications independence is achieved by physically limiting communication to one way from the MSI to the GW.

Connection between the MSI and the SUs

The SU is a non-safety-related, standard computer that is temporarily connected to a TXS system when needed to perform surveillances or troubleshoot.