ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Thursday, February 09, 2012 12:01 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); CRIBB Arnie (EXTERNAL AREVA); DELANO Karen (AREVA); HATHCOCK Phillip (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); HUDSON Greg (AREVA); MEACHAM Robert (AREVA)
Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 506 (5456), FSAR Ch. 14, Question 14.03.05-39
Attachments: RAI 506 Question 14.03.05-39 Response US EPR DC - DRAFT.pdf

Getachew,

Attached is a revised DRAFT response to Question 14.03.05-39 for RAI No. 506 (FSAR Ch. 14) in advance of the February 21, 2012 final date. This response addresses comments received from NRC staff.

Let me know if the staff has any questions or if this response can be sent as final.

Thanks,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, January 19, 2012 10:48 AM
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 5

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. Supplement 4 response was submitted on January 13, 2012 to provide technically correct and complete responses to 2 questions.

The schedule for a technically correct and complete final response to the remaining 4 questions has been changed as provided below.

Question #	Response Date
RAI 506 — 14.03.05-27	**February 21, 2012**

RAI 506 — 14.03.05-30	**February 21, 2012**
RAI 506 — 14.03.05-39	**February 21, 2012**
RAI 506 — 14.03.05-41	**February 21, 2012**

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
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From: WILLIFORD Dennis (CORP/QP)
Sent: Friday, January 13, 2012 12:39 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 4

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.
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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,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
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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: 3735

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D4AE8C19)

Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 506 (5456), FSAR Ch. 14, Question 14.03.05-39
Sent Date: 2/9/2012 12:00:34 PM
Received Date: 2/9/2012 12:01:32 PM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

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"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>
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"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>
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"MEACHAM Robert (AREVA)" <Robert.Meacham@areva.com>
Tracking Status: None
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Tracking Status: None

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Files	**Size**	**Date & Time**	
MESSAGE	14792	2/9/2012 12:01:32 PM	
RAI 506 Question 14.03.05-39 Response US EPR DC - DRAFT.pdf			991514

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,
Question 14.03.05-39

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 14.03.05-39:

Discuss the basis for not including ITAAC to verify single failure protection for all safety-related systems.

IEEE Std. 603-1991, Clause 5.1, requires that any single failure within the safety system shall not prevent proper protective action at the system level when required. Guidance in the application of the single-failure criterion is provided in Regulatory Guide 1.53, "Application of the Single-Failure Criterion to Nuclear Power Plant Protection Systems," which endorses IEEE Std. 379-1988, "Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems." The applicant provided ITAACs to verify design commitment regarding single-failure protection for safety-related systems such as Protection System (U.S. EPR FSAR, Tier 1, Table 2.4.1-7, Item 4.18), SICS (Tier 1, Table 2.4.2-2, Item 4.10), and SAS (Tier 1, Table 2.4.4-6, Item 4.10). Staff requests applicant to explain why such single-failure protection ITAACs were left out for the other safety-related systems such as Incore Instrumentation System, Excore Instrumentation System, Boron Concentration Measurement System, Radiation Monitoring System, Hydrogen Monitoring System, Signal Conditioning and Distribution System, and Rod Position Measurement System.

Response to Question 14.03.05-39:

U.S. EPR FSAR Tier 1, Instrumentation and Controls Design Features, Displays and Controls commitments and inspections, tests, analyses and acceptance criteria (ITAAC) will be revised to add an ITAAC item for single failure criteria to the following:

- PACS (Section 2.4.5, Item 4.11)
- Boron Concentration Measurement System (Section 2.4.11, Item 4.4).
- Control Rod Drive Control System (Section 2.4.13, Item 4.6).
- Hydrogen Monitoring System (Section 2.4.14, Item 4.3).
- Excore Instrumentation System (Section 2.4.17, Item 4.4).
- Incore Instrumentation System (Section 2.4.19, Item 4.4).
- Radiation Monitoring System (Section 2.4.22, Item 4.3).
- Signal Conditioning and Distribution System (Section 2.4.25, Item 4.7).
- Rod Position Measurement System (Section 2.4.26, Item 4.9).

