ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Wednesday, June 22, 2011 1:56 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 452, FSAR Ch. 7, Supplement 5
Attachments: RAI 452 Supplement 5 Response US EPR DC.pdf

Getachew,

AREVA NP provided a schedule for a technically complete and correct response to the 2 questions in RAI 452 on December 6, 2010. Supplement 1 response was sent on February 24, 2011 to provide a revised schedule for all questions. Supplement 2 response was sent on March 29, 2011 to provide a technically correct and complete response to one of the remaining 2 questions. Supplement 3 response was sent on April 25, 2011, and Supplement 4 response was sent on May 25, 2011, to provide a revised schedule for the remaining question.

The attached file, "RAI 452 Supplement 5 Response US EPR DC.pdf" provides a technically correct and complete response to the remaining question.

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 452 Question 07-03-36.

The following table indicates the respective pages in the response document, "RAI 452 Supplement 5 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 452 07.03-36	2	3

This concludes the formal AREVA NP response to RAI 452, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, May 25, 2011 10:42 AM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 452, FSAR Ch. 7, Supplement 4

Getachew,

AREVA NP provided a schedule for technically complete and correct responses to the questions in RAI 452 on December 6, 2010. Supplement 1 response was sent on February 24, 2011 to provide a revised schedule for all questions. Supplement 2 response was sent on March 29, 2011 to provide a technically correct and complete response to one of the remaining 2 questions. Supplement 3 response was sent on April 25, 2011 to provide a revised schedule for the remaining question.

The schedule for a technically correct and complete response to the remaining question has been changed and is provided below.

Question #	Response Date
RAI 452 07.03-36	June 22, 2011

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: WELLS Russell (RS/NB)
Sent: Monday, April 25, 2011 4:41 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 452, FSAR Ch. 7, Supplement 3

Getachew,

AREVA NP provided a schedule for technically complete and correct responses to the questions in RAI 452 on December 6, 2010. Supplement 1 response was sent on February 24, 2011 to provide a revised schedule for all questions. Supplement 2 response was sent on March 29, 2011 to provide technically correct and complete response to one of the remaining 2 questions.

To allow additional time to interact with NRC staff the schedule for a technically correct and complete response to the remaining question has been changed.

The schedule for a technically correct and complete response to the remaining question is provided below.

Question #	Response Date
RAI 452 07.03-36	May 27, 2011

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.
3315 Old Forest Road, P.O. Box 10935
Mail Stop OF-57
Lynchburg, VA 24506-0935
Phone: 434-832-3884 (work)
434-942-6375 (cell)
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Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)
Sent: Tuesday, March 29, 2011 4:06 PM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 452, FSAR Ch. 7, Supplement 2

Getachew,

AREVA NP provided a schedule for technically complete and correct responses to the questions in RAI 452 on December 6, 2010. Supplement 1 response was sent on February 24, 2011 to provide a revised schedule for all questions. Based on discussions with NRC, the attached file, "RAI 452 Supplement 2 Response US EPR DC.pdf" provides technically correct and complete response to one of the remaining 2 questions, as committed.

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

The following table indicates the respective pages in the response document, "RAI 452 Supplement 2 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 452 07.03-35	2	4

The schedule for a technically correct and complete response to the one remaining question is unchanged and is provided below.

Question #	Response Date
RAI 452 07.03-36	April 28, 2011

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.
3315 Old Forest Road, P.O. Box 10935
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Lynchburg, VA 24506-0935
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Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)
Sent: Thursday, February 24, 2011 4:33 PM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); BRYAN Martin (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 452, FSAR Ch. 7, Supplement 1

Getachew,

AREVA NP provided a schedule for technically complete and correct responses to the questions in RAI 452 on December 6, 2010.

Based upon the information presented to the NRC during the February 15, 2011, Public Meeting, the schedule for the remaining questions has been changed.

The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 452 07.03-35	April 28, 2011
RAI 452 07.03-36	April 28, 2011

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.
3315 Old Forest Road, P.O. Box 10935
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Russell.Wells@Areva.com

From: BRYAN Martin (External RS/NB)
Sent: Monday, December 06, 2010 4:50 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); PANNELL George (CORP/QP)
Subject: Response to U.S. EPR Design Certification Application RAI No. 452, FSAR Ch. 7

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 452 Response US EPR DC," provides a schedule since a technically correct and complete response to the question is not provided.

The following table indicates the respective pages in the response document, "RAI 452 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 452 07.03-35	2	2
RAI 452 07.03-36	3	3

A complete answer is not provided for 2 of the 2 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 452 07.03-35	March 30, 2011
RAI 452 07.03-36	March 30, 2011

Sincerely,

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

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Friday, November 05, 2010 8:33 AM
To: ZZ-DL-A-USEPR-DL
Cc: Morton, Wendell; Spaulding, Deirdre; Jackson, Terry; Canova, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 452(5161), FSAR Ch. 7

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on October 20, 2010, and discussed with your staff on November 4, 2010. No change is made to the draft RAI as a result of that discussion. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

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

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 3137

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D47AECEB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 452, FSAR Ch. 7, Supplement 5
Sent Date: 6/22/2011 1:55:49 PM
Received Date: 6/22/2011 1:56:29 PM
From: WILLIFORD Dennis (AREVA)

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Files	**Size**	**Date & Time**
MESSAGE	9846	6/22/2011 1:56:29 PM
RAI 452 Supplement 5 Response US EPR DC.pdf		869936

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

Response to

Request for Additional Information No. 452(5161), Revision 0, Supplement 5

11/05/2010

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 07.03 - Engineered Safety Features Systems
Application Section: 7.3

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

Question 07.03-36:

Follow-up to RAI No. 60, Question 07.03-01

Provide an ITAAC to the U.S. EPR design that specifically tests the functionality of the self-test features.

10 CFR 50.55a(h) incorporates by reference IEEE Std. 603-1991. Clause 5.7 of IEEE Std. 603-1991 requires, in part, that capability for testing and calibration of safety system equipment shall be provided during power operation and shall duplicate, as closely as practicable, performance of the safety function. In RAI No. 60, Question 07.03-01, the staff requested the applicant explain how the design functionality of the self-testing features is verified in the U.S. EPR design. The applicant intends to take credit for the self-testing features to meet the requirements of IEEE Std. 603-1991, Clause 5.7. Per guidance from SRP Section 7.3, 10 CFR 52.47(b)(1) requires, in part, that ITAAC be performed to provided a reasonable assurance of design functionality.

The applicant responded to RAI No. 60, Question 07.03-01, by pointing to the response for RAI 78, Supplement 2, which revised U.S. EPR FSAR Tier 1, Section 2.4.1, ITAAC Item 5.7. The response is insufficient as ITAAC Item 4.5 does not address the self-test features directly, nor does it provide an alternative method of design verification. The staff requests the applicant provide an ITAAC that directly tests all the design attributes of the self-test features so that the staff would have reasonable assurance that the self-test features can meet the requirements of IEEE Std. 603-1991, Clause 5.7.

Response to Question 07.03-36:

AREVA NP used NUREG 0800, Standard Review Plan, Section 14.3, as guidance for determining the level of detail and type of ITAAC that are necessary for design certification in the development of U.S. EPR FSAR Tier 1 ITAAC. In Section III “REVIEW PROCEDURES” of NUREG 0800, SRP 14.3, the following is stated:

> Preparation for the review of ITAAC should include the following:
>
> If applicable, review the DCD for a certified design similar to the design for which certification is sought, specifically the Tier 1 information, for the purpose of using a similar approach, format, and language and for familiarity with the treatment of SSCs, the appropriate level of design detail, and other certification issues.

This suggests that past precedence established by certified designs needs to be used to determine the level of detail and type of ITAAC to be considered. A diligent review was performed of available design control documents of other certified designs that use digital instrumentation and control in the implementation of the safety instrumentation and control (I&C) systems. A specific search for ITAAC that addresses testing of self-test features for a digital I&C safety system was performed. The type of ITAAC suggested in the question could not be identified in similar certified designs. ITAAC for testing the self-test features of the safety I&C systems is therefore not necessary for design certification.

“U.S. EPR Protection System Surveillance Testing and TELEPERM XS Self-Monitoring Technical Report” (ANP-10315), Section 2.2.6.1 describes the self-tests and the periodic surveillance that can be performed on the protection system (PS) and safety automation system (SAS). The tests can be performed as part of the initial plant tests. ANP-10315 will be submitted by separate letter after completion of the response to RAI 485, Question 07.09-69.

AREVA NP proposes addressing testing the self-test features of the PS and SAS in the initial plant tests that are included in U.S EPR FSAR Tier 2, Section 14.2. U.S. EPR FSAR Tier 2, Section 14.2.12.11.22 will be modified to include a test method and acceptance criteria that address testing of the self-test features of the PS. U.S. EPR FSAR Tier 2, Section 14.2.12.11.15 will be modified to include a test method and acceptance criteria that address testing of the self-test features of SAS.

Proposed changes to the I&C architecture were communicated to the NRC staff in the February 15, 2011 public meeting. The affected sections of U.S. EPR FSAR Tier 1, Sections 2.4, 2.5, and 3.7 will be revised to incorporate the revised I&C architecture. This section is provided in its entirety with this response to facilitate NRC review. Other conforming changes to U.S. EPR FSAR Tier 2, are included with the response to RAI 442, Supplement 13.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.4, 2.5, and 3.7 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

2.4 Instrumentation and Control Systems

2.4.1 Protection System

1.0 Description

The protection system (PS) is provided to sense conditions requiring protective action and automatically initiate the safety systems required to mitigate the event.

The PS provides the following safety related functions:

- Performs automatic initiation of reactor trip (RT) functions.
- Performs automatic initiation of engineered safety feature (ESF) functions.
- Provides for ~~manual~~ initiation of RT manual functions.
- Provides for ~~manual~~ actuation of ESF manual functions.
- Generates permissive signals that authorize the activation or deactivation of certain protective actions according to current plant conditions.
- Generates permissive signals that maintain safety related interlocks.

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2.0 Arrangement

2.1 PS equipment is located as listed in Table 2.4.1-1—Protection System Equipment.

2.2 Physical separation exists between the four divisions of the PS.

2.3 Physical separation exists between Class 1E PS equipment and non-Class 1E equipment.

3.0 Mechanical Design Features

3.1 Equipment identified as Seismic Category I in Table 2.4.1-1 can withstand seismic design basis loads without loss of safety function.

4.0 I&C Design Features, Displays and Controls

4.1 The PS generates automatic RT signals.

4.2 The PS generates automatic ESF signals.

4.3 The permissives provide operating bypass capability for the corresponding PS functions.

4.4 Communication independence is provided between the four PS divisions.

4.5 The PS is capable of performing its safety function when PS equipment is in maintenance bypass (inoperable). Bypassed PS equipment is indicated in the MCR.

4.6 Setpoints associated with the automatic RT signals and the automatic ESF signals are determined using a methodology that addresses the determination of applicable contributors to instrumentation loop errors, the method in which the errors are combined, and how the errors are applied to the design analytical limits.

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4.7 Input variables from the signal conditioning and distribution system (SCDS) provide the inputs for generating RT signals and ESF signals.

4.8 Electrical isolation is provided on connections between PS equipment and non-Class 1E equipment.

4.9 ~~Deleted.~~The PS uses TXS system communication messages that are sent with a specific protocol.

4.10 Class 1E PS equipment can perform its safety function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

4.11 Controls listed in Table 2.4.1-4 exist on the SICS in the MCR to allow manual actuation at the system level.

4.12 Controls listed in Table 2.4.1-5 exist on the SICS in the MCR ~~and RSS~~ to allow validation or inhibition of manual permissives. A separate set of controls listed in Table 2.4.1-5 exist on the SICS in the RSS to allow manual validation or inhibition of permissives.

4.13 The PS performs interlock functions listed in Table 2.4.1-6.

4.14 The PS system design and application software are developed using a process composed of six lifecycle phases with each phase having outputs which must conform to the requirements of that phase. The six lifecycle phases are the following:

1. Basic Design Phase.
2. Detailed Design Phase.
3. Manufacturing Phase.
4. System Integration and Testing Phase.
5. Installation and Commissioning Phase.
6. Final Documentation Phase.

4.15 Controls exist on the SICS in the RSS that allow manual actuation of RT.

4.16 Electrical isolation is provided on connections between the four PS divisions.

4.17 Communications independence is provided between PS equipment and non-Class 1E equipment.

4.18 The PS is designed so that safety-related functions required for an anticipated operational occurrence (AOO) or postulated accident (PA)design basis events (DBE) are performed in the presence of the following:

- Single detectable failures within the PS 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 PADBE requiring the safety function.

4.19 The equipment for each PS 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.

4.20 Locking mechanisms are provided on the PS cabinet doors. Opened PS cabinet doors are indicated in the MCR.

4.21 Key lock CPU state switches are provided at the PS cabinets to restrict modifications to the PS software.

4.22 The operational availability of each input variable can be confirmed during reactor operation including post-accident periods.

4.23 Deleted.The PS hardware and system software are designed to conform to the key TELEPERM XS principles, features, and quality methods.

4.24 The PS response time for RT and ESF signals is less than the value required to satisfy the design basis safety analysis response time assumptions.

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

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

5.0 Electrical Power Design Features

5.1 Class 1E PS components are powered from a Class 1E division in a normal or alternate feed condition.

6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.1-7 lists the PS ITAAC.

Table 2.4.1-1—Protection System Equipment

Description	Tag Number (1)	Location	Seismic Category	IEEE Class 1E(2)
PS Cabinets, Division 1	30CLE	Safeguard Building 1	I	1^N 2^A
PS Cabinets, Division 2	30CLF	Safeguard Building 2	I	2^N 1^A
PS Cabinets, Division 3	30CLG	Safeguard Building 3	I	3^N 4^A
PS Cabinets, Division 4	30CLH	Safeguard Building 4	I	4^N 3^A

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.