U.S. EPR Tier 1, Section 2.4.2, ITAAC Item 4.10, and Section 2.4.4, ITAAC Item 4.10 will be revised to conform to the current design.

FSAR Impact:

U.S. EPR FSAR Tier 1, Sections 2.4.2, 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.

U.S. EPR FSAR Tier 2, Section 6.2.5.2, and Tables 3.2.2-1 and 3.11-1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

3.0 Mechanical Design Features

3.1 Equipment identified as Seismic Category I in Table 2.4.2-1 can withstand seismic design basis loads without loss of safety function.

4.0 I&C Design Features, Displays and Controls

4.1 The capability to transfer control of the SICS from the MCR to the RSS exists in a fire area separate from the MCR. The transfer switches are each associated with a single division of the safety-related control and allow transfer of control without entry into the MCR.

4.2 Electrical isolation ~~exists~~ is provided between the Class 1E electrical divisions that power the controls and indications of the SICS as listed in Table 2.4.2-1.

4.3 Electrical isolation is provided on connections between the safety-related parts of the SICS and non-Class 1E equipment.

4.4 Class 1E SICS equipment listed in Table 2.4.2-1 can ~~perform its safety~~ function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

4.5 The SICS provides controls for manual actuation of reactor trip in the MCR and RSS.~~Deleted.~~

4.6 Electrical isolation is provided on connections between the RSS and the MCR for the SICS.

4.7 The SICS provides controls in the MCR for the manual actuation of the ESF functions listed in Table 2.4.2-2—Manually Actuated ESF Functions.~~Deleted.~~

4.8 The SICS provides indications of Type A, B, and C PAM variables in the MCR.~~Deleted.~~

4.9 The SICS provides, in the MCR, manual controls and indications necessary to reach and maintain safe shutdown following an AOO or PA.~~Deleted..~~

4.10 The SICS 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:

14.03.05-39

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

4.11 Locking mechanisms are provided on the SICS doors in the MCR and RSS. Opened SICS doors in the RSS are indicated in the MCR.~~Deleted.~~

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

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

14.03.05-39

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

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.10	The SAS is designed so that safety-related functions required for AOOs or PAs are performed in the presence of the following: • Single detectable failures within the SAS. • 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 SAS at the level of replaceable modules and components.	A report ~~exists and~~ concludes that the SAS is designed so that safety-related functions required for AOOs or PAs are performed in the presence of the following: • Single detectable failures within the SAS ~~concurrent with identifiable but non-detectable failures~~. • Failures caused by the single failure. • Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function.
4.11	The equipment for each SAS 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.	Inspections will be performed on the SAS equipment to verify that the equipment for each SAS division is distinctly identified and distinguishable from other markings placed on the equipment and that the identifications do not require frequent use of reference material.	The equipment for each SAS 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.
4.12	Locking mechanisms are provided on the SAS cabinet doors. Opened SAS cabinet doors are indicated in the MCR.	a. ~~Inspections~~ An inspection will be performed ~~to verify the existence of locking mechanisms on the SAS cabinet doors~~. b. ~~Tests~~ A test will be performed ~~to verify the proper operation of the locking mechanisms on the SAS cabinet doors~~. c. ~~Tests~~ A test ~~and inspections~~ will be performed ~~to verify an indication exists in the MCR when a SAS cabinet door is in the open position~~.	a. Locking mechanisms exist on the SAS cabinet doors. b. The locking mechanisms on the SAS cabinet doors operate properly. c. Opened SAS cabinet doors are indicated in the MCR with an SAS cabinet door is in the open position.

14.03.05-39

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.

14.03.05-39

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.

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

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.8	The PACS provides a position indication signal to the SICS for each containment isolation valve (Type B PAM variable) listed in Table 2.4.5-2.	Tests will be performed using test signals. ~~to verify that the PACS provides position indication signals to the SICS for each containment isolation valve.~~	The PACS provides a position indication signal to the SICS for each containment isolation valve 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	Tests, analyses, or a combination of tests and analyses will be performed ~~on the communication module~~.	~~A report exists and concludes that the~~ Non-Class 1E PACS communication module will not cause a failure of 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.	A type test will be performed using test signals. ~~on the PACS priority module to preclude consideration of a software common cause failure.~~	The capability of 100% combinatorial testing of the PACS priority module is provided to preclude a software common cause failure. ~~A report exists and concludes that 100% combinatorial type testing on the PACS priority module has been successfully completed.~~
4.11	The PACS 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 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.	A failure modes and effects analysis will be performed on the PACS at the level of replaceable modules and components.	A report concludes that the PACS 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 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.

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2.4.11 Boron Concentration Measurement System

1.0 Description

The boron concentration measurement system (BCMS) measures the boron concentration in the chemical and volume control system (CVCS).

The BCMS has the following safety-related function:

- Sends boron concentration measurement signals to the signal conditioning and distribution system (SCDS).

2.0 Arrangement

2.1 The location of the BCMS equipment is ~~located~~ as listed in Table 2.4.11–1—Boron Concentration Measurement System Equipment.

3.0 Mechanical Design Features

3.1 Equipment identified as Seismic Category I in Table 2.4.11-1 can withstand seismic design basis loads without loss of safety function.

4.0 I&C Design Features, Displays and Controls

4.1 The BCMS provides output signals to the recipients listed in Table 2.4.11-2—Boron Concentration Measurement System Output Signals.

4.2 The BCMS equipment classified as Class 1E listed in Table 2.4.11-1 can ~~perform its safety~~ function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

4.3 Locking mechanisms are provided on the BCMS cabinet doors. Opened BCMS cabinet doors are indicated in the MCR.

4.4 The BCMS 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 BCMS concurrent with identifiable but non-detectable failures.
- 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.

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5.0 Electrical Power Design Features

5.1 The components designated ~~identified~~ as Class 1E in Table 2.4.11-1 are powered from the Class 1E division as listed in Table 2.4.11-1 in a normal or alternate feed condition.

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

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
		c. A test will be performed.	c. Opened BCMS cabinet doors are indicated in the MCR when a BCMS cabinet door is in the open position.
4.4	The BCMS 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 BCMS concurrent with identifiable but non-detectable failures. • 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 BCMS at the level of replaceable modules and components.	A report concludes that the BCMS 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 BCMS concurrent with identifiable but non-detectable failures. • 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	The components designated ~~identified~~ as Class 1E in Table 2.4.11-1 are powered from the Class 1E division as listed in Table 2.4.11-1 in a normal or alternate feed condition.	a. Testing will be performed ~~for components identified as Class 1E in Table 2.4.11-1~~ by providing a test signal in each normally aligned division. b. Testing will be performed ~~for components identified as Class 1E in Table 2.4.11-1~~ 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 2.4.11-1. 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 2.4.11-1.

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2.4.13 Control Rod Drive Control System

1.0 Description

The control rod drive control system (CRDCS) controls the actuation of power to the control rod drive mechanisms (CRDM).

The CRDCS has the following safety-related functions:

- Interrupts power to the CRDMs via the reactor trip contactors.
- Provides signals that report the status of the reactor trip contactors to the Signal Conditioning and Distribution System (SCDS).

The CRDCS provides the following non-safety-related functions:

- Actuates the rod cluster control assemblies through the CRDMs.

2.0 Arrangement

2.1 The location of the CRDCS equipment is ~~located~~ as listed in Table 2.4.13-1—Control Rod Drive Control System Equipment.

3.0 Mechanical Design Features

3.1 Equipment identified as Seismic Category I in Table 2.4.13-1 can withstand seismic design basis loads without loss of safety function.

4.0 I&C Design Features, Displays and Controls

4.1 The CRDCS equipment classified as Class 1E listed in Table 2.4.13-1 can ~~perform its safety~~ function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges, and power surges.

4.2 The CRDCS receives inputs from the sources listed in Table 2.4.13-2—Control Rod Drive Control System Input Signals.

4.3 Each reactor trip contactor listed in Table 2.4.13-1 opens when an RT signal is received from the corresponding PS division.

4.4 The CRDCS limits the rod cluster control assembly (RCCA) bank withdrawal rate to a maximum value of 30 in per minute or less.

4.5 The CRDCS provides output signals to the recipients listed in Table 2.4.13-3—Control Rod Drive Control System Output Signals.