Table 2.4.1-2—Protection System Automatic Reactor Trip Signals and Input Variables (2 Sheets)

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Reactor Trip Signal	Input Variable
High Linear Power Density (HLPD)	Neutron Flux - Self Powered Neutron Detectors
Low Departure from Nucleate Boiling Ratio (DNBR)	Neutron Flux - Self Powered Neutron Detectors
	Cold Leg Temperature (NR)
	Reactor Coolant Pump (RCP) Speed
	RCS Loop Flow
	~~Temperature Compensated~~ Rod Control Cluster Assembly Position
	Pressurizer Pressure (NR)
High Neutron Flux Rate of Change	Neutron Flux - Power Range Detectors
High Core Power Level	Cold Leg Temperature (WR)
	Hot Leg Pressure (WR)
	Hot Leg Temperature (NR)
	RCS Loop Flow
Low RCP Speed	RCP Speed
Low ~~Loop~~ RCS Flow Rate (two loops)	RCS Loop Flow
Low–Low ~~Loop~~ RCS Flow Rate (one loop)	RCS Loop Flow
Low Doubling Time	Neutron Flux - Intermediate Range Detectors
High Neutron Flux	Neutron Flux - Intermediate Range Detectors
Low Pressurizer Pressure	Pressurizer Pressure (NR)
High Pressurizer Pressure	Pressurizer Pressure (NR)
High Pressurizer Level	Pressurizer Level (NR)
Low Hot Leg Pressure	Hot Leg Pressure (WR)
Steam Generator (SG) Pressure Drop	SG Pressure
Low Steam Generator Pressure	SG Pressure
High Steam Generator Pressure	SG Pressure
Low Steam Generator Level	SG Level (NR)
High Steam Generator Level	SG Level (NR)
High Containment Pressure	Containment Service Compartment Pressure (NR)
	Containment Equipment Compartment Pressure
Low Saturation Margin	Cold Leg Temperature (WR)
	Hot Leg Pressure (WR)
	Hot Leg Temperature (NR)
	RCS Loop Flow

Table 2.4.1-2—Protection System Automatic Reactor Trip Signals and Input Variables (2 Sheets)

Reactor Trip Signal	Input Variable
On Safety Injection System (SIS) Actuation	SIS Actuation Signal
On Emergency Feedwater System (EFWS) Actuation – Low Steam Generator Level	EFWS Actuation Signal

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Table 2.4.1-3—Protection System Automatic Engineered Safety Feature Signals and Input Variables (2 Sheets)

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Engineered Safety Feature Signal	Input Variable
Safety Injection System Actuation	Pressurizer Pressure (NR)
	Hot Leg Pressure (WR)
	Hot Leg Temperature (WR)
	~~RCS~~ Hot Leg Loop Level
Emergency Feedwater System Actuation	SG Level (WR)
	SG Pressure
	LOOP Signal
	SIS Actuation Title Case ~~s~~Signal
Emergency Feedwater System Isolation	SG Level (WR)
	SG Pressure
	SG Isolation Signal
Partial Cooldown Actuation	SIS Actuation Title Case ~~s~~Signal
Main Steam Relief ~~Train~~ Isolation Valve (~~MSRT~~MSRIV) Opening	SG Pressure
Main Steam Relief Train (MSRT) Isolation	SG Pressure
Main Steam Isolation	SG Pressure
	SG Isolation Signal
	Containment Equipment Compartment Pressure
	Containment Service Compartment Pressure (NR)
Main Feedwater Isolation	SG Level (NR)
	SG Pressure
	RT ~~Breaker Position~~Initiated Signal
	SG Isolation Signal
	Containment Equipment Compartment Pressure
	Containment Service Compartment Pressure (NR)
Containment Isolation Stage 1	Containment Service Compartment Pressure (NR)
	Containment Service Compartment Pressure (WR)
	Containment Equipment Compartment Pressure
	Containment High Range Activity
	SIS Actuation Signal
Containment Isolation Stage 2	Containment Service Compartment Pressure (WR)
CVCS Charging Isolation	Pressurizer Level (NR)

Table 2.4.1-3—Protection System Automatic Engineered Safety Feature Signals and Input Variables (2 Sheets)

Engineered Safety Feature Signal	Input Variable
CVCS Isolation for Anti-Dilution	Boron Concentration
	~~Boron Temperature~~
	CVCS Charging Flow
	Cold Leg Temperature (WR)
Emergency Diesel Generator Actuation	LOOP 6.9kV Bus Voltage Signal
	SIS Actuation Signal
PSRV Opening	Hot Leg Pressure (NR)
SG Isolation	Main Steam Line Activity
	SG Level (NR)
	Partial C~~c~~ooldown A~~a~~ctuated S~~s~~ignal
Reactor Coolant Pump Trip	RCP Differential Pressure
	SIS Actuation Signal
	Containment Isolation Stage 2 Signal
Main Control Room Air Conditioning System (CRACS) Isolation and Filtering	MCR Air Intake Duct Activity
	Containment Isolation Stage 1 Signal
Turbine Trip	~~RT Breaker Position~~RT Initiated Signal
Loss of Offsite Power (LOOP)	~~Bus loss of voltage~~ 6.9kV Bus Voltage
	~~Bus degraded voltage~~ SIS Actuation Signal
Hydrogen Mixing Dampers Opening	Containment Service Compartment Pressure (NR)
	Containment Equipment Compartment/Containment Service Compartment Differential Pressure

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Table 2.4.1-4—Protection System Manually Actuated Functions

Reactor Trip
SIS Actuation
Partial Cooldown Actuation
~~MSRT Actuation~~MSRIV Opening
MSRT Isolation
Main Steam Isolation
Main Feedwater (MFW) Isolation
Containment Isolation
SG Isolation
CRACS Isolation and Filtering
EDG Actuation
EFWS Isolation
EFWS Actuation
CVCS Charging Isolation
CVCS Isolation on Anti-Dilution ~~Isolation~~Mitigation
PSRV Opening
RCP Trip
Hydrogen Mixing Dampers Opening
Turbine Trip

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Table 2.4.1-5—Protection System Permissives and Operating Bypasses (2 Sheets)

Permissive	Inhibit	Validate	MCR Control	RSS Control	Function Bypassed by Inhibited Permissive	Function Bypassed by Validated Permissive
P2	Automatic	Automatic			Low DNBR RT	
					HLPD RT	
					Low RCS Loop Rate Flow RT	
					Low RCP Speed RT	
					Low Pressurizer Pressure RT	
P3	Automatic	Automatic			Low-Low RCS Flow Rate Loop RT	
P5	Automatic	Automatic			High Core Power Level RT	
					Low Saturation Margin RT	
P6	Automatic	Manual	X	X		High Neutron Flux RT
						Low Doubling Time RT
P7	Automatic	Automatic			CVCS Isolation on ADM at Standard Shutdown Conditions	CVCS Isolation on ADM at Shutdown Conditions
					CVCS Isolation on ADM at Standard Shutdown Conditions with Manual Calculation	
P8	Automatic	Automatic			CVCS Isolation on ADM at Power	CVCS Isolation on ADM at Standard Shutdown Conditions
						CVCS Isolation on ADM at Standard Shutdown Conditions with Manual Calculation

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Table 2.4.1-5—Protection System Permissives and Operating Bypasses (2 Sheets)

Permissive	Inhibit	Validate	MCR Control	RSS Control	Function Bypassed by Inhibited Permissive	Function Bypassed by Validated Permissive
P12	Automatic	Manual	X	X		High Pressurizer Level RT
						Low Hot Leg Pressure RT
						Low SG Pressure RT
						MSRT Isolation (manual)
						MSRT Isolation (low SG pressure)
						Main Steam Isolation (low SG pressure)
						~~MFW~~ Startup and Shutdown System (SSS) Isolation (low SG pressure)
						SIS Actuation (low pressurizer pressure)
						SIS Actuation (low delta P_{sat})

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Table 2.4.1-5—Protection System Permissives and Operating Bypasses (2 Sheets)

Permissive	Inhibit	Validate	MCR Control	RSS Control	Function Bypassed by Inhibited Permissive	Function Bypassed by Validated Permissive
P13	Automatic	Manual	X	X		Low SG Level RT
						High SG Level RT
						EFWS Actuation (low SG level)
						EFWS Actuation (SIS + LOOP)
						EFWS Actuation (manual)
						~~EFWS Isolation (high SG level)~~
						EFWS Isolation (manual)
						MFW Full Load Isolation (high SG level)
						~~MFW~~ SSS Isolation (high SG level for period of time ~~+ RT~~)
						SG Isolation
P14	Manual	Manual	X	X		Partial Cooldown Actuation
P15	Automatic	Manual	X	X		SIS Actuation (low delta Psat)
						SIS Actuation (low RCS loop level)
P16	Manual	Manual	X	X		Align SIS from cold leg injection to hot leg injection
P17	Automatic	Manual	X	X	PSRV Opening (high Hot Leg pressure)	CVCS Charging Isolation (high Pressurizer level)
P18	Automatic	Automatic				Repositioning of the SG transfer valves

Table 2.4.1-6—Protection System Interlocks

RHR Suction Valves
MHSI Large Miniflow Line Valves
Safety Injection Accumulator Valves

Table 2.4.1-7—Protection System ITAAC (13 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	PS equipment is located as listed in Table 2.4.1-1.	Inspections will be performed of the location of the PS equipment.	The PS equipment listed in Table 2.4.1-1 is located as listed in Table 2.4.1-1.
2.2	Physical separation exists between the four divisions of the PS.	Inspections will be performed to verify that the divisions of the PS are located in separate safeguard buildings	The four divisions of the PS are located in separate safeguard buildings as listed in Table 2.4.1-1.
2.3	Physical separation exists between Class 1E PS equipment and non-Class 1E equipment.	a. Design analyses will be performed to determine the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E PS equipment and non-Class 1E equipment. b. Inspections will be performed to verify that the required safety-related structures, separation distance, barriers, or any combination thereof exist between Class 1E PS equipment and non-Class 1E equipment.	a. A report exists and defines the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E PS equipment and non-Class 1E equipment. b. The required safety-related structures, separation distance, barriers, or any combination thereof exist between Class 1E PS equipment and non-Class 1E equipment. Reconciliation is performed of any deviations to the design.
3.1	Equipment identified as Seismic Category I in Table 2.4.1-1 can withstand seismic design basis loads without loss of safety function.	a. Type tests, analyses or a combination of type tests and analyses will be performed on the equipment listed as Seismic Category I in Table 2.4.1-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Tests/analysis reports exist and conclude that the equipment listed as Seismic Category I in Table 2.4.1-1 can withstand seismic design basis loads without loss of safety function.

Table 2.4.1-7—Protection System ITAAC (13 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
		b. Inspections will be performed of the Seismic Category I equipment listed in Table 2.4.1-1 to verify that the equipment including anchorage is installed as specified on the construction drawings.	b. Inspection reports exist and conclude that the Seismic Category I equipment listed in Table 2.4.1-1 including anchorage is installed as specified on the construction drawings.
4.1	The PS generates automatic RT signals.	a. Tests will be performed on the PS using test signals to verify that the RT breakers open when a trip limit in the PS is reached b. Tests will be performed on the PS using test signals to verify that a RT signal is generated for the input variables listed in Table 2.4.1-2 when a test signal reaches the trip limit.	a. The RT breakers open after a test signal reaches the trip limit in the PS for one RT function. b. The PS generates a RT signal after the test signal reaches the trip limit for the input variables listed in Table 2.4.1-2.
4.2	The PS generates automatic ESF signals.	Tests will be performed on the PS using test signals to verify that a ESF signal is generated for the input variables listed in Table 2.4.1-3 when a test signal reaches the trip limit.	The PS generates a ESF signal after the test signal reaches the trip limit for the input variables listed in Table 2.4.1-3. The ESF signals remain following removal of the test signal. The ESF signals are removed when test signals that represent the completion of the ESF function are present. Deliberate operator action is required to return the PS to normal.

Table 2.4.1-7—Protection System ITAAC (13 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.3	The permissives provide operating bypass capability for the corresponding PS functions.	a. For each function listed as being bypassed by an inhibited permissive in Table 2.4.1-5, tests will be performed to verify that each function is bypassed when test signals representing the corresponding inhibited permissive signal are present. ~~For each function listed as being bypassed by an inhibited permissive in Table 2.4.1-5, tests will be performed to verify the automatic removal of the bypass when test signals representing the corresponding inhibited permissive are removed.~~	a. The functions listed as being bypassed by inhibited permissives in Table 2.4.1-5 are bypassed when test signals representing the corresponding inhibited permissive are present ~~and the bypasses are automatically removed when test signals representing the corresponding inhibited permissive are removed~~.
		b. For each function listed as being bypassed by a validated permissive in Table 2.4.1-5, tests will be performed to verify that each function is bypassed when test signals representing the corresponding validated permissive signal are present. ~~For each function listed as being bypassed by a validated permissive in Table 2.4.1-5, tests will be performed to verify the automatic removal of the bypass when test signals representing the corresponding validated permissive are removed.~~	b. The functions listed as being bypassed by validated permissives in Table 2.4.1-5 are bypassed when test signals representing the corresponding validated permissive are present ~~and the bypasses are automatically removed when test signals representing the corresponding validated permissive are removed~~.

Table 2.4.1-7—Protection System ITAAC (13 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.4	Communication independence is provided between the four PS divisions. 452, 07.03-36	Tests, analyses, or a combination of tests and analyses will be performed on the PS equipment.	A report exists and concludes that: • The PS function processors do not interface directly with a network. Separate communication ~~processors~~ modules interface directly with the network. • Separate send and receive data channels are used in both the communications ~~processor~~ module and the PS function processor. • The PS function processors operate in a strictly cyclic manner. • The PS function processors operate asynchronously from the PS communications ~~processors~~ module.
4.5	The PS is capable of performing its safety function when PS equipment is in maintenance bypass ~~(inoperable)~~. Bypassed PS equipment is indicated in the MCR.	a. A test of the PS will be performed to verify the maintenance bypass functionality. b. Tests will be performed to verify the existence of indications in the MCR when PS equipment is in maintenance bypass (inoperable).	a. The PS can perform its safety functions when PS equipment is in maintenance bypass ~~(inoperable)~~. b. Bypassed PS equipment is indicated in the MCR.

Table 2.4.1-7—Protection System ITAAC (13 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.6	Setpoints associated with the automatic RT signals and the automatic ESF signals are determined using a methodology that addresses the determination of applicable contributors to instrumentation loop errors, the method in which the errors are combined, and how the errors are applied to the design analytical limits.	a. An inspection will be performed to verify the existence of an ~~established~~ documented methodology for determining the PS setpoints.	a. A~~n established~~ documented methodology for determining PS setpoints exists.
		b. An analysis will be performed to verify that the PS setpoints for the functions listed in Table 2.4.1-2 and Table 2.4.1-3 are determined using the documented methodology. 452, 07.03-36	b. A report exists and concludes that the PS setpoints associated with the automatic RT signals listed in Table 2.4.1-2 and the automatic ESF signals listed in Table 2.4.1-3 are determined using a documented methodology: (1) For the determination of applicable contributors to instrument loop error. (2) For combining instrument loop errors. (3) For how the errors are applied to the design analytical limits.
4.7	Input variables from the SCDS provide the inputs for generating RT signals and ESF signals.	a. An analysis will be performed on the PS software design to verify that the input variables from the SCDS listed in Table 2.4.1-2 and Table 2.4.1-3 provide the inputs for generating the RT signals in Table 2.4.1-2 and the ESF signals in Table 2.4.1-3.	a. A report exists and concludes that for each RT signal listed in Table 2.4.1-2 and each ESF signal listed in Table 2.4.1-3, the input variables from the SCDS associated with the signals are used in the PS software design for generating each signal.

Table 2.4.1-7—Protection System ITAAC (13 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
	452, 07.03-36	b. Inspections, tests, or combinations of inspections and tests will be performed on the PS equipment to verify that ~~the SCDS outputs~~sensors that provide the input variables from the SCDS listed in Table 2.4.1-2 and Table 2.4.1-3 are connected to the correct input terminals of the PS as specified in the construction drawings.	b. The ~~SCDS outputs~~sensors that provide the input variables from the SCDS listed in Table 2.4.1-2 and Table 2.4.1-3 are connected to the correct input terminals of the PS as specified in the construction drawings.
4.8	Electrical isolation is provided on connections between PS equipment and non-Class 1E equipment.	a. Analyses will be performed to determine the test specification for electrical isolation devices on connections between PS 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 PS 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 PS equipment and non-Class 1E equipment.	b. A report exists and concludes that the Class 1E isolation devices used between PS equipment and non-Class 1E equipment prevent the propagation of credible electrical faults.
		c. Inspections will be performed on connections between PS equipment and non-Class 1E equipment.	c. Class 1E electrical isolation devices exist on connections between PS equipment and non-Class 1E equipment.

Table 2.4.1-7—Protection System ITAAC (13 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.9	Deleted.The PS uses TXS system communication messages that are sent with a specific protocol.	Deleted.Inspections will be performed on PS equipment to verify that PS communication messages are sent with a specific protocol.	Deleted. Inspections identify that 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: o Protocol version o Sender ID o Receiver ID o Message ID o Message type o 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.
4.10	Class 1E PS equipment can perform its safety function when subjected to EMI, RFI, ESD, and power surges.	Type tests or type tests and analyses of these will be performed on the Class 1E equipment listed in Table 2.4.1-1.	A report exists and concludes that the equipment identified as Class 1E in Table 2.4.1-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.
4.11	Controls listed in Table 2.4.1-4 exist on the SICS in the MCR that allow manual actuation at the system level.	Tests will be performed to verify the correct functionality of the controls on the SICS in the MCR.	For each function in Table 2.4.1-4, the PS generates actuation signals after the corresponding controls on the SICS in the MCR are manually activated. Deliberate manual action is required to return the PS to normal.