4.6 The CRDCS 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 CRDCS concurrent with identifiable but non-

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detectable failures.

- 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.

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 concurrent with identifiable but non-detectable failures. • 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 concurrent with identifiable but non-detectable failures. • 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. 14.03.05-39	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.	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.

2.4.14 Hydrogen Monitoring System

1.0 Description

The hydrogen monitoring system (HMS) provides for the monitoring of hydrogen concentration in the containment atmosphere.

The HMS has the following safety-related function:

- Provides containment ~~Measures the~~ hydrogen concentration ~~in containment~~signals to SCDS.

2.0 Arrangement

2.1 The location of the HMS system equipment is ~~located~~ as listed in Table 2.4.14-1—Hydrogen Monitoring System Equipment.

3.0 Mechanical Design Features

3.1 Equipment identified as Seismic Category I in Table 2.4.14-1 can withstand seismic design basis loads without loss of safety function.

4.0 I&C Design Features, Displays and Controls

4.1 The HMS equipment classified as Class 1E listed in Table 2.4.14-1 can ~~perform its safety~~ function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

4.2 The HMS provides output signals to the recipients listed in Table 2.4.14-2—Hydrogen Monitoring System Output Signals.

4.3 The HMS 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 HMS concurrent with identifiable but non-detectable failures.
- 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.

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5.0 Electrical Power Design Features

5.1 The components designated ~~identified~~ as Class 1E in Table 2.4.14-1 are powered from the Class 1E division as listed in Table 2.4.14-1 in a normal or alternate feed condition.

Table 2.4.14-1—Hydrogen Monitoring System Equipment

Description	Tag Number (1)	Location	Seismic Category	IEEE Class 1E (2)	~~Harsh~~ Environment
Hydrogen Sensor	30JMU10CQ001	Reactor Building	I	1^{N} 4^{A} 2^{A}	Harsh~~Yes~~
Hydrogen Sensor	30JMU10CQ002	Reactor Building	I	1^{N} 4^{A} 2^{A}	Harsh~~Yes~~
Hydrogen Sensor	30JMU10CQ003	Reactor Building	I	1^{N} 4^{A} 2^{A}	Harsh~~Yes~~
Hydrogen Sensor	30JMU10CQ004	Reactor Building	I	1^{N} 4^{A} 2^{A}	Harsh~~Yes~~
Hydrogen Sensor	30JMU10CQ005	Reactor Building	I	1^{N} 4^{A} 2^{A}	Harsh~~Yes~~
Hydrogen Sensor	30JMU10CQ006	Reactor Building	I	1^{N} 4^{A} 2^{A}	Harsh~~Yes~~
Hydrogen Sensor	30JMU10CQ007	Reactor Building	I	1^{N} 4^{A} 2^{A}	Harsh~~Yes~~
Hydrogen Monitoring Signal Processing Unit	30JMU10GH001	Safeguard Building	I	1^{N} 4^{A} 2^{A}	Mild~~No~~
Hydrogen Monitoring Signal Processing Unit	30JMU10GH002	Safeguards Building	I	4^{N} 3^{A}	Mild

1) Equipment tag numbers are provided for information and are not part of the design certification.

2) ^{N} denotes the division the component is normally powered from. ^{A} denotes the division the component is powered from when alternate feed is implemented.

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

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.3	The HMS 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 HMS concurrent with identifiable but non-detectable failures. • 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 HMS at the level of replaceable modules and components.	A report concludes that the HMS 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 HMS concurrent with identifiable but non-detectable failures. • 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	The components designated ~~identified~~ as Class 1E in Table 2.4.14-1 are powered from the Class 1E division as listed in Table 2.4.14-1 in a normal or alternate feed condition.	a. Testing will be performed ~~for components identified as Class 1E in Table 2.4.14-1~~ by providing a test signal in each normally aligned division. b. Testing will be performed ~~for components identified as Class 1E in Table 2.4.14-1~~ 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 2.4.14-1. 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 2.4.14-1.

2.4.17 Excore Instrumentation System

1.0 Description

The excore instrumentation system (EIS) provides signals indicative of neutron flux level conditions to other I&C systems.

The EIS has the following safety related function:

- Provides neutron flux level signals to the signal conditioning and distribution system (SCDS).

2.0 Arrangement

2.1 The location of the EIS equipment is ~~located~~ as listed in Table 2.4.17-1—Excore Instrumentation System Equipment.

3.0 Mechanical Design Features

3.1 Equipment identified as Seismic Category I in Table 2.4.17-1 can withstand seismic design basis loads without loss of safety function.

4.0 I&C Design Features, Displays and Controls

4.1 The EIS equipment classified as Class 1E listed in Table 2.4.17-1 can ~~perform its safety~~ function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

4.2 The EIS provides output signals to the recipients listed in Table 2.4.17-2—Excore Instrumentation System Output Signals.

4.3 Locking mechanisms are provided on the EIS cabinet doors. Opened EIS cabinet doors are indicated in the MCR.

4.4 The EIS 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 EIS concurrent with identifiable but non-detectable failures.
- 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.

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5.0 Electrical Power Design Features

5.1 The components designated ~~identified~~ as Class 1E in Table 2.4.17-1 are powered from the Class 1E division as listed in Table 2.4.17-1 in a normal or alternate feed condition.

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

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
		c. A test will be performed	c. Opened EIS cabinet doors are indicated in the MCR when a EIS cabinet door is in the open position.
4.4	The EIS 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 EIS concurrent with identifiable but non-detectable failures. • 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 EIS at the level of replaceable modules and components.	A report concludes that the EIS 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 EIS concurrent with identifiable but non-detectable failures. • 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	The components designated ~~identified~~ as Class 1E in Table 2.4.17-1 are powered from the Class 1E division as listed in Table 2.4.17-1 in a normal or alternate feed condition. 14.03.05-39	a. Testing will be performed ~~for components identified as Class 1E in Table 2.4.17-1~~ by providing a test signal in each normally aligned division. b. Testing will be performed ~~for components identified as Class 1E in Table 2.4.17-1~~ 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 2.4.17-1. 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 2.4.17-1.

2.4.19 Incore Instrumentation System

1.0 Description

The incore instrumentation system (ICIS) provides information about the conditions inside the reactor core.

The ICIS has the following ~~safety~~ safety-related functions:

- Provides self powered neutron detector (SPND) output signals to signal conditioning and distribution system (SCDS).
- Provides ~~a measurement of~~ core outlet temperature signals to SCDS.

2.0 Arrangement

2.1 The location of the ICIS equipment is ~~located~~ as listed in Table 2.4.19-1—Incore Instrumentation System Equipment.

3.0 Mechanical Design Features

3.1 Equipment identified as Seismic Category I in Table 2.4.19-1 can withstand seismic design basis loads without loss of safety function.

4.0 I&C Design Features, Displays and Controls

4.1 The ICIS equipment classified as Class 1E listed in Table 2.4.19-1 can ~~perform its safety~~ function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

4.2 The ICIS provides output signals to the recipients listed in Table 2.4.19-2—Incore Instrumentation System Output Signals.

4.3 Locking mechanisms are provided on the ICIS cabinet doors. Opened ICIS cabinet doors are indicated in the MCR.

4.4 The ICIS 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 ICIS concurrent with identifiable but non-detectable failures.
- 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.

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

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.3	Locking mechanisms are provided on the ICIS cabinet doors. Opened ICIS 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 ICIS cabinet doors. b. The locking mechanisms on the ICIS cabinet doors operate properly. c. Opened ICIS cabinet doors are indicated in the MCR when a ICIS cabinet door is in the open position.
4.4	The ICIS 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 ICIS concurrent with identifiable but non-detectable failures. • 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 ICIS at the level of replaceable modules and components.	A report concludes that the ICIS 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 ICIS concurrent with identifiable but non-detectable failures. • 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.

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2.4.22 Radiation Monitoring System

1.0 Description

The radiation monitoring system (RMS) provides surveillance of ionizing radiation comprising all provisions dealing with the occurrence of ionizing radiation within the plant and measures related to the health control of personnel who could be exposed to radiation.

The radiation monitoring system provides the following safety-related function:

- Provides safety-related signals to the SCDS.

The radiation monitoring system provides the following non-safety related function:

- Provides non-safety-related signals to the SCDS.