Table 2.4.1-7—Protection System ITAAC (13 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.12	Controls listed in Table 2.4.1-5 exist on the SICS in the MCR ~~and RSS~~ to allow validation or inhibition of manual permissives. A separate set of controls listed in Table 2.4.1-5 exist on the SICS in the RSS to allow manual validation or inhibition of permissives.	Tests will be performed to verify the correct functionality of the controls on the SICS in the MCR and RSS.	For ~~each of~~ the manual permissives listed in Table 2.4.1-5, the correct permissive status is present in the PS actuation logic units (ALU) after the corresponding controls on the SICS in the MCR and RSS are manually activated.
4.13	The PS performs interlock functions listed in Table 2.4.1-6.	Tests will be performed on the ~~as-built~~ PS using test signals to simulate plant conditions that require the interlock functions listed in Table 2.4.1-6.	The PS generates the correct output signals for each interlock function listed in Table 2.4.1-6 when the test signals are such that the interlock function is required.
4.14	The PS system design and application software are developed using a process composed of six lifecycle phases, with each phase having outputs which must conform to the requirements of that phase. The six lifecycle phases are the following: 1) Basic Design Phase. 2) Detailed Design Phase. 3) Manufacturing Phase. 4) System Integration and Testing Phase. 5) Installation and Commissioning Phase. 6) Final Documentation Phase.	a. Analyses will be performed to verify that the outputs for the PS basic design phase conform to the requirements of that phase. ~~{{DAC}}~~	a. A report exists and concludes that the outputs conform requirements of the basic design phase of the PS. ~~{{DAC}}~~
		b. Analyses will be performed to verify that the outputs for the PS detailed design phase conform to the requirements of that phase. ~~{{DAC}}~~	b. A report exists and concludes that the outputs conform to requirements of the detailed design phase of the PS. ~~{{DAC}}~~
		c. Analyses will be performed to verify that the outputs for the PS manufacturing phase conform to the requirements of that phase.	c. A report exists and concludes that the outputs conform to the requirements of the manufacturing phase of the PS.
		d. Analyses will be performed to verify that the outputs for the PS system integration and testing phase conform to the requirements of that phase.	d. A report exists and concludes that the outputs conform to the requirements of the system integration and testing phase of the PS.

Table 2.4.1-7—Protection System ITAAC (13 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
		e. Analyses will be performed to verify that the outputs for the PS installation and commissioning phase conform to the requirements of that phase. f. Analyses will be performed to verify that the outputs for the PS final documentation phase conform to the requirements of that phase.	e. A report exists and concludes that the outputs conform to the requirements of the installation and commissioning phase of the PS. f. A report exists and concludes that the outputs conform to the requirements of the final documentation phase of the PS.
4.15	Controls exist on the SICS in the RSS that allow manual actuation of RT.	Tests will be performed to verify the correct functionality of the controls on the SICS in the RSS.	The correct actuation signals are present at the RT devices after the corresponding controls on the SICS in the RSS are manually activated.
4.16	Electrical isolation is provided on connections between the four PS divisions.	a. Analyses will be performed to determine the test specification for electrical isolation devices on connections between the four PS divisions. b. Type tests, analyses, or a combination of type tests and analyses will be performed on the electrical isolation devices between the four PS divisions. c. Inspections will be performed on connections between the four PS divisions.	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 the four PS divisions. b. A report exists and concludes that the Class 1E isolation devices used between the four PS divisions prevent the propagation of credible electrical faults. c. Class 1E electrical isolation devices exist on connections between the four PS divisions.

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Table 2.4.1-7—Protection System ITAAC (13 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.17	Communications independence is provided between PS equipment and non-Class 1E equipment.	Tests, analyses, or a combination of tests and analyses will be performed on the PS equipment. 452, 07.03-36	A report exists and concludes that: • Data communications between PS function processors and non-Class 1E equipment is through a Monitoring and Service Interface (MSI). • The MSI ~~processors~~ does not interface directly with a network. Separate communication ~~processors~~ modules interface directly with the network. • Separate send and receive data channels are used in both the communications ~~processor~~ module and the MSI ~~processor~~. • The MSI ~~processors~~ operates in a strictly cyclic manner. • The MSI ~~processors~~ operates asynchronously from the communications ~~processors~~module. • The PS uses a hardware device to confirm that unidirectional signals are sent to non-safety-related I&C systems.

Table 2.4.1-7—Protection System ITAAC (13 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.18	The PS is designed so that safety-related functions required for ~~DBE~~ an AOO or PA are performed in the presence of the following: • Single detectable failures within the PS ~~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 ~~DBE~~ requiring the safety function.	A failure modes and effects analysis will be performed on the PS at the level of replaceable modules and components.	A report exists and concludes that the PS is designed so that safety-related functions required for ~~DBE~~ an AOO or PA are performed in the presence of the following: • Single detectable failures within the PS ~~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~~DBE~~ requiring the safety function.
4.19	The equipment for each PS 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 PS equipment to verify that the equipment for each PS 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 PS 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.
4.20	Locking mechanisms are provided on the PS cabinet doors. Opened PS cabinet doors are indicated in the MCR.	a. Inspections will be performed to verify the existence of locking mechanisms on the PS cabinet doors. b. Tests will be performed to verify the proper operation of the locking mechanisms on the PS cabinet doors. c. Tests will be performed to verify an indication exists in the MCR when a PS cabinet door is in the open position.	a. Locking mechanisms exist on the PS cabinet doors. b. The locking mechanisms on the PS cabinet doors operate properly. c. Opened PS cabinet doors are indicated in the MCR.

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Table 2.4.1-7—Protection System ITAAC (13 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.21	~~Key lock~~CPU state switches are provided at the PS cabinets to restrict modifications to the PS software.	a. Inspections will be performed to verify the existence of ~~key lock~~CPU state switches that restrict modifications to the PS software. b. Tests will be performed to verify that the ~~key lock~~CPU state switches restrict modifications to the PS software	a. ~~Key lock~~CPU state switches are provided at the PS cabinets. b. ~~Key lock~~CPU state switches at the PS cabinets restrict modifications to the PS software.
4.22	The operational availability of each input variable can be confirmed during reactor operation including post-accident periods.	Analysis will be performed to demonstrate that the operational availability of each input variable listed in Table 2.4.1-2 and Table 2.4.1-3 can be confirmed during reactor operation including post-accident periods by one of the following methods: • By perturbing the monitored variable. • 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.	A report exists and concludes that the operational availability of each input variable listed in Table 2.4.1-2 and Table 2.4.1-3 can be confirmed during reactor operation including post-accident periods by one of the following methods: • By perturbing the monitored variable. • 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.

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Table 2.4.1-7—Protection System ITAAC (13 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.23	Deleted.~~The PS hardware and system software are designed to conform to the key TELEPERM XS principles, features, and quality methods.~~	Deleted.~~A TELEPERM XS platform changes analysis will be performed on the PS hardware and system software to verify its conformance to the key TELEPERM XS principles, features, and quality methods.~~ ~~**{{DAC}}**~~	Deleted.~~A report exists and concludes that the PS hardware modules and system software modules:~~ ~~a. Conform to the key TELEPERM XS design principles.~~ ~~**{{DAC}}**~~ ~~b. Conform to the key TELEPERM XS processing features.~~ ~~**{{DAC}}**~~ ~~c. Conform to the key TELEPERM XS communication independence features.~~ ~~**{{DAC}}**~~
			~~d. Do not introduce more than a minimal increase in the likelihood of occurrence of a software malfunction relative to predecessor modules.~~ ~~**{{DAC}}**~~ ~~e. Do not introduce more than a minimal increase in the consequences of a malfunction relative to predecessor modules.~~ ~~**{{DAC}}**~~ ~~f. Do not create the possibility for a malfunction with a different result relative to predecessor modules.~~ ~~**{{DAC}}**~~ ~~g. Were developed according to procedures that do not result in a reduction in the TELEPERM XS quality methods.~~ ~~**{{DAC}}**~~

Table 2.4.1-7—Protection System ITAAC (13 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.24	The PS response time for RT and ESF signals is less than the value required to satisfy the design basis safety analysis response time assumptions. 452, 07.03-36	a. Analyses will be performed to determine the required response time from sensor to ALU output, including sensor delay, which supports the safety analysis response time assumptions for the RT signals listed in Table 2.4.1-2 and ESF signals listed in Table 2.4.1-3.	a. A report exists and identifies the required response time from sensor to ALU output which supports the safety analysis response time assumptions for the RT signals listed in Table 2.4.1-2 and ESF signals listed in Table 2.4.1-3.
		b. Tests, analyses, or a combination of tests and analyses will be performed on the PS equipment that contributes to RT and ESF signal response times.	b. A report exists and concludes that PS response times ~~from sensor to ALU output~~ support the safety analysis response time assumptions for the RT signals listed in Table 2.4.1-2 and ESF signals listed in Table 2.4.1-3.
4.25	Hardwired disconnects exist between the SU and each divisional MSI of the PS. The hardwired disconnects prevent the connection of the Service Unit to more than a single division of the PS.	a. Inspections will be performed on the PS to verify the existence of a hardwired disconnects between the SU and each divisional MSI of PS	a. Hardwired disconnects exist between the SU and each divisional MSI of the PS.
		b. Tests will be performed on the PS to verify that the hardwired disconnects prevent the connection of the SU to more than a single division of the PS.	b. The hardwired disconnects prevent the connection of the SU to more than a single division of the PS.
4.26	PS self-test features are capable of detecting faults consistent with the requirements of the PS.	a. Analyses will be performed to determine the faults that require detection through self-test features.	a. A report exists and identifies the faults that require detection through self-test features.
		b. Type tests, analyses or a combination of type tests and analyses will be performed to verify that faults requiring detection through self-test features are detected by the PS equipment.	b. A report exists and concludes that the PS equipment is capable of detecting faults required to be detected by self-test features.

Table 2.4.1-7—Protection System ITAAC (13 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
5.1	Class1E PS components are powered from a Class 1E division 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. 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.	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. 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.

Next File

2.4.2 Safety Information and Control System

1.0 Description

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The SICS is provided as a safety-related HMI and is specifically designed to provide the operator with the necessary inventory of controls and indications for the following:

- Mitigation of anticipated operational occurrences (MCR).
- Mitigation of postulated accidents (MCR).
- Reach and maintain safe shutdown (MCR and RSS).
- Mitigation of anticipated operational occurrences concurrent with a CCF of the PS (MCR).
- Mitigation of postulated accidents concurrent with a CCF of the PS (MCR).
- Mitigation of severe accidents (MCR).

~~The safety information and control system (SICS) provides the human-machine interface (HMI) means to perform control and information functions needed to monitor the plant safety status and bring the unit to and maintain it in a safe shutdown state in case of the inoperability of the process information and control system (PICS).~~

~~In case of the unavailability of the PICS, the~~ The ~~SICS provides the following safety-related functions:~~

- ~~Manual actuation of reactor trip in the main control room (MCR) and remote shutdown station (RSS).~~
- ~~Manual component-level actuation of safety-related actuators (MCR only).~~
- ~~Manual system-level actuation of engineered safety features (MCR only).~~
- ~~Monitoring and control of systems required to achieve and maintain safe shutdown (MCR).~~
- ~~Display of Type A through Type C post-accident monitoring variables (MCR only).~~

2.0 Arrangement

2.1 SICS equipment is located as listed in Table 2.4.2-1—Safety Information and Control System Equipment.

2.2 Deleted.~~Physical separation exists between the four Class 1E panel interface divisions of the SICS~~.

2.3 Deleted.~~Physical separation exists between the four Class 1E QDS divisions of the SICS.~~

2.4 Physical separation exists between Class 1E SICS equipment and non-Class 1E equipment.

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2.5 Physical separation exists between the Class 1E electrical divisions that power the controls and indications of the SICS.

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 between the Class 1E electrical divisions that power the controls and indications of the SICS.~~Deleted.~~

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 can perform its safety function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

4.5 Deleted.~~The SICS system design and application software are developed using a process composed of six life cycle phases with each phase having outputs which must conform to the requirements of that phase. The six life cycle phases are the following:~~

~~1.Basic Design Phase.~~

~~1.Detailed Design Phase.~~

~~2.Manufacturing Phase.~~

~~3.System Integration and Testing phase.~~

~~4.Installation and Commissioning Phase.~~

~~5.Final Documentation Phase.~~

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

4.7 Deleted.~~Electrical isolation is provided on connections between the four SICS divisions.~~

4.8 Deleted.~~Communications independence is provided between the four SICS divisions.~~

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4.9 Deleted.~~Communications independence is provided between SICS equipment and non-Class 1E equipment~~.

4.10 The SICS is designed so that safety-related functions required for an anticipated operational occurrence (AOO) or postulated accident (PA) ~~design basis events (DBE)~~ are performed in the presence of the following:

- Single detectable failures within the SICS ~~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 ~~DBE~~ requiring the safety function.

4.11 Deleted.~~The equipment for each SICS 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 Deleted.~~Locking mechanisms are provided on the SICS cabinet doors located outside of the MCR. Opened SICS cabinet doors are indicated in the MCR~~.

4.13 Deleted.~~Key lock switches on the QDS restrict connections between the QDS and the QDS service unit.~~

4.14 Deleted.~~The SICS is capable of performing its safety function when one of the SICS divisions is out of service. Out of service divisions of SICS are indicated in the MCR.~~

4.15 Deleted.~~The SICS PI hardware and system software are designed to conform to the key TELEPERM XS principles, features, and quality methods.~~

4.16 Deleted.~~The SICS QDS hardware and system software are evaluated and accepted for use in safety-related applications through a commercial grade dedication process.~~

5.0 Electrical Power Design Features

5.1 Class 1E SICS components are powered from a Class 1E division in a normal or alternate feed condition.

6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.2-2 lists the SICS ITAAC.

Table 2.4.2-1—Safety Information and Control System Equipment (2 Sheets)

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Description	Tag Number (1)	Location	Seismic Category	IEEE Class 1E (2)
~~SICS PI Cabinets, Division 1~~	~~30CWY1~~	~~Safeguard Building 1~~	~~I~~	~~1^N 2^A~~
~~SICS PI Cabinets, Division 2~~	~~30CWY2~~	~~Safeguard Building 2~~	~~I~~	~~2^N 1^A~~
~~SICS PI Cabinets, Division 3~~	~~30CWY3~~	~~Safeguard Building 3~~	~~I~~	~~3^N 4^A~~
~~SICS PI Cabinets, Division 4~~	~~30CWY4~~	~~Safeguard Building 4~~	~~I~~	~~4^N 3^A~~
~~SICS QDS Units MCR for safety-related I&C functions, Division 1~~	~~N/A~~	~~MCR~~	~~I~~	~~1^N 2^A~~
~~SICS QDS Units MCR for safety-related I&C functions, Division 2~~	~~N/A~~	~~MCR~~	~~I~~	~~2^N 1^A~~
~~SICS QDS Units MCR for safety-related I&C functions, Division 3~~	~~N/A~~	~~MCR~~	~~I~~	~~3^N 4^A~~
~~SICS QDS Units MCR for safety-related I&C functions, Division 4~~	~~N/A~~	~~MCR~~	~~I~~	~~4^N 3^A~~
~~SICS QDS Units MCR for non-safety related I&C functions~~	~~N/A~~	~~MCR~~	~~N/A~~	~~N/A~~
~~SICS QDS Units RSS, Division 1~~	~~N/A~~	~~RSS~~	~~I~~	~~1^N 2^A~~
~~SICS QDS Units RSS, Division 2~~	~~N/A~~	~~RSS~~	~~I~~	~~2^N 1^A~~
~~SICS QDS Units RSS, Division 3~~	~~N/A~~	~~RSS~~	~~I~~	~~3^N 4^A~~
~~SICS QDS Units RSS, Division 4~~	~~N/A~~	~~RSS~~	~~I~~	~~4^N 3^A~~
Hardwired ~~(Conventional)~~ I&C~~, Division 1~~	N/A	MCR, RSS	I	~~1^{NA} 2^{NA} 3^{NA} 4^{NA}~~ (Note ~~3~~2) 452, 07.03-36
~~Hardwired (Conventional)~~	~~N/A~~	~~MCR, RSS~~	~~I~~	~~2^N~~

Table 2.4.2-1—Safety Information and Control System Equipment (2 Sheets)

Description	Tag Number (1)	Location	Seismic Category	IEEE Class 1E (2)
~~I&C, Division 2~~				~~1^A^~~
~~Hardwired (Conventional) I&C, Division 3~~	~~N/A~~	~~MCR, RSS~~	~~I~~	~~3^N^~~ ~~4^A^~~
~~Hardwired (Conventional) I&C, Division 4~~	~~N/A~~	~~MCR, RSS~~	~~I~~	~~4^N^~~ ~~3^A^~~

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.~~

2) Controls and indications are powered by all four electrical divisions.

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Table 2.4.2-2—Safety Information and Control System ITAAC (10 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	SICS equipment is located as listed in Table 2.4.2-1.	Inspection will be performed of the location of the SICS equipment.	The SICS equipment listed in Table 2.4.2-1 is located as listed in Table 2.4.2-1.
2.2	Deleted.~~Physical separation exists between the four Class 1E panel interface divisions of the SICS.~~	Deleted.~~Inspections will be performed to verify that the divisions of Class 1E panel interface cabinets are located in separate Safeguard Buildings.~~	Deleted.~~The four divisions of Class 1E panel interface cabinets are located in separate Safeguard Buildings as listed in Table 2.4.2-1.~~
2.3	Deleted.~~Physical separation exists between the four Class 1E QDS divisions of the SICS.~~	Deleted.~~a. Design analyses will be performed to determine the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between the four Class 1E QDS divisions of the SICS.~~ Deleted.~~b. Inspections will be performed to verify that the required safety-related structures, separation distance, barriers, or any combination thereof exist between the divisions of Class 1E QDS equipment.~~	Deleted.~~a. A report exists and defines the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between the four Class 1E QDS divisions of the SICS.~~ Deleted.~~b. The required safety-related structures, separation distance, barriers, or any combination thereof exist between the divisions of Class 1E QDS equipment. Reconciliation is performed of any deviations to the design.~~

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Table 2.4.2-2—Safety Information and Control System ITAAC (10 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.4	Physical separation exists between Class 1E SICS equipment and non-Class 1E equipment.	a. Design analyses will be performed to determine the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E SICS equipment and non-Class 1E equipment. b. Inspections will be performed to verify that the required safety-related structures, separation distance, barriers, or any combination thereof exist between Class 1E SICS equipment and non-Class 1E equipment.	a. A report exists and defines the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E SICS equipment and non-Class 1E equipment. b. The required safety-related structures, separation distance, barriers, or any combination thereof exist between Class 1E SICS equipment and non-Class 1E equipment.. Reconciliation is performed of any deviations to the design.
2.5	Physical separation exists between the Class 1E electrical divisions that power the controls and indications of the SICS.	Inspections will be performed to verify that the Class 1E electrical divisions that power the controls and indications of the SICS are located in separate Safeguard Buildings.	The Class 1E electrical divisions that power the controls and indications of the SICS as listed in Table 2.4.2-1 are located in separate Safeguard Buildings.

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Table 2.4.2-2—Safety Information and Control System ITAAC (10 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.1	Equipment identified as Seismic Category I in Table 2.4.2-1can withstand seismic design basis loads without loss of safety function.	a. Type tests, analyses or a combination of type tests and analyses will be performed on the equipment listed as Seismic Category I in Table 2.4.1-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Tests/analysis reports exist and conclude that the equipment listed as Seismic Category I in Table 2.4.1-1 can withstand seismic design basis loads without loss of safety function.
		b. Inspections will be performed of the Seismic Category I equipment listed in Table 2.4.2-1 to verify that the equipment including anchorage is installed as specified on the construction drawings.	b. Inspection reports exist and conclude that the Seismic Category I equipment listed in Table 2.4.2-1 including anchorage is installed as specified on the construction drawings.
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.	a. Inspections will be performed to verify the existence of procedures.	a. A report exists and concludes that procedures exist for transfer of control of the SICS from the MCR to the RSS.
		b. Tests will be performed to verify that control of the SICS can be transferred from the MCR to the RSS.	b. A report exists and concludes that the test results confirm that control of the SICS can be transferred from the MCR to the RSS.
		c. An inspection will be performed to verify the existence of the SICS RSS transfer switches in a fire area separate from the MCR, each associated with a single division of the safety-related control.	c. Transfer switches exist in a fire area separate from the MCR, each associated with a single division of the safety-related control.

Table 2.4.2-2—Safety Information and Control System ITAAC (10 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.2	Electrical isolation exists between the Class 1E electrical divisions that power the controls and indications of the SICS.~~Deleted.~~	Inspections will be performed to verify that the Class 1E electrical divisions that power the controls and indications of the SICS are electrically isolated from one another.~~Deleted.~~	The Class 1E electrical divisions that power the controls and indications of the SICS as listed in Table 2.4.2-1 are electrically isolated from each another.~~Deleted.~~
4.3	Electrical isolation is provided on connections between the safety-related parts of the SICS and non-Class 1E equipment.	a. Analyses will be performed to determine the test specification for electrical isolation devices on connections between the safety-related parts of the SICS 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 the safety-related parts of the SICS 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 the safety-related parts of the SICS and non-Class 1E equipment.	b. A report exists and concludes that the Class 1E isolation devices used between the safety-related parts of the SICS and non-Class 1E equipment. prevent the propagation of credible electrical faults.
		c. Inspections will be performed on connections between the safety-related parts of the SICS and non-Class 1E equipment.	c. Class 1E electrical isolation devices exist on connections between the safety-related parts of the SICS and non-Class 1E equipment.
4.4	Class 1E SICS equipment can perform its safety function when subjected to EMI, RFI, ESD, and power surges.	Type tests or type tests and analysis of these will be performed for the Class 1E equipment listed in Table 2.4.1-1.	A report exists and concludes that the equipment identified as Class 1E in Table 2.4.2-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.

Table 2.4.2-2—Safety Information and Control System ITAAC (10 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.5	Deleted.The SICS system design and application software are developed using a process composed of six life cycle phases, with each phase having outputs which must conform to the requirements of that phase. The six life cycle phases are the following: 1) Basic Design Phase. 2) Detailed Design Phase. 3) Manufacturing Phase. 4) System Integration and Testing Phase 5) Installation and Commissioning Phase. 6) Final Documentation Phase.	Deleted.a. Analyses will be performed to verify that the outputs for the SICS basic design phase conform to the requirements of that phase. {{DAC}} b. Analyses will be performed to verify that the outputs for the SICS detailed design phase conform to the requirements of that phase. {{DAC}} c. Analyses will be performed to verify that the outputs for the SICS manufacturing phase conform to the requirements of that phase. d. Analyses will be performed to verify that the outputs for the SICS system integration and testing phase conform to the requirements of that phase. e. Analyses will be performed to verify that the outputs for the SICS installation and commissioning phase conform to the requirements of that phase..	Deleted.a. A report exists and concludes that the outputs conform requirements of the basic design phase of the SICS. {{DAC}} b. A report exists and concludes that the outputs conform to requirements of the detailed design phase of the SICS. {{DAC}} c. A report exists and concludes that the outputs conform to the requirements of the manufacturing phase of the SICS. d. A report exists and concludes that the outputs conform to the requirements of the system integration and testing phase of the SICS. e. A report exists and concludes that the outputs conform to the requirements of the installation and commissioning phase of the SICS.
		f. Analyses will be performed to verify that the outputs for the SICS final documentation phase conform to the requirements of that phase.	f. A report exists and concludes that the outputs conform to the requirements of the final documentation phase of the SICS.

Table 2.4.2-2—Safety Information and Control System ITAAC (10 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.6	Electrical isolation is provided on connections between the RSS and the MCR for the SICS.	a. Analyses will be performed to determine the test specification for electrical isolation devices on connections between the RSS and the MCR for the SICS.	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 the RSS and the MCR for the SICS.
		b. Type tests, analyses, or a combination of type tests and analyses will be performed on the electrical isolation devices between the RSS and the MCR for the SICS.	b. A report exists and concludes that the Class 1E isolation devices used between the RSS and the MCR for the SICS prevent the propagation of credible electrical faults.
		c. Inspections will be performed on connections between the RSS and the MCR for the SICS.	c. Class 1E electrical isolation devices exist on connections between the RSS and the MCR for the SICS.
4.7	Deleted.~~Electrical isolation is provided on connections between the four SICS divisions.~~	Deleted.~~a. Analyses will be performed to determine the test specification for electrical isolation devices on connections between the four SICS divisions.~~	Deleted.~~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 the four SICS divisions.~~
		~~b. Type tests, analyses, or a combination of type tests and analyses will be performed on the electrical isolation devices between the four SICS divisions.~~	~~b. A report exists and concludes that the Class 1E isolation devices used between the four SICS divisions prevent the propagation of credible electrical faults.~~
		~~c. Inspections will be performed on connections between the four SICS divisions.~~	~~c. Class 1E electrical isolation devices exist on connections between the four SICS divisions.~~

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Table 2.4.2-2—Safety Information and Control System ITAAC (10 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.8	Deleted.~~Communications independence is provided between the four SICS divisions.~~	Deleted.~~Tests, analyses, or a combination of tests and analyses will be performed on the SICS equipment.~~	Deleted.~~A report exists and concludes that:~~ • ~~The SICS function processors do not interface directly with a network. Separate communication processors interface directly with the network.~~ • ~~Separate send and receive data channels are used in both the communications processor and the SICS function processor.~~ • ~~The SICS function processors operate in a strictly cyclic manner.~~ • ~~The SICS function processors operate asynchronously from the SICS communications processors.~~
4.9	Deleted.~~Communications independence is provided between SICS equipment and non-Class 1E equipment.~~	Deleted.~~Tests, analyses, or a combination of tests and analyses will be performed on the SICS equipment.~~	Deleted.~~A report exists and concludes that communications independence is provided between SICS equipment and non-Class 1E equipment.~~

Table 2.4.2-2—Safety Information and Control System ITAAC (10 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.10	The SICS is designed so that safety-related functions required for an AOO or PA DBE are performed in the presence of the following: • Single detectable failures within the SICS 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 DBE 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 DBE are performed in the presence of the following: • Single detectable failures within the SICS 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 DBE requiring the safety function.
4.11	Deleted.The equipment for each SICS 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.	Deleted.Inspections will be performed on the SICS equipment to verify that the equipment for each SICS 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.	Deleted.The equipment for each SICS 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	Deleted.Locking mechanisms are provided on the SICS cabinet doors located outside of the MCR. Opened SICS cabinet doors are indicated in the MCR.	Deleted.a. Inspections will be performed to verify the existence locking mechanisms on the SICS cabinet doors located outside the MCR. b. Tests will be performed to verify the proper operation of the locking mechanisms on the SICS cabinet doors located outside of the MCR.	Deleted.a. Locking mechanisms exist on the SICS cabinet doors located outside of the MCR. b. The locking mechanisms on the SICS cabinet doors located outside of the MCR operate properly.

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Table 2.4.2-2—Safety Information and Control System ITAAC (10 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
		c. Tests and inspections will be performed to verify an indication exists in the MCR when a SICS cabinet door located outside of the MCR is in the open position.	c. Opened SICS cabinet doors located outside of the MCR are indicated in the MCR.
4.13	Deleted.Key lock switches on the QDS restrict connections between the QDS and the QDS service unit.	Deleted.Tests will be performed to verify that the key lock switches on the QDS restrict modifications to the SICS software.	Deleted.Key lock switches on the QDS restrict modifications to the SICS software.
4.14	Deleted.The SICS is capable of performing its safety function when one of the SICS divisions is out of service. Out of service divisions of SICS are indicated in the MCR.	Deleted.a. A test of the SICS will be performed to verify the SICS can perform its safety function when one of the SICS divisions is out of service. b. Inspections will be performed to verify the existence of indications in the MCR when a SICS division is placed out of service.	Deleted.a. The SICS can perform its safety functions when one of the SICS divisions is out of service. b. Out of service divisions of SICS are indicated in the MCR.
4.15	Deleted.The SICS PI hardware and system software are designed to conform to the key TELEPERM XS principles, features, and quality methods. **{{DAC}}**	Deleted.A TELEPERM XS platform changes analysis will be performed on the SICS hardware and system software to verify its conformance to the key TELEPERM XS principles, features, and quality methods. **{{DAC}}**	Deleted.A report exists and concludes that the SICS PI hardware modules and system software modules: a. Conform to the key TELEPERM XS design principles. **{{DAC}}** b. Conform to the key TELEPERM XS processing features. **{{DAC}}** c. Conform to the key TELEPERM XS communication independence features. **{{DAC}}**

Table 2.4.2-2—Safety Information and Control System ITAAC
(10 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
			~~d. Do not introduce more than a minimal increase in the likelihood of occurrence of a software malfunction relative to predecessor modules.~~ ~~**{{DAC}}**~~ ~~e. Do not introduce more than a minimal increase in the consequences of a malfunction relative to predecessor modules.~~ ~~**{{DAC}}**~~ ~~f. Do not create the possibility for a malfunction with a different result relative to predecessor modules.~~ ~~**{{DAC}}**~~ ~~g. Were developed according to procedures that do not result in a reduction in the TELEPERM XS quality methods.~~ ~~**{{DAC}}**~~

Table 2.4.2-2—Safety Information and Control System ITAAC (10 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.16	Deleted.The SICS QDS hardware and system software are evaluated and accepted for use in safety related applications through a commercial grade dedication process.	Deleted.a. Analyses will be performed to determine the critical characteristics of the QDS. {{DAC}} b. Analyses will be performed to determine a combination of special tests, surveys, source verifications, or performance record reviews that is sufficient to demonstrate that the QDS exhibits the required critical characteristics. {{DAC}} c. Inspections, tests, analyses or a combination thereof will be performed to demonstrate that the QDS exhibits the required critical characteristics.	Deleted.a. A report exists and defines the critical characteristics for acceptance of the QDS. {{DAC}} b. A dedication acceptance plan exists and defines a combination of special tests, surveys, source verifications, or performance reviews that is sufficient to demonstrate that the QDS exhibits the required critical characteristics. {{DAC}} c. A dedication acceptance package exists and documents results of special tests, surveys, source verifications, or performance reviews that demonstrate the QDS exhibits the required critical characteristics.
5.1	Class 1E SICS components are powered from a Class 1E division in a normal or alternate feed condition.	a. Testing will be performed for components identified as Class 1E in Table 2.4.2-1 by providing a test signal in each normally aligned division. b. Testing will be performed for components identified as Class 1E in Table 2.4.2-1 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 2.4.2-1. 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 2.4.2-1.

Next File

2.4.3 ~~Severe Accident I&C~~Deleted

~~1.0Description~~

~~The severe accident instrumentation and control (I&C) system provides information and controls to properly control the plant during a severe accident.~~

~~The severe accident I&C system provides the following non-safety related functions:~~

~~– Receives signals from other I&C systems.~~

~~– Provides control functions associated with severe accidents.~~

~~– Provides indications of severe accident plant parameters in the main control room (MCR).~~

~~2.0Arrangement~~

~~2.1The severe accident I&C equipment is located as listed in Table 2.4.3-1—Severe Accident I&C Equipment.~~

~~2.2Physical separation exists between the four divisions of the severe accident I&C system.~~

~~3.0System Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Table 2.4.3-2 lists the severe accident I&C ITAAC~~

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Table 2.4.3-1—Severe Accident I&C Equipment

Description	Tag Number [1]	Location
Severe Accident I&C Cabinet, Division 1	30CSE01GW001	Safeguard Building 1
Severe Accident I&C Cabinet, Division 2	30CSF01GW001	Safeguard Building 2
Severe Accident I&C Cabinet, Division 3	30CSG01GW001	Safeguard Building 3
Severe Accident I&C Cabinet, Division 4	30CSH01GW001	Safeguard Building 4

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

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~~Table 2.4.3-2—Severe Accident I&C ITAAC~~

	~~Commitment Wording~~	~~Inspections, Tests, Analyses~~	~~Acceptance Criteria~~
~~2.1~~	~~The severe accident I&C equipment is located as listed in Table 2.4.3-1.~~	~~Inspections will be performed of the location of the severe accident I&C equipment.~~	~~The equipment listed in Table 2.4.3-1 is located as listed in Table 2.4.3-1.~~
~~2.2~~	~~Physical separation exists between the four divisions of the severe accident I&C system.~~	~~Inspections will be performed to verify that the divisions of the severe accident I&C system are located in separate Safeguard Buildings.~~	~~The four divisions of the severe accident I&C system are located in separate Safeguard Buildings.~~

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Next File

2.4.4 Safety Automation System

1.0 Description

The safety automation system (SAS) provides control and monitoring of safety systems.