2.0 Arrangement

2.1 The location of the RMS equipment is ~~located~~ as listed in Table 2.4.22-1—Radiation Monitoring System Equipment.

3.0 Mechanical Design Features

3.1 Components identified as Seismic Category I in Table 2.4.22-1 can withstand seismic design basis loads without a loss of safety function.

4.0 I&C Design Features, Displays and Controls

4.1 The RMS provides the output signals to the recipients listed in Table 2.4.22-2—Radiation Monitoring System Output Signals.

4.2 Locking mechanisms are provided on the RMS cabinet doors. Opened RMS cabinet doors are indicated in the MCR.~~Deleted.~~

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4.3 The RMS 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 RMS concurrent with identifiable but non-detectable failures.
- 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.

4.4 Class 1E RMS equipment listed in Table 2.4.22-1 can function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

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

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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.3	The RMS 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 RMS concurrent with identifiable but non-detectable failures. • 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 RMS at the level of replaceable modules and components.	A report concludes that the RMS 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 RMS concurrent with identifiable but non-detectable failures. • 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.
4.4	Class 1E RMS equipment listed in Table 2.4.22-1 can function when subjected to EMI, RFI, ESD, and power surges.	Type tests or type tests and analyses will be performed.	Equipment identified as Class 1E in Table 2.4.22-1 can function when subjected to EMI, RFI, ESD, and power surges.
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.	a. Testing will be performed ~~for components identified as Class 1E in Table 2.4.22-1~~ by providing a test signal in each normally aligned division. b. Testing will be performed ~~for components identified as Class 1E in Table 2.4.22-1~~ 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 2.4.22-1. 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 2.4.22-1.

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 concurrent with identifiable but non-detectable failures.
- 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.

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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.

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

	Commitment Wording	Inspection, Tests, Analyses	Acceptance Criteria
		c. Inspections will be performed on the connections between the SCDS Class 1E equipment and non-Class1E equipment.	c. Class 1E electrical isolation devises exist on connections between the SCDS Class 1E equipment and non Class 1E equipment.
4.5	The SCDS equipment listed as Class 1E listed in Table 2.4.25-1 can ~~perform its safety~~ function when subjected to EMI, RFI, ESD, and power surges.	Type tests, tests, analyses or a combination ~~of these~~ will be performed ~~on the Class 1E equipment listed in Table 2.4.25-1~~.	~~A report exists and concludes that the e~~Equipment listed as Class 1E in Table 2.4.25-1 can ~~perform its safety~~ function when subjected to EMI, RFI, ESD, and power surges.
4.6	Locking mechanisms are provided on the SCDS cabinet doors. Opened SCDS 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 SCDS cabinet doors. b. The locking mechanisms on the SCDS cabinet doors MCR operate properly. c. Opened SCDS cabinet doors are indicated in the MCR when a SCDS cabinet door is in the open position.
4.7	The SCDS 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 SCDS concurrent with identifiable but non-detectable failures. • 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 SCDS at the level of replaceable modules and components.	A report concludes that the SCDS 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 SCDS concurrent with identifiable but non-detectable failures. • 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.

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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.

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.

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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 concurrent with identifiable but non-detectable failures.
- 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.

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.

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

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Commitment Wording		Inspection, Tests, Analyses	Acceptance Criteria
4.9	The RPMS 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 RPMS concurrent with identifiable but non-detectable failures. • 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 RPMS at the level of replaceable modules and components.	A report concludes that the RPMS 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 RPMS concurrent with identifiable but non-detectable failures. • 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.	a. Analyses will be performed to determine the test specification for electrical isolation devices on connections between RPMS equipment and non-Class 1E equipment.	a. A test plan exists that provides the test specification for determining whether a device is capable of preventing the propagation of credible electrical faults on connections between RPMS equipment and non-Class 1E equipment.
		b. Type tests, analyses, or a combination of type tests and analyses will be performed on the electrical isolation devices between RPMS equipment and non-Class 1E equipment.	b. A report exists and concludes that the Class 1E isolation devices used between RPMS equipment and non-Class 1E equipment prevent the propagation of credible electrical faults.
		c. Inspections will be performed on connections between RPMS equipment and non-Class 1E equipment.	c. Class 1E electrical isolation devices exist on connections between RPMS equipment and non-Class 1E equipment.

Table 3.2.2-1—Classification Summary
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KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
30JMU10 GH001	Signal Processing Unit	S	N/A	I	Yes	1UJH~~, 4UJH~~	
30JMU10 GH002	Signal Processing Unit	S	N/A	I	Yes	4UJH	
JS	**Reactor Control, Surveillance & Limitation System**	NS-AQ	N/A	II	Yes	UJA, UJH	14.03.05-39
CLE51/52, CLF51/52, CLG51/52, CLH51/52	**Signal Conditioning and Distribution System (SCDS)**						
30CLE51	SCDS Cabinets Division 1	S	N/A	I	Yes	1UJK	
30CLF51	SCDS Cabinets Division 2	S	N/A	I	Yes	2UJK	
30CLG51	SCDS Cabinets Division 3	S	N/A	I	Yes	3UJK	
30CLH51	SCDS Cabinets Division 4	S	N/A	I	Yes	4UJK	
30CLE52	SCDS Cabinets Division 1	NS-AQ	N/A	I	Yes	1UJK	
30CLF52	SCDS Cabinets Division 2	NS-AQ	N/A	I	Yes	2UJK	
30CLG52	SCDS Cabinets Division 3	NS-AQ	N/A	I	Yes	3UJK	

Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment
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Name Tag (Equipment Description)	Tag Number	Local Area KKS ID (Room Location)	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)	Safety Class (Note 4)	EQ Program Designation (Note 5)
Contactor Module	34BUA12BZ002	31UJK 18027	M	M	RT ES SI	S 1E EMC	Y (5) Y (6)
Contactor Module	34BUA12BZ003	31UJK 18027	M	M	RT ES SI	S 1E EMC	Y (5) Y (6)
Contactor Module	34BUA12BZ004	31UJK 18027	M	M	RT ES SI	S 1E EMC	Y (5) Y (6)
14.03.05-39 Hydrogen Monitoring System (HCMS)							
Hydrogen Monitoring Signal Processing Unit	30JMU10GH001	31UJH10011	M	M	SI	S 1E EMC	Y (1) Y (5)
Hydrogen Signal Processing Unit	30JMU10GH002	34UJH0011	M	M	SI	S 1E EMC	Y (1) Y (5)
H2 Sensor UJA	30JMU10CQ001	30UJA40001	H	H	SI	S 1E EMC	Y (1) Y(5)
H2 Sensor UJA	30JMU10CQ002	30UJA34019	H	H	SI	S 1E EMC	Y (1) Y(5)
H2 Sensor UJA	30JMU10CQ003	30UJA34003	H	H	SI	S 1E EMC	Y (1) Y(5)
H2 Sensor UJA	30JMU10CQ004	30UJA29014	H	H	SI	S 1E EMC	Y (1) Y(5)
H2 Sensor UJA	30JMU10CQ005	30UJA23008	H	H	SI	S 1E EMC	Y (1) Y(5)
H2 Sensor UJA	30JMU10CQ006	30UJA29013	H	H	SI	S 1E EMC	Y (1) Y(5)
H2 Sensor UJA	30JMU10CQ007	30UJA29014	H	H	SI	S 1E EMC	Y (1) Y(5)
H2 Sensor UFA	30JMU20CQ001	30UFA10082	M	H	SII	NS-AQ EMC	Y(2) Y(5) Y(6)
H2 Sensor UFA	30JMU20CQ002	30UFA10082	M	H	SII	NS-AQ EMC	Y(2) Y(5) Y(6)
H2 Sensor UFA	30JMU20CQ003	30UFA10082	M	H	SII	NS-AQ EMC	Y(2) Y(5) Y(6)
H2 Sensor UFA	30JMU20CQ004	30UFA13085	M	H	SII	NS-AQ EMC	Y(2) Y(5) Y(6)
H2 Sensor UFA	30JMU20CQ005	30UFA13085	M	H	SII	NS-AQ EMC	Y(2) Y(5) Y(6)
H2 Isolation Valve UJA	30JMU50AA075	30UJA11016	H	H	PAM SI	S 1E EMC	Y(1) Y(5)
H2 Isolation Valve UJH	30JMU50AA076	34UJH10011	M	H	PAM SI	S 1E EMC	Y(2) Y(5) Y(6)
H2 Isolation Valve UJA	30JMU50AA077	30UJA11016	H	H	PAM SI	S 1E EMC	Y(1) Y(5)
H2 Isolation Valve UJH	30JMU50AA078	34UJH10011	M	H	PAM SI	S 1E EMC	Y(2) Y(5) Y(6)
H2 Isolation ValvE UJA	30JMU50AA079	30UJA11016	H	H	PAM SI	S 1E EMC	Y(1) Y(5)
H2 Isolation Valve UJH	30JMU50AA080	34UJH10011	M	H	PAM SI	S 1E EMC	Y(2) Y(5) Y(6)
H2 Isolation Valve UJA	30JMU50AA081	30UJA11016	H	H	PAM SI	S 1E EMC	Y(1) Y(5)
H2 Isolation Valve UJH	30JMU50AA082	34UJH10011	M	H	PAM SI	S 1E EMC	Y(2) Y(5) Y(6)
H2 Isolation Valve UJH	30JMU50AA083	34UJH10011	M	H	PAM SI	S 1E EMC	Y(2) Y(5) Y(6)
H2 Isolation Valve UJA	30JMU50AA084	30UJA11016	H	H	PAM SI	S 1E EMC	Y(1) Y(5)
T Cabinet Heater	30JMU50AH010	34UJH10010	M	H	SII	NS-AQ	Y(2) Y(5)
P Dnstr Moist Senr	30JMU50CP001	31UJH10010	M	H	SII	NS-AQ	Y(2) Y(5)
P At Vacuum Tank	30JMU50CP002	34UJH10010	M	H	SII	NS-AQ	Y(2) Y(5)
N2 Sup Upstr P Redu	30JMU50CP501	34UJH10010	M	H	SII	NS-AQ	Y(2) Y(5)
N2 Sup Dnstr P Redu	30JMU50CP502	34UJH10010	M	H	SII	NS-AQ	Y(2) Y(5)