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The SAS provides the following safety related functions:

- Provides control and monitoring of systems required to transfer the plant to cold shutdown and maintain it in this state following an anticipated operational occurrence (AOO) or postulated accident (PA) design basis event.
- Provides control and monitoring of safety--related functions of auxiliary support systems.
- Provides acquisition and processing of Type A, B and C post-accident monitoring variables for display to the operators in the main control room (MCR) and on the remote shutdown station (RSS).
- Provides a safety interlock function.

2.0 Arrangement

2.1 SAS equipment is located as listed in Table 2.4.4-1—Safety Automation System Equipment.

2.2 Physical separation exists between the four divisions of the SAS.

2.3 Physical separation exists between Class 1E SAS equipment and non-Class 1E equipment.

3.0 Mechanical Design Features

3.1 Equipment identified as Seismic Category I in Table 2.4.4-1 can withstand seismic design basis loads without loss of safety function.

4.0 I&C Design Features, Displays and Controls

4.1 Class 1E SAS equipment can perform its safety function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

4.2 The SAS receives input signals from the sources listed in Table 2.4.4-2—Safety Automation System Input Signals.

4.3 The SAS provides the output signals listed in Table 2.4.4-3—Safety Automation System Output Signals.

4.4 The SAS provides the interlocks listed in Table 2.4.4-4—Safety Automation System Interlocks.

4.5 The SAS system design and application software are developed using a process composed of six life-cycle phases with each phase having outputs which must conform to the requirements of that phase. The six life-cycle phases are the following:

1. Basic Design Phase.
2. Detailed Design Phase.
3. Manufacturing Phase.
4. System Integration and Testing Phase.
5. Installation and Commissioning Phase.
6. Final Documentation Phase.

4.6 Electrical isolation is provided on connections between the four SAS divisions.

4.7 Electrical isolation is provided on connections between SAS equipment and non-Class 1E equipment.

4.8 Communications independence is provided between the four SAS divisions.

4.9 Communications independence is provided between SAS equipment and non-Class 1E equipment.

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4.10 The SAS is designed so that safety-related functions required for ~~design basis events (DBE)~~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 ~~DBE~~ 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.

4.12 Locking mechanisms are provided on the SAS cabinet doors. Opened SAS cabinet doors are indicated in the MCR.

4.13 CPU state ~~Key lock~~ switches are present at the SAS cabinets to restrict modifications to the SAS software.

4.14 The SAS is capable of performing its safety function when one of the SAS divisions is out of service. Out of service divisions of SAS are indicated in the MCR.

4.15 The operational availability of each input variable listed can be confirmed during reactor operation including post-accident periods.

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4.16 Deleted.~~The SAS hardware and system software are designed to conform to the key TELEPERM XS principles, features, and quality methods.~~

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.

5.0 Electrical Power Design Features

5.1 Class 1E SAS components are powered from a Class 1E division in a normal or alternate feed condition.

6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.4-~~5~~ 6 lists the SAS ITAAC.

Table 2.4.4-1—Safety Automation System Equipment

Description	Tag Number (1)	Location	Seismic Category	IEEE Class 1E(2)
SAS Cabinets, Division 1	30DRA1	Safeguard Building 1	I	1^N 2^A
SAS Cabinets, Division 2	30DRA2	Safeguard Building 2	I	2^N 1^A
SAS Cabinets, Division 3	30DRA3	Safeguard Building 3	I	3^N 4^A
SAS Cabinets, Division 4	30DRA4	Safeguard Building 4	I	4^N 3^A

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.

Table 2.4.4-2—Safety Automation System Input Signals

Item #	Signal	Source	# Divisions	IEEE Class 1E
1	Steam Generator Pressure	Signal Conditioning and Distribution System (SCDS)~~Protection System~~	4	Yes
2	Main Steam Relief Control Valve Position	Priority and Actuator Control System (PACS)~~Main Steam System~~	4	Yes
3	Neutron Flux from Power Range Detector (PRD) for Nuclear Power Calculation~~Core Thermal Power~~	SCDS~~Protection System~~	4	Yes
4	Main Steam Relief Isolation Valve Position	PACS~~Main Steam System~~	4	Yes
5	Steam Generator Level ~~Wide Range~~(WR)	SCDS~~Protection System~~	4	Yes
6	Emergency Feedwater ~~System~~ Flow	SCDS~~Emergency Feedwater System~~	4	Yes

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Table 2.4.4-3—Safety Automation System Output Signals

Item #	Output Signal	~~Signal Generation~~	Recipient	# Divisions	~~IEEE Class 1E~~
1	EFW Flow Control Valve Position Signal	~~Auto~~	PACS	4	~~Yes~~
2	EFW SG Level Control Valve Position Signal	~~Auto~~	PACS	4	~~Yes~~
3	Main Steam Relief Control Valve Signal	~~Auto~~	PACS	4	~~Yes~~

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Table 2.4.4-4—Safety Automation System Interlocks

Isolation of Component Cooling Water System (CCWS) Trains

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Table 2.4.4-5—Safety Automation System Automatic Functions (4 Sheets)

System	Function Name
Annulus Ventilation System (AVS)	Accident Filtration Train Heater Control
Annulus Ventilation System (AVS)	Accident Train Switchover
Component Cooling Water System (CCWS)	CCWS Common 1.b Automatic Backup Switchover of Train 1 to Train 2
Component Cooling Water System (CCWS)	CCWS Common 1.b Automatic Backup Switchover of Train 2 to Train 1
Component Cooling Water System (CCWS)	CCWS Common 2.b Automatic Backup Switchover of Train 3 to Train 4
Component Cooling Water System (CCWS)	CCWS Common 2.b Automatic Backup Switchover of Train 4 to Train 3
Component Cooling Water System (CCWS)	CCWS Emergency Temperature Control
Component Cooling Water System (CCWS)	CCWS Emergency Leak Detection
Component Cooling Water System (CCWS)	CCWS Switchover Valve Interlock
Component Cooling Water System (CCWS)	CCWS RCP Thermal Barrier Containment Isolation Valve Interlock
Component Cooling Water System (CCWS)	CCWS Switchover Valves Leakage or Failure
Component Cooling Water System (CCWS)	CCWS Condenser Supply Water Flow Control
Emergency Feedwater System (EFWS)	SG Closed Loop Level Control
Emergency Feedwater System (EFWS)	EFW Pump Flow Control
Essential Service Water System (ESWS)	Automatic ESWS Actuation from CCWS Start
Essential Service Water Pump Building Ventilation System (ESWPBVS)	Remove Heat Generated by Essential Service Water Equipment
Fuel Building Ventilation System (FBVS)	Safety-related Room Heater Control

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Table 2.4.4-5—Safety Automation System Automatic Functions (4 Sheets)

System	Function Name
Fuel Building Ventilation System (FBVS)	Maintain Ambient Conditions for EBS and FPCS pump rooms (Recirculation Coolers)
Fuel Pool Cooling and Purification System (FPCPS)	Fuel Pool Cooling Pump Trip On Low SFP Level
In-Containment Refueling Water Storage Tank System (IRWST)	IRWST Boundary Isolation for Preserving IRWST Water Inventory
Main Control Room Air Conditioning System (CRACS)	Iodine Filtration Train Heater Control
Main Control Room Air Conditioning System (CRACS)	Heater Control for Outside Inlet Air
Main Control Room Air Conditioning System (CRACS)	Pressure Control
Main Control Room Air Conditioning System (CRACS)	Cooler Temperature Control
Main Steam System (MSS)	Steam Generator MSRCV Regulation during Standby Position Control
Main Steam System (MSS)	Steam Generator MSRCV Regulation during Pressure Control
Safeguard Building Controlled-Area Ventilation System (SBVS)	SIS/RHRS Pump Rooms Heat Removal
Safeguard Building Controlled-Area Ventilation System (SBVS)	SIS/RHRS Valve Rooms Heat Removal
Electrical Division of Safeguard Building Ventilation System (SBVSE)	Supply and Recirculation Exhaust Air Flow Control
Electrical Division of Safeguard Building Ventilation System (SBVSE)	Supply Fan Safe Shut-off
Electrical Division of Safeguard Building Ventilation System (SBVSE)	Recirculation/Exhaust Fan Safe Shut-off
Electrical Division of Safeguard Building Ventilation System (SBVSE)	Exhaust Fan Safe Shut-off

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Table 2.4.4-5—Safety Automation System Automatic Functions (4 Sheets)

System	Function Name
Electrical Division of Safeguard Building Ventilation System (SBVSE)	Supply Air Temperature
Electrical Division of Safeguard Building Ventilation System (SBVSE)	Freeze Protection – Supply Air Temperature
Electrical Division of Safeguard Building Ventilation System (SBVSE)	Freeze Protection – Heat Tracing
Electrical Division of Safeguard Building Ventilation System (SBVSE)	Supply Air Temperature Control for Cooling
Electrical Division of Safeguard Building Ventilation System (SBVSE)	Supply Air Temperature Control for Supply Air Heating
Electrical Division of Safeguard Building Ventilation System (SBVSE)	Battery Room Temperature Control
Electrical Division of Safeguard Building Ventilation System (SBVSE)	Battery Room Supply Air Temperature
Electrical Division of Safeguard Building Ventilation System (SBVSE)	Emergency Feedwater Pump Room Heat Removal
Electrical Division of Safeguard Building Ventilation System (SBVSE)	Component Cooling Water System Rooms Heat Removal
Safety Chilled Water System (SCWS)	SCWS Train 1 to Train 2 Switchover on Train 1 Low Evaporator Flow
Safety Chilled Water System (SCWS)	SCWS Train 2 to Train 1 Switchover on Train 2 Low Evaporator Flow
Safety Chilled Water System (SCWS)	SCWS Train 3 to Train 4 Switchover on Train 3 Low Evaporator Flow
Safety Chilled Water System (SCWS)	SCWS Train 4 to Train 3 Switchover on Train 4 Low Evaporator Flow
Safety Chilled Water System (SCWS)	SCWS Train 1 to Train 2 Switchover on Train 1 Chiller Black Box Internal Fault
Safety Chilled Water System (SCWS)	SCWS Train 2 to Train 1 Switchover on Train 2 Chiller Black Box Internal Fault

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Table 2.4.4-5—Safety Automation System Automatic Functions (4 Sheets)

System	Function Name
Safety Chilled Water System (SCWS)	SCWS Train 3 to Train 4 Switchover on Train 3 Chiller Black Box Internal Fault
Safety Chilled Water System (SCWS)	SCWS Train 4 to Train 3 Switchover on Train 4 Chiller Black Box Internal Fault
Safety Chilled Water System (SCWS)	SCWS Train 2 to Train 1 Switchover on Loss of Ultimate Heat Sink (LUHS)/CCWS
Safety Chilled Water System (SCWS)	SCWS Train 3 to Train 4 Switchover on Loss of Ultimate Heat Sink (LUHS)/CCWS
Safety Chilled Water System (SCWS)	SCWS Train 1 to Train 2 Switchover on LOOP Re-start Failure
Safety Chilled Water System (SCWS)	SCWS Train 2 to Train 1 Switchover on LOOP Re-start Failure
Safety Chilled Water System (SCWS)	SCWS Train 3 to Train 4 Switchover on LOOP Re-start Failure
Safety Chilled Water System (SCWS)	SCWS Train 4 to Train 3 Switchover on LOOP Re-start Failure
Safety Chilled Water System (SCWS)	SCWS Chiller Evaporator Water Flow Control (Trains 1 and 4)
Safety Injection and Residual Heat Removal System (SIS/RHRS)	Automatic RHRS Flow Rate Control
Safety Injection and Residual Heat Removal System (SIS/RHRS)	Automatic Trip of LHSI Pump (in RHR Mode) on Low ΔPsat
Safety Injection and Residual Heat Removal System (SIS/RHRS)	Automatic Trip of LHSI Pump (in RHR Mode) on Low Loop Level
Safety Injection and Residual Heat Removal System (SIS/RHRS)	LHSI Valves Actuation Based on RHRS Alignment

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Table 2.4.4-56—Safety Automation System ITAAC (10 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	SAS equipment is located as listed in Table 2.4.4-1.	Inspections will be performed of the location of the SAS equipment.	The SAS equipment listed in Table 2.4.4-1 is located as listed in Table 2.4.4-1.
2.2	Physical separation exists between the four divisions of the SAS.	Inspections will be performed to verify that the divisions of the SAS are located in separate Safeguard Buildings.	The four divisions of the SAS are located in separate Safeguard Buildings as listed in Table 2.4.4-1.
2.3	Physical separation exists between Class 1E SAS equipment and non-Class 1E equipment.	a. Design analyses will be performed to determine the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E SAS equipment and non-Class 1E equipment. b. Inspections will be performed to verify that the required safety-related structures, separation distance, barriers, or any combination thereof exist between Class 1E SAS equipment and non-Class 1E equipment.	a. A report exists and defines the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E SAS equipment and non-Class 1E equipment. b. The required safety-related structures, separation distance, barriers, or any combination thereof exist between Class 1E SAS equipment and non-Class 1E equipment. Reconciliation is performed of any deviations to the design.
3.1	Equipment identified as Seismic Category I in Table 2.4.4-1 can withstand seismic design basis loads without loss of safety function.	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the equipment listed as Seismic Category I in Table 2.4.4-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Tests/analysis reports exist and conclude that the equipment listed as Seismic Category I in Table 2.4.4-1 can withstand seismic design basis loads without loss of safety function.