with spray water from the severe accident heat removal system, and the PAR cover also protects the catalyst from direct spray and aerosol deposition.

The PARs are designed to withstand severe accident ambient conditions. This includes the capability of reducing hydrogen under severe accident conditions as specified in Table 6.2.5-1. As is the case for other severe accident components, the PARs provide reasonable assurance that the equipment can perform its identified function during severe accident conditions as described in Section 19.2. The U.S. EPR severe accident evaluation is presented in Reference 8.

6.2.5.2.2 Hydrogen Monitoring System

Two subsystems of the HMS measure hydrogen concentrations within containment. The low range system measures hydrogen concentrations in the containment atmosphere during design basis events. The high range system measures hydrogen and steam concentrations in the containment atmosphere during and after beyond design basis events. The design and performance parameters for the subsystems are listed in Table 6.2.5-2—HMS Design and Performance Parameters.

The low range system consists of hydrogen sensors arranged in the following containment areas:

- Upper dome.
- Upper pressurizer compartment.
- Upper steam generator compartments 1/2 and 3/4.
- Annular rooms.

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~~The low range HMS signal processing unit is located in Safeguard Building 1 and is powered from the Class 1E electrical power supply~~The low range HMS signal processing units are located in Safeguards Buildings 1 and 4. They are both powered from the Class 1E electrical power supply. Hydrogen concentrations are measured continuously during plant operation and are available for display in the main control room. A hydrogen concentration measurement that exceeds one percent by volume actuates an alarm in the main control room to indicate a release of hydrogen to the containment atmosphere. A hydrogen concentration measurement that exceeds four percent by volume actuates an alarm indicating that the flammability limit in air has been exceeded. The loss of a measuring channel or failure of the signal processing unit is also indicated.

The high range HMS system consists of two redundant trains of gas samplers and the associated piping running to the process and analysis modules. Information provided by the system regarding hydrogen and steam concentrations is used for accident management measures, for assessing the efficiency of the CGCS, and for estimating the