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Table 2.4.4-56—Safety Automation System ITAAC (10 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
		b. Inspections will be performed of the Seismic Category I equipment listed in Table 2.4.4-1 to verify that the equipment including anchorage is installed as specified on the construction drawings.	b. Inspection reports exist and conclude that the Seismic Category I equipment listed in Table 2.4.4-1 including anchorage is installed as specified on the construction drawings.
4.1	Class 1E SAS equipment can perform its safety function when subjected to EMI, RFI, ESD, and power surges.	Type tests or type tests and analysis of these will be performed for the Class 1E equipment listed in Table 2.4.4-1.	A report exists and concludes that the equipment identified as Class 1E in Table 2.4.4-1 can perform its safety function when subjected to electromagnetic interference EMI, RFI, ESD, and power surges.
4.2	The SAS receives input signals from the sources listed in Table 2.4.4-2.	Tests will be performed to verify the existence of input signals.	The SAS receives input signals from the sources listed in Table 2.4.4-2.
4.3	The SAS provides the output signals listed in Table 2.4.4-3.	Tests will be performed to verify the existence of output signals.	The SAS provides output signals to the recipients listed in Table 2.4.4-3.
4.4	The SAS provides the interlocks listed in Table 2.4.4-4.	Tests will be performed using test signals to verify the operation of the interlocks listed in Table 2.4.4-4.	The interlocks listed in Table 2.4.4-4 respond as specified when activated by a test signal.
4.5	The SAS system design and application software are developed using a process composed of six life-cycle phases, with each phase having outputs which must conform to the requirements of that phase. The six life cycle phases are the following: 1) Basic Design Phase. 2) Detailed Design Phase.	a. Analyses will be performed to verify that the outputs for the SAS basic design phase conform to the requirements of that phase. ~~{{DAC}}~~ b. Analyses will be performed to verify that the outputs for the SAS detailed design phase conform to the requirements of that phase. ~~{{DAC}}~~	a. A report exists and concludes that the outputs conform requirements of the basic design phase of the SAS. ~~{{DAC}}~~ b. A report exists and concludes that the outputs conform to requirements of the detailed design phase of the SAS. ~~{{DAC}}~~

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Table 2.4.4-~~5~~6—Safety Automation System ITAAC (10 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
	3) Manufacturing Phase. 4) System Integration and Testing Phase 5) Installation and Commissioning Phase. 6) Final Documentation Phase.	c. Analyses will be performed to verify that the outputs for the SAS manufacturing phase conform to the requirements of that phase. d. Analyses will be performed to verify that the outputs for the SAS system integration and testing phase conform to the requirements of that phase. e. Analyses will be performed to verify that the outputs for the SAS installation and commissioning phase conform to the requirements of that phase.. f. Analyses will be performed to verify that the outputs for the SAS final documentation phase conform to the requirements of that phase.	c. A report exists and concludes that the outputs conform to the requirements of the manufacturing phase of the SAS. d. A report exists and concludes that the outputs conform to the requirements of the system integration and testing phase of the SAS. e. A report exists and concludes that the outputs conform to the requirements of the installation and commissioning phase of the SAS. f. A report exists and concludes that the outputs conform to the requirements of the final documentation phase of the SAS.
4.6	Electrical isolation is provided on connections between the four SAS divisions.	a. Analyses will be performed to determine the test specification for electrical isolation devices on connections between the four SAS divisions. b. Type tests, analyses, or a combination of type tests and analyses will be performed on the electrical isolation devices between the four SAS divisions.	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 the four SAS divisions. b. A report exists and concludes that the Class 1E isolation devices used between the four SAS divisions prevent the propagation of credible electrical faults.

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Table 2.4.4-~~5~~6—Safety Automation System ITAAC
(10 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
		c. Inspections will be performed on connections between the four SAS divisions.	c. Class 1E electrical isolation devices exist on connections between the four SAS divisions.
4.7	Electrical isolation is provided on connections between SAS equipment and non-Class 1E equipment.	a. Analyses will be performed to determine the test specification for electrical isolation devices on connections between SAS 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 SAS 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 SAS equipment and non-Class 1E equipment.	b. A report exists and concludes that the Class 1E isolation devices used between SAS equipment and non-Class 1E equipment prevent the propagation of credible electrical faults.
		c. Inspections will be performed on connections between SAS equipment and non-Class 1E equipment.	c. Class 1E electrical isolation devices exist on connections between SAS equipment and non-Class 1E equipment.

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Table 2.4.4-~~5~~6—Safety Automation System ITAAC (10 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.8	Communications independence is provided between the four SAS divisions.	Tests, analyses, or a combination of tests and analyses will be performed on the SAS equipment.	A report exists and concludes that: • The SAS function processors do not interface directly with a network. Separate communication processors interface directly with the network. • Separate send and receive data channels are used in both the communications processor and the SAS function processor. • The SAS function processors operate in a strictly cyclic manner. • The SAS function processors operate asynchronously from the SAS communications processors.

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Table 2.4.4-56—Safety Automation System ITAAC (10 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.9	Communications independence is provided between SAS equipment and non-Class 1E equipment.	Tests, analyses, or a combination of tests and analyses will be performed on the SAS equipment.	A report exists and concludes that: • Data communications between SAS function processors and non-Class 1E equipment is through a Monitoring and Service Interface (MSI). • The MSI processors do not interface directly with a network. Separate communication processors modules interface directly with the network. • Separate send and receive data channels are used in both the communications processor modules and the MSI function processor. • The MSI processors operate in a strictly cyclic manner. • The MSI processors operate asynchronously from the communications processorsmodules. • The SAS uses a hardware device to ensure that unidirectional signals are sent to non-safety-related I&C systems.

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Table 2.4.4-~~5~~6—Safety Automation System ITAAC (10 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.10	The SAS is designed so that safety-related functions required for ~~DBE~~ 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~~DBE~~ 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 ~~DBE~~ 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 ~~DBE~~ 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 will be performed to verify the existence of locking mechanisms on the SAS cabinet doors. b. Tests will be performed to verify the proper operation of the locking mechanisms on the SAS cabinet doors. c. Tests 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.

Table 2.4.4-56—Safety Automation System ITAAC (10 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
4.13	CPU state Key lock switches are present at the SAS cabinets to restrict modifications to the SAS software.	a. Inspections will be performed to verify the existence of CPU state key lock switches that restrict modifications to the SAS software. b. Tests will be performed to verify that the CPU state key lock switches restrict modifications to the SAS software.	a. CPU state Key lock switches are provided at the SAS cabinets. b. CPU state Key lock switches at the SAS cabinets restrict modifications to the SAS software.
4.14	The SAS is capable of performing its safety function when one of the SAS divisions is out of service. Out of service divisions of SAS are indicated in the MCR.	a. A test of the SAS will be performed to verify the SAS can perform its safety function when one of the SAS divisions is out of service. b. Inspections will be performed to verify the existence of indication in the MCR when a SAS division is placed out of service.	a. The SAS can perform its safety functions when one of the SAS divisions is out of service. b. Out of service divisions of SAS are indicated in the MCR.

Table 2.4.4-56—Safety Automation System ITAAC (10 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.15	The operational availability of each input variable can be confirmed during reactor operation including post-accident periods. 452, 07.03-36	Analysis will be performed to demonstrate that the operational availability of each input variable listed in Table 2.4.4-2 can be confirmed during reactor operation including post-accident periods by one of the following methods: • By perturbing the monitored variable. • 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.	A report exists and concludes that the operational availability of each input variable listed in Table 2.4.4-2 can be confirmed during reactor operation including post-accident periods by one of the following methods: • By perturbing the monitored variable. • 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.The SAS hardware and system software are designed to conform to the key TELEPERM XS principles, features, and quality methods. {{DAC}}	Deleted.A TELEPERM XS platform changes analysis will be performed on the SAS hardware and system software to verify its conformance to the key TELEPERM XS principles, features, and quality methods. {{DAC}}	Deleted.A report exists and concludes that the SAS hardware modules and system software modules: a. Conform to the key TELEPERM XS design principles. {{DAC}} b. Conform to the key TELEPERM XS processing features. {{DAC}} c. Conform to the key TELEPERM XS communication independence features. {{DAC}}

Table 2.4.4-56—Safety Automation System ITAAC (10 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
			d. Do not introduce more than a minimal increase in the likelihood of occurrence of a software malfunction relative to predecessor modules. **{{DAC}}** e. Do not introduce more than a minimal increase in the consequences of a malfunction relative to predecessor modules. **{{DAC}}** f. Do not create the possibility for a malfunction with a different result relative to predecessor modules. **{{DAC}}** g. Were developed according to procedures that do not result in a reduction in the TELEPERM XS quality methods. **{{DAC}}**
4.17	Hardwired disconnects exist between the SU and each divisional MSI of the SAS. The hardwired disconnects prevent the connection of the SU to more than a single division of the SAS.	a. Inspections will be performed on the SAS to verify the existence of hardwired disconnects between the SU and each divisional MSI of SAS. b. Tests will be performed on the SAS to verify that the hardwired disconnects prevent the connection of the SU to more than a single division of the SAS.	a. Hardwired disconnects exist between the SU and each divisional MSI of the SAS. b. The hardwired disconnects prevent the connection of the SU to more than a single division of the SAS.
4.18	The SAS performs automatic functions listed in Table 2.4.4-5.	Tests will be performed using test signals to verify the operation of automatic functions listed in Table 2.4.4-5.	The SAS generates the correct output signals for each automatic function listed in Table 2.4.4-5.

Table 2.4.4-56—Safety Automation System ITAAC (10 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
5.1	Class 1E SAS components are powered from a Class 1E division in a normal or alternate feed condition.	a. Testing will be performed for components identified as Class 1E in Table 2.4.4-1 by providing a test signal in each normally aligned division. b. Testing will be performed for components identified as Class 1E in Table 2.4.4-1 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 2.4.4-1. 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 2.4.4-1.

Next File

2.4.5 Priority and Actuator Control System

1.0 Description

The priority and actuator control system (PACS) is a safety-related system.

The PACS provides the following safety--related functions:

- Prioritizes actuation requests from I&C systems.
- Performs essential equipment protection.
- Performs drive actuation.
- Performs drive monitoring.

2.0 Arrangement

2.1 PACS equipment is located as listed in Table 2.4.5-1—Priority and Actuator Control System Equipment.

2.2 Physical separation exists between the four divisions of the PACS.

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2.3 Physical separation exists between Class 1E PACS equipment and non-Class 1E equipment.

3.0 Mechanical Design Features

3.1 Equipment identified as Seismic Category I in Table 2.4.5-1 can withstand seismic design basis loads without loss of safety function.

4.0 I&C Design Features, Displays and Controls

4.1 ~~Safety related~~Protection system (PS) signals received by each priority module override ~~all non-safety related~~other signals received by the priority module.

4.2 Electrical isolation is provided on connections between Class 1E PACS equipment and non-Class 1E equipment.

4.3 Class 1E PACS equipment can perform its safety function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

4.4 The input wiring from other I&C systems to the PACS is properly connected.

4.5 The capability for testing of the PACS is provided while retaining the capability of the PACS to accomplish its safety function. PACS divisions in test are indicated in the MCR.

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 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.

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5.0 Electrical Power Design Features

5.1 Class 1E PACS components are powered from a Class 1E division in a normal or alternate feed condition.

6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.5-2 lists the PACS ITAAC.

Table 2.4.5-1—Priority and Actuator Control System Equipment

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Description	Tag Number (1)	Location	Seismic Category	IEEE Class 1E(2)(3)
PACS Cabinets, Division 1	30CLE6	Safeguard Building 1	I	1^N 2^A
PACS Cabinets, Division 2	30CLF6	Safeguard Building 2	I	2^N 1^A
PACS Cabinets, Division 3	30CLG6	Safeguard Building 3	I	3^N 4^A
PACS Cabinets, Division 4	30CLH6	Safeguard Building 4	I	4^N 3^A

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.

3) The PACS communication module is classified as an associated circuit.

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Table 2.4.5-1—Priority and Actuator Control System Equipment

Description	Tag Number (1)	Location	Seismic Category	IEEE Class 1E(2)
PACS Cabinets, Division 1	30CLE6	Safeguard Building 1	I	1^N 2^A
PACS Cabinets, Division 2	30CLF6	Safeguard Building 2	I	2^N 1^A
PACS Cabinets, Division 3	30CLG6	Safeguard Building 3	I	3^N 4^A
PACS Cabinets, Division 4	30CLH6	Safeguard Building 4	I	4^N 3^A

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.

Table 2.4.5-2—Containment Isolation Valves
(6 Sheets)

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System Name	Valve Number
CADS	30SCB01AA001
CADS	30SCB01AA002
CCWS	30KAB30AA049
CCWS	30KAB30AA051
CCWS	30KAB30AA052
CCWS	30KAB30AA053
CCWS	30KAB30AA055
CCWS	30KAB30AA056
CCWS	30KAB40AA001
CCWS	30KAB40AA006
CCWS	30KAB40AA012
CCWS	30KAB60AA013
CCWS	30KAB60AA018
CCWS	30KAB60AA019
CCWS	30KAB70AA013
CCWS	30KAB70AA018
CCWS	30KAB70AA019
CVCS	30JEW01AA005
CVCS	30JEW50AA001
CVCS	30JEW50AA002
CVCS	30KBA14AA002
CVCS	30KBA14AA003
CVCS	30KBA34AA002
CVS	30KLA10AA001
CVS	30KLA10AA003
CVS	30KLA20AA001
CVS	30KLA20AA003
CVS	30KLA30AA002
CVS	30KLA30AA003
CVS	30KLA40AA001
CVS	30KLA40AA002
CWS	30QNJ41AA002
CWS	30QNJ41AA027

Table 2.4.5-2—Containment Isolation Valves (6 Sheets)

System Name	Valve Number
CWS	30QNJ41AA028
DWDS	30GHC74AA001
DWDS	30GHC74AA002
EBS	30JDH10AA006
EBS	30JDH40AA006
EFWS	30LAR11AA006
EFWS	30LAR21AA006
EFWS	30LAR31AA006
EFWS	30LAR41AA006
FPCPS	30FAL12AA001
FPCPS	30FAL12AA002
FPCPS	30FAL15AA002
FWS	30LAB60AA002
FWS	30LAB70AA002
FWS	30LAB80AA002
FWS	30LAB90AA002
FWDS	30SGB30AA031
FWDS	30SGB30AA032
GWPS	30KPL84AA002
GWPS	30KPL84AA003
GWPS	30KPL85AA003
GWPS	30KPL85AA004
HMS	30JMU50AA075
HMS	30JMU50AA076
HMS	30JMU50AA077
HMS	30JMU50AA078
HMS	30JMU50AA079
HMS	30JMU50AA080
HMS	30JMU50AA081
HMS	30JMU50AA082
HMS	30JMU50AA083
HMS	30JMU50AA084
HMS	30JMU51AA085

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Table 2.4.5-2—Containment Isolation Valves (6 Sheets)

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System Name	Valve Number
HMS	30JMU51AA086
HMS	30JMU51AA087
HMS	30JMU51AA088
HMS	30JMU51AA089
HMS	30JMU51AA090
HMS	30JMU51AA091
HMS	30JMU51AA092
HMS	30JMU51AA093
HMS	30JMU51AA094
IRWST	30JMQ40AA001
IRWST	30JNK10AA001
IRWST	30JNK10AA009
IRWST	30JNK10AA013
IRWST	30JNK11AA009
IRWST	30JNK20AA001
IRWST	30JNK30AA001
IRWST	30JNK40AA001
Leak-Off	30JMM10AA006
Leak-Off	30JMM10AA007
Leak-Off	30JMM23AA001
Leak-Off	30JMM23AA002
LHSI/RHRS	30JNA10AA002
LHSI/RHRS	30JNA10AA003
LHSI/RHRS	30JNA20AA002
LHSI/RHRS	30JNA20AA003
LHSI/RHRS	30JNA30AA002
LHSI/RHRS	30JNA30AA003
LHSI/RHRS	30JNA32AA001
LHSI/RHRS	30JNA40AA002
LHSI/RHRS	30JNA40AA003
LHSI/RHRS	30JNG10AA060
LHSI/RHRS	30JNG10AA061
LHSI/RHRS	30JNG12AA001

Table 2.4.5-2—Containment Isolation Valves (6 Sheets)

System Name	Valve Number
LHSI/RHRS	30JNG15AA004
LHSI/RHRS	30JNG20AA060
LHSI/RHRS	30JNG20AA061
LHSI/RHRS	30JNG22AA001
LHSI/RHRS	30JNG25AA004
LHSI/RHRS	30JNG30AA060
LHSI/RHRS	30JNG30AA061
LHSI/RHRS	30JNG35AA004
LHSI/RHRS	30JNG40AA060
LHSI/RHRS	30JNG40AA061
LHSI/RHRS	30JNG42AA001
LHSI/RHRS	30JNG45AA004
MCS	30LCA90AA003
MCS	30LCA90AA005
MC	30LCA90AA006
MHSI	30JND10AA002
MHSI	30JND20AA002
MHSI	30JND30AA002
MHSI	30JND40AA002
MSS	30LBA10AA002
MSS	30LBA10AA441
MSS	30LBA13AA001
MSS	30LBA13AA101
MSS	30LBA14AA001
MSS	30LBA20AA002
MSS	30LBA20AA441
MSS	30LBA23AA001
MSS	30LBA23AA101
MSS	30LBA24AA001
MSS	30LBA30AA002
MSS	30LBA30AA441
MSS	30LBA33AA001
MSS	30LBA33AA101

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Table 2.4.5-2—Containment Isolation Valves (6 Sheets)

System Name	Valve Number
MSS	30LBA34AA001
MSS	30LBA40AA002
MSS	30LBA40AA441
MSS	30LBA43AA001
MSS	30LBA43AA101
MSS	30LBA44AA001
NGDS	30QJB40AA001
NGDS	30QJB40AA002
NGDS	30QJB40AA003
NGDS	30QJB40AA004
NIDVS	30KTA10AA017
NIDVS	30KTA10AA018
NIDVS	30KTC10AA005
NIDVS	30KTC10AA006
NIDVS	30KTC10AA010
NIDVS	30KTD10AA015
NIDVS	30KTD10AA024
NIDVS	30KTD10AA025
NSS	30KUA10AA003
NSS	30KUA10AA004
NSS	30KUA20AA002
NSS	30KUA20AA003
NSS	30KUA30AA003
NSS	30KUA30AA004
NSS	30KUB10AA001
NSS	30KUB10AA002
NSS	30QUC11AA001
NSS	30QUC11AA011
NSS	30QUC12AA001
NSS	30QUC12AA011
NSS	30QUC13AA001
NSS	30QUC13AA011
NSS	30QUC14AA001

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Table 2.4.5-2—Containment Isolation Valves (6 Sheets)

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System Name	Valve Number
NSS	30QUC14AA011
SAHRS	30JMQ41AA001
SAHRS	30JMQ42AA001
SAHRS	30JMQ43AA001
SASS	30KUL51AA002
SASS	30KUL51AA003
SASS	30KUL52AA002
SASS	30KUL52AA003
SGBDS	30LCQ51AA002
SGBDS	30LCQ51AA003
SGBDS	30LCQ52AA001
SGBDS	30LCQ52AA002

Table 2.4.5-23—Priority and Actuator Control System ITAAC (4 Sheets)

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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	PACS equipment is located as listed in Table 2.4.5-1.	Inspections will be performed of the location of the PACS equipment.	The PACS equipment listed in Table 2.4.5-1 is located as listed in Table 2.4.5-1.
2.2	Physical separation exists between the four divisions of the PACS.	Inspections will be performed to verify that the divisions of the PACS are located in separate Safeguard Buildings.	The four divisions of the PACS are located in separate Safeguard Buildings as listed in Table 2.4.5-1.
2.3	Physical separation exists between Class 1E PACS equipment and non-Class 1E equipment.	a. Design analyses will be performed to determine the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E PACS equipment and non-Class 1E equipment. b. Inspections will be performed to verify that the required safety-related structures, separation distance, barriers, or any combination thereof exist between the Class 1E PACS equipment and non- Class 1E equipment.	a. A report exists and defines the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E PACS equipment and non-Class 1E equipment. b. The required safety-related structures, separation distance, barriers, or any combination thereof exist between Class 1E PACS equipment and non-Class 1E equipment. Reconciliation is performed of any deviations to the design.
3.1	Equipment identified as Seismic Category I in Table 2.4.5-1 can withstand seismic design basis loads without loss of safety function.	a. Type tests, analyses or a combination of type tests and analyses will be performed on the equipment listed as Seismic Category I in Table 2.4.5-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Tests/analysis reports exist and conclude that the equipment listed as Seismic Category I in Table 2.4.5-1 can withstand seismic design basis loads without loss of safety function.

Table 2.4.5-23—Priority and Actuator Control System ITAAC (4 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
		b. Inspections will be performed of the Seismic Category I equipment listed in Table 2.4.5-1 to verify that the equipment including anchorage is installed as specified on the construction drawings.	b. Inspection reports exist and conclude that the Seismic Category I equipment listed in Table 2.4.5-1 including anchorage is installed as specified on the construction drawings.
4.1	Safety relatedPS signals received by each priority module override all non-safety relatedother signals received by the priority module	Tests will be performed using test signals that verify PS safety related signals received by each priority modules override all non-safety related other signals received by the priority module.	Test results exist and conclude that the safety relatedPS signals received by each priority module override all non safety related other signals received by the priority modules.
4.2	Electrical isolation is provided on connections between Class 1E PACS equipment and non-Class 1E equipment.	a. Analyses will be performed to determine the test specification for electrical isolation devices on connections between Class 1E PACS 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 Class 1E PACS 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 Class 1E PACS equipment and non-Class 1E equipment.	b. A report exists and concludes that the Class 1E isolation devices used between Class 1E PACS equipment and non-Class 1E equipment prevent the propagation of credible electrical faults.
		c. Inspections will be performed on connections between Class 1E PACS equipment and non-Class 1E equipment.	c. Class 1E electrical isolation devices exist on connections between Class 1E PACS and non-Class 1E equipment.

Table 2.4.5-~~2~~3—Priority and Actuator Control System ITAAC (4 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.3	Class 1E PACS equipment can perform its safety function when subjected to EMI, RFI, ESD, and power surges.	Type tests or type tests and analysis of these will be performed for the Class 1E equipment listed in Table 2.4.5-1.	A report exists and concludes that the equipment identified as Class 1E in Table 2.4.5-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.
4.4	The input wiring from other I&C systems to the PACS is properly connected.	Inspections will be performed to verify that the input wiring from other I&C systems to the PACS is properly connected.	The input wiring from the other I&C systems to the PACS is properly connected.
4.5	The capability for testing of the PACS is provided while retaining the capability of the PACS to accomplish its safety function. PACS divisions in test are indicated in the MCR.	a. Testing will be performed to verify the capability for testing of the PACs is provided while retaining the capability to accomplish its safety function. b. Inspections will be performed to verify the existence of indication in the MCR when a division of the PACS is placed in test.	a. The capability for testing of the PACS is provided while retaining the capability of the PACS to accomplish its safety functions. b. PACS divisions in test are indicated in the MCR.
4.6	Locking mechanisms are provided on the PACS cabinet doors. Opened PACS cabinet doors are indicated in the MCR.	a. Inspections will be performed to verify the existence of locking mechanisms on the PACS cabinet doors. b. Tests will be performed to verify the proper operation of the locking mechanisms on the PACS cabinet doors. c. Tests and inspections will be performed to verify an indication exists in the MCR when a PACS cabinet door is in the open position.	a. Locking mechanisms exist on the PACS cabinet doors. b. The locking mechanisms on the PACS cabinet doors operate properly. c. Opened PACS cabinet doors are indicated in the MCR.

Table 2.4.5-23—Priority and Actuator Control System ITAAC (54 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
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.	Inspections will be performed on the PACS equipment to verify that the equipment for each PACS 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 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 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 3.5-12.4.5-2.
4.9	Non-Class 1E PACS communication module associated with Class 1E equipment will not cause a failure of a 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 communication module will not cause a failure of 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 on the PACS priority module to preclude consideration of a software common cause failure.	A report exists and concludes that 100% combinatorial type testing on the PACS priority module has been successfully completed.

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Table 2.4.5-23—Priority and Actuator Control System ITAAC (54 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
5.1	Class 1E PACS components are powered from a Class 1E division 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.

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2.4.6 Plant Fire Alarm System

1.0 Description

The plant fire alarm system (PFAS) is a non-safety related alarm signaling system which provides control and monitoring of plant fire protection, suppression and detection system parameters.

The PFAS provides the following non-safety related functions:

- Provides a fire alarm management interface to the operators.
- Controls and monitors plant fire suppression and detection systems.
- Provides the main control room (MCR) operators with information displays and supports automatic and manual control of fire protection equipment.

2.0 I&C Design Features, Displays and Controls

2.1 The PFAS provides the displays listed in Table 2.4.6-1—Plant Fire Alarm System Displays and Alarms – Main Control Room and Remote Shutdown Station.

2.2 The as-built plant fire alarm system is consistent with the post-fire safe shutdown analyses.

3.0 Electrical Power

3.1 The PFAS is provided with both an electrically supervised primary and secondary power source that will transfer automatically to the secondary power source upon loss of the primary source.

3.2 A trouble signal indication is provided in the MCR upon a loss of either power source to any local fire control panel (LFCP) or workstation.

4.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.6-2 lists the PFAS ITAAC.

Table 2.4.6-1—Plant Fire Alarm System Displays and Alarms – Main Control Room and Remote Shutdown Station

Display	Associated Alarms
PFAS graphics display with specific alarm information. Turbine Building alarm signals also displayed at PFAS.	Common PFAS Fire Alarm signal at process information and control system (PICS) Common PFSA Supervisory Alarm signal at PICS Common PFAS System Trouble signal at PICS

Table 2.4.6-2—Plant Fire Alarm System ITAAC

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The PFAS provides the displays listed in Table 2.4.6-1.	Testing will be performed to verify the existence of the displays on PICS at the MCR and the RSS as listed in Table 2.4.6-1.	a. The displays listed in Table 2.4.6-1 exist on the PICS in the MCR and the RSS. b. Turbine Building alarm system signals also displayed at PFAS with same signals listed in Table 2.4.6-1.
2.2	The as-built plant fire alarm system is consistent with the post-fire safe shutdown analyses.	An inspection will be performed.	An inspection report documents that the as-built plant fire alarm system is consistent with the post-fire safe shutdown analysis.
3.1	The PFAS is provided with both an electrically supervised primary and secondary power source that will transfer automatically to the secondary source upon loss of the primary source.	Tests will be performed to verify the transfer of power of the PFAS from the primary source of power to the secondary source.	The PFAS is provided with an electrically supervised primary and secondary power source that will transfer automatically to the secondary source upon loss of the primary source.
3.2	A trouble signal indication is provided in the MCR upon a loss of either power source to any LFCP or workstation.	Testing will be performed to verify the existence of a trouble signal indication in the MCR when either the primary or secondary power source is lost at any LFCP or workstation.	A trouble signal indication is provided in the MCR upon a loss of either power source to any LFCP or workstation.

Next File

2.4.7 Seismic Monitoring System

1.0 Description

The seismic monitoring system (SMS) produces a record of the vibratory ground motion from various areas of the plant during an earthquake so that features important to safety can be evaluated after an earthquake. The SMS is capable of sensing and permanently recording the absolute acceleration versus time.

2.0 Arrangement

2.1 The SMS in-structure instrumentation is placed at locations modeled as mass points in the building dynamic analysis so that the measured motion can be directly compared with the design spectra. Field mounted sensors of the triaxial type (i.e., three-directional, x-y-z axes) are rigidly mounted at the following locations:

- Free-field, if a suitable location is available.
- The primary containment structure (base foundation and two higher elevations).
- An independent Seismic Category I structure (foundation and higher elevation) not influenced by or connected to the primary containment structure.

3.0 I&C Design Features, Displays and Controls

3.1 The SMS system can compute the cumulative absolute velocity (CAV) and provides indication of the CAV in the main control room (MCR).

3.2 The SMS equipment has a dynamic range that allows measurement of the effects of seismic events.

3.3 The SMS equipment had bandwidth that allows measurement of the effects of seismic events.

3.4 The SMS equipment has a sampling rate that allows measurement of the effects of seismic events.

3.5 The SMS equipment has a trigger rate that allows measurement of the effects of seismic events.

4.0 Electrical Power

4.1 The SMS backup battery has capacity to power its instruments for continuous operation for a period of time.

5.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.7-1 lists the SMS ITAAC.

Table 2.4.7-1—Seismic Monitoring System ITAAC

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The location of the SMS equipment is as described in Section 2.4.7, Subsection 2.1.	a. Analyses will be performed to determine the location of the SMS equipment. b. Inspections will be performed to verify the location of the SMS equipment is per the analyses.	a. An analysis report exists that determines the location of the SMS equipment. b. The SMS equipment is located as per the analyses.
3.1	The SMS system can compute the CAV and provides a display of the CAV in the MCR.	a. Type tests, tests, analyses, or a combination of analyses and tests will be performed on the SMS. b. Inspections will be performed for the existence or retrieve-ability of a display of CAV in the MCR.	a. The SMS can compute the CAV. b. Indication and alarms from CAV can be retrieved in the MCR.
3.2	The SMS equipment has a dynamic range that allows measurement of the effects of seismic events.	Type tests, analyses or a combination of type tests and analyses of the SMS equipment will be performed.	The SMS has a dynamic range of at least 1000:1 zero-to-peak and is able to record at least 1.0 g zero-to-peak.
3.3	The SMS equipment has bandwidth that allows measurement of the effects of seismic events.	Type tests, analyses or a combination of type tests and analyses of the SMS equipment will be performed.	The SMS has bandwidth of at least 0.2 to 50 Hertz.
3.4	The SMS equipment has a sampling rate that allows measurement of the effects of seismic events.	Type tests, analyses or a combination of type tests and analyses of the SMS equipment will be performed.	The SMS has a sample rate of at least 200 samples per second in each of the three directions.
3.5	The SMS equipment has a trigger rate that allows measurement of the effects of seismic events.	Type tests, analyses or a combination of type tests and analyses of the SMS equipment will be performed.	The SMS has an actuating level that is adjustable and within the range of 0.001g and 0.02g.
4.1	The SMS backup battery has capacity to power its instruments for continuous operation for a period of time.	Type tests, analyses or a combination of type tests and analyses of the SMS equipment will be performed.	The SMS has a backup battery that has a capacity for a minimum of 25 minutes of system operation.

Next File

2.4.8 Leakage Detection System

1.0 Description

The leakage detection system supports the identification of reactor coolant pressure boundary (RCPB) leakage and leakage from the main steam line (MSL) piping inside the containment (i.e., from the steam generators to the first anchor point location at the Containment Building penetration).

2.0 I&C Design Features, Displays and Controls

2.1 Reactor Building fan cooler condensate collector ~~level~~ flow indication is provided in the MCR.

2.2 MSL humidity detection indication is provided in the MCR.

3.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.8-1 lists the Leakage Detection System ITAAC.

Table 2.4.8-1—Leakage Detection System ITAAC

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	Reactor Building (RB) cooler condensate flow measurement indication is provided in the MCR. Reactor BuildingRB fan cooler condensate collector level flow indication is provided in the MCR. 452, 07.03-36	Testing will be performed for the Reactor Building condensate collector level indications. a. Analyses and tests will be performed to design RB cooler condensate flow measurement equipment. b. Test of the as-installed RB cooler condensate flow detection equipment will be performed.	Condensate collector level change is indicated in the MCR on the Reactor Building condensate collector level indications. • Reactor Building fan cooler level condensate levels JYH11CF001 JYH14CF001 JYH21CF001 JYH22CF001 JYH23CF001 JYH24CF001 JYH22CF003 JYH22CF004 JYH23CF003 JYH23CF004 • The system can detect 1.0 gpm condensate flow within 1 hour. a. A design report exists and concludes that the as-designed RB cooler condensate flow detection equipment can detect condensate flow of 0.5 gpm. b. The installed RB cooler condensate flow detection equipment can detect a flow of 0.5 gpm.
2.2	MSL humidity detection indication is provided in the MCR.	a. Analyses and tests will be performed to design the MSL humidity detection equipment.	a. A design report exists and concludes that the as-designed MSL humidity detection equipment can detect MSL leakage of 0.1 gpm.

Table 2.4.8-1—Leakage Detection System ITAAC
(2 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
		b. Inspections of the installation of the MSL humidity detection equipment will be performed and deviations to the design report will be reconciled.	b. The installed MSL humidity detection equipment complies with the design and deviations have been reconciled.

Next File

2.4.9 Process Automation System

There are no Tier 1 entries for this system.

Next File

2.4.10 Process Information and Control System

1.0 Description

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The process information and control system (PICS) is implemented with an industrial I&C platform.~~a digital human machine interface (HMI).~~ It provides monitoring and control of plant systems. The PICS is non-safety related and is provided in both the main control room (MCR) and the remote shutdown station (RSS).

2.0 I&C Design Features

2.1 Deleted.~~The system hardware and software in the PICS is diverse from the safety-related system hardware and software in the Safety Information and Control System (SICS).~~

2.2 The PICS system design is accomplished through a phased approach which includes the following (or equivalent) phases:

1. System Requirements Phase.
2. System Design Phase.
3. Software/Hardware Requirements Phase.
4. Software/Hardware Design Phase.
5. Software/Hardware Implementation Phase.
6. Software/Hardware Validation Phase.
7. System Integration Phase.
8. System Validation Phase.

2.3 Deleted.

2.4 Electrical isolation is provided on PICS connections between the RSS and the MCR.

2.5 The capability to transfer control of the PICS from the MCR to the RSS exists in a fire area separate from the MCR and allows transfer of control without entry into the MCR.

3.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.10-1 lists the PICS ITAAC.

Table 2.4.10-1—Process Information and Control System ITAAC (3 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	Deleted.~~The system hardware and software in the PICS is diverse from the safety-related system hardware and software in the SICS.~~	Deleted.~~An analysis will be performed to demonstrate that the system hardware and software in the PICS is diverse from the safety-related system hardware and software in the SICS.~~	Deleted.~~A report exists and concludes that the system hardware and software in the PICS is diverse from the safety-related system hardware and software in the SICS.~~
2.2	The PICS system design is accomplished through a phased approach which includes the following (or equivalent) phases: 1) System Requirements Phase. 2) System Design Phase. 3) Software/Hardware Requirements Phase. 4) Software/Hardware Design Phase. 5) Software/Hardware Implementation Phase. 6) Software/Hardware Validation Phase. 7) System Integration Phase. 8) System Validation Phase.	a. Analyses will be performed to verify that the outputs for the PICS system requirements phase conform to the requirements of that phase. ~~{{DAC}}~~ b. Analyses will be performed to verify that the outputs for the PICS system design phase conform to the requirements of that phase. ~~{{DAC}}~~ c. Analyses will be performed to verify that the outputs for the PICS software/hardware requirements phase conform to the requirements of that phase. ~~{{DAC}}~~ d. Analyses will be performed to verify that the outputs for the PICS software/hardware design phase conform to the requirements of that phase. ~~{{DAC}}~~ e. Analyses will be performed to verify that the outputs for the PICS software/hardware implementation phase conform to the requirements of that phase.	a. A report exists and concludes that the outputs for the PICS system requirements phase conform to the requirements of that phase. ~~{{DAC}}~~ b. A report exists and concludes that the outputs for the PICS system design phase conform to the requirements of that phase. ~~{{DAC}}~~ c. A report exists and concludes that the outputs for the PICS software/hardware requirements phase conform to the requirements of that phase. ~~{{DAC}}~~ d. A report exists and concludes that the outputs for the PICS software/hardware design phase conform to the requirements of that phase. ~~{{DAC}}~~ e. A report exists and concludes that the outputs for the PICS software/hardware implementation phase conform to the requirements of that phase.

Table 2.4.10-1—Process Information and Control System ITAAC (3 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
		f. Analyses will be performed to verify that the outputs for the PICS software/hardware validation phase conform to the requirements of that phase. g. Analyses will be performed to verify that the outputs for the PICS system integration phase conform to the requirements of that phase. h. Analyses will be performed to verify that the outputs for the PICS system validation phase conform to the requirements of that phase.	f. A report exists and concludes that the outputs for the PICS software/hardware validation phase conform to the requirements of that phase. g. A report exists and concludes that the outputs for the PICS system integration phase conform to the requirements of that phase. h. A report exists and concludes that the outputs for the PICS system validation phase conform to the requirements of that phase.
2.3	Deleted.	Deleted.	Deleted.
2.4	Electrical isolation is provided on PICS connections between the RSS and the MCR.	a. Analyses will be performed to determine the test specification for electrical isolation devices on connections between the RSS and the MCR for the PICS. b. Type tests, analyses, or a combination of type tests and analyses will be performed on the electrical isolation devices between the RSS and the MCR for the PICS.	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 the RSS and the MCR for the PICS. b. A report exists and concludes that the isolation devices used between the RSS and the MCR for the PICS prevent the propagation of credible electrical faults.
		c. Inspections will be performed on connections between the RSS and the MCR for the PICS.	c. Electrical isolation devices exist on connections between the RSS and the MCR for the PICS.

Table 2.4.10-1—Process Information and Control System ITAAC (3 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.5	The capability to transfer control of the PICS from the MCR to the RSS exists in a fire area separate from the MCR and allows transfer of control without entry into the MCR.	a. Inspections will be performed to verify the existence of procedures.	a. A report exists and concludes that procedures exist for transfer of control of the PICS from the MCR to the RSS.
		b. Tests will be performed to verify that control of the PICS can be transferred from the MCR to the RSS.	b. A report exists and concludes that the test results confirm that control of the PICS can be transferred from the MCR to the RSS.
		c. An inspection will be performed to verify the existence of the PICS RSS transfer means in a fire are separate from the MCR.	c. Transfer means exist in a fire area separate from the MCR.

Next File

2.4.11 Boron Concentration Measurement System

1.0 Description

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The boron concentration measurement system (BCMS) measures the boron concentration in the chemical and volume control system (CVCS). ~~The boron concentration measurement system signals are processed in four divisions of the protection system (PS).~~

The BCMS has the following safety-related function:

- ~~Provides~~ Sends boron concentration measurement signals to the signal conditioning and distribution system (SCDS)~~s for the PS~~.

2.0 Arrangement

2.1 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 listed in Table 2.4.11-2—Boron Concentration Measurement System Output Signals.

4.2 The BCMS equipment classified as Class 1E 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.

5.0 Electrical Power Design Features

5.1 The components identified as Class1E 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.

6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.11-3 lists the BCMS ITAAC.

Table 2.4.11-1—Boron Concentration Measurement System Equipment

Description	Tag Number (1)	Location	Seismic Category	IEEE Class 1E (2)
Boron Concentration Sensor Division 1	30KBA34CQ857A	Fuel Building	I	1^N^ 2^A^
Boron Concentration Sensor Division 2	30KBA34CQ857B	Fuel Building	I	2^N^ 1^A^
Boron Concentration Sensor Division 3	30KBA34CQ858B	Fuel Building	I	3^N^ 4^A^
Boron Concentration Sensor Division 4	30KBA34CQ858A	Fuel Building	I	4^N^ 3^A^
Temperature Sensor Division 1	30KBA34CT857A	Fuel Building	I	1^N^ 2^A^
Temperature Sensor Division 2	30KBA34CT857B	Fuel Building	I	2^N^ 1^A^
Temperature Sensor Division 3	30KBA34CT858B	Fuel Building	I	3^N^ 4^A^
Temperature Sensor Division 4	30KBA34CT858A	Fuel Building	I	4^N^ 3^A^
Boron Concentration Measurement Conditioning Cabinets Division 1	30CLE23	Safeguard Building 1	I	1^N^ 2^A^
Boron Concentration Measurement Conditioning Cabinets Division 2	30CLF23	Safeguard Building 2	I	2^N^ 1^A^
Boron Concentration Measurement Conditioning Cabinets Division 3	30CLG23	Safeguard Building 3	I	3^N^ 4^A^
Boron Concentration Measurement Conditioning Cabinets Division 4	30CLH23	Safeguard Building 4	I	4^N^ 3^A^

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 2.4.11-2—Boron Concentration Measurement System Output Signals

Item #	Output Signal	Signal Generation	Recipient	# Divisions	IEEE Class 1E
1	Boron Concentration Measurement	Auto	SCDSPS	4	Yes
2	Fluid Temperature for Boron Concentration Measurement Correction	Auto	PS	4	Yes

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

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The BCMS equipment is located as listed in Table 2.4.11–1.	Inspections will be performed of the location of the BCMS equipment.	The equipment listed in Table 2.4.11-1 is located as listed in Table 2.4.11-1.
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.	a. Type tests, analyses or a combination of type tests and analyses will be performed on the equipment listed as Seismic Category I in Table 2.4.11-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements. b. Inspections will be performed of the Seismic Category I equipment listed in Table 2.4.11-1 to verify that the equipment including anchorage is installed as specified on the construction drawings.	a. Tests/analysis reports exist and conclude that the equipment listed as Seismic Category I in Table 2.4.11-1 can withstand seismic design basis loads without loss of safety function. b. Inspection reports exist and conclude that the Seismic Category I equipment listed in Table 2.4.11-1 including anchorage is installed as specified on the construction drawings.
4.1	The BCMS provides output signals listed in Table 2.4.11-2.	Tests will be performed to verify the existence of output signals.	The BCMS provides output signals to the recipients listed in Table 2.4.11-2.
4.2	The BCMS equipment classified as Class 1E in Table 2.4.11-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.	Type tests or type tests and analysis of these will be performed for the Class 1E equipment listed in Table 2.4.11-1.	A report exists and concludes that the equipment listed as Class 1E in Table 2.4.11-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.

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

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
5.1	The components identified as Class1E 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.

Next File

2.4.12 Vibration Monitoring System

There are no Tier 1 entries for this system.

Next File

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:

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- Interrupts power to the CRDMs via the reactor trip contactors.
- Provides signals that report the status of the reactor trip contactors ~~modules~~ to the ~~PS~~SCDS.

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

- Actuates the rod control cluster assemblies through the CRDMs.

2.0 Arrangement

2.1 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 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.

4.3 Each reactor trip contactor opens when a RT signal is received from the corresponding PS division.

4.4 The CRDCS limits the rod cluster control ~~cluster~~ assembly (RCCA) bank withdrawal rate to a maximum value.

5.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.13-3 lists the CRDCS ITAAC.

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Table 2.4.13-1—Control Rod Drive Control System Equipment
(4 Sheets)

Description	Tag Number (1)	Location	Seismic Category	IEEE Class 1E
Reactor trip contactors ~~modules~~	~~31BUA1BZ001~~ ~~31BUA2BZ001~~ ~~31BUA3BZ001~~ ~~31BUA4BZ001~~ ~~31BUA5BZ001~~ ~~31BUA6BZ001~~ ~~31BUA7BZ001~~ ~~31BUA8BZ001~~ ~~31BUA9BZ001~~ ~~31BUA10BZ001~~ ~~31BUA11BZ001~~ 31BUA1BZ001 31BUA1BZ002 31BUA1BZ003 31BUA1BZ004 31BUA2BZ001 31BUA2BZ002 31BUA2BZ003 31BUA2BZ004 31BUA3BZ001 31BUA3BZ002 31BUA3BZ003 31BUA3BZ004 31BUA4BZ001 31BUA4BZ002 31BUA4BZ003 31BUA4BZ004 31BUA5BZ001 31BUA5BZ002 31BUA5BZ003 31BUA5BZ004 31BUA6BZ001 31BUA6BZ002 31BUA6BZ003 31BUA6BZ004 31BUA7BZ001 31BUA7BZ002 31BUA7BZ003	Safeguard Building 1	I	Yes

Table 2.4.13-1—Control Rod Drive Control System Equipment (4 Sheets)

Description	Tag Number [1]	Location	Seismic Category	IEEE Class 1E
	31BUA7BZ004 31BUA8BZ001 31BUA8BZ002 31BUA8BZ003 31BUA8BZ004 31BUA9BZ001 31BUA9BZ002 31BUA9BZ003 31BUA9BZ004 31BUA10BZ001 31BUA10BZ002 31BUA10BZ003 31BUA10BZ004 31BUA11BZ001 31BUA11BZ002 31BUA11BZ003 31BUA11BZ004			
Reactor trip contactors ~~modules~~ 452, 07.03-36	~~34BUA1BZ001~~ ~~34BUA2BZ001~~ ~~34BUA3BZ001~~ ~~34BUA4BZ001~~ ~~34BUA5BZ001~~ ~~34BUA6BZ001~~ ~~34BUA7BZ001~~ ~~34BUA8BZ001~~ ~~34BUA9BZ001~~ ~~34BUA10BZ001~~ ~~34BUA11BZ001~~ ~~34BUA12BZ001~~ 34BUA1BZ001 34BUA1BZ002 34BUA1BZ003 34BUA1BZ004 34BUA2BZ001 34BUA2BZ002 34BUA2BZ003 34BUA2BZ004 34BUA3BZ001	Safeguard Building 4	I	Yes

Table 2.4.13-1—Control Rod Drive Control System Equipment
(4 Sheets)

Description	Tag Number (1)	Location	Seismic Category	IEEE Class 1E
	34BUA3BZ002			
	34BUA3BZ003			
	34BUA3BZ004			
	34BUA4BZ001			
	34BUA4BZ002			
	34BUA4BZ003			
	34BUA4BZ004			
	34BUA5BZ001			
	34BUA5BZ002			
	34BUA5BZ003			
	34BUA5BZ004			
	34BUA6BZ001			
	34BUA6BZ002			
	34BUA6BZ003			
	34BUA6BZ004			
	34BUA7BZ001			
	34BUA7BZ002			
	34BUA7BZ003			
	34BUA7BZ004			
	34BUA8BZ001			
	34BUA8BZ002			
	34BUA8BZ003			
	34BUA8BZ004			
	34BUA9BZ001			
	34BUA9BZ002			
	34BUA9BZ003			
	34BUA9BZ004			
	34BUA10BZ001			
	34BUA10BZ002			
	34BUA10BZ003			
	34BUA10BZ004			
	34BUA11BZ001			
	34BUA11BZ002			
	34BUA11BZ003			
	34BUA11BZ004			
	34BUA12BZ001			
	34BUA12BZ002			
	34BUA12BZ003			

Table 2.4.13-1—Control Rod Drive Control System Equipment
(4 Sheets)

Description	Tag Number [1]	Location	Seismic Category	IEEE Class 1E
	34BUA12BZ004			

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

Table 2.4.13-2—Control Rod Drive Control System Input Signals

Item #	Signal	Source	# Divisions	IEEE Class 1E
1	Reactor Trip Limitation Signal	PS	4	Yes

Table 2.4.13-3—Control Rod Drive Control System ITAAC

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	The CRDCS equipment is located as listed in Table 2.4.13-1.	Inspections will be performed of the location of the CRDCS equipment.	The equipment listed in Table 2.4.13-1 is located as listed in Table 2.4.13-1.
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.	a. Type tests, , analyses or a combination of type tests and analyses will be performed on the equipment listed as Seismic Category I in Table 2.4.13-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Tests/analysis reports exist and conclude that the equipment listed as Seismic Category I in Table 2.4.13-1 can withstand seismic design basis loads without loss of safety function.
		b. Inspections will be performed of the Seismic Category I equipment listed in Table 2.4.13-1 to verify that the equipment including anchorage is installed as specified on the construction drawings.	b. Inspection reports exist and conclude that the Seismic Category I equipment listed in Table 2.4.13-1 including anchorage is installed as specified on the construction drawings.
4.1	The CRDCS equipment classified as Class 1E in Table 2.4.13-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.	Type tests or type tests and analysis of these will be performed for the Class 1E equipment listed in Table 2.4.13-1.	A report exists and concludes that the equipment listed as Class 1E in Table 2.4.13-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.
4.2	The CRDCS receives input signals from the sources listed in Table 2.4.13-2.	Tests will be performed to verify the existence of input signals.	The CRDCS receives input signals from the sources listed in Table 2.4.13-2.
4.3	Each reactor trip contactor opens when a RT signal is received from the corresponding PS division.	Tests will be performed on the as-built reactor trip contactors using test signals.	Each reactor trip contactor listed in Table 2.4.13-1 opens in response to a RT test signal from the corresponding PS division.
4.4	The CRDCS limits the RCCA bank withdrawal rate to a maximum value.	Tests will be performed to determine the maximum RCCA bank withdrawal rate.	The CRDCS limits the RCCA bank withdrawal rate to 30 inches per minute or less.

Next File

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:

- Measures the hydrogen concentration in containment.

2.0 Arrangement

2.1 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 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.

5.0 Electrical Power Design Features

5.1 The components 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.

6.0 Environmental Qualifications

6.1 Components listed as Class 1E in Table 2.4.14-1 that are designated as harsh environment, will perform their function in the environments that exist during and following design basis events.

7.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.14-2 lists the HMS ITAAC.

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Table 2.4.14-1—Hydrogen Monitoring System Equipment

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

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.

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

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The HMS equipment is located as listed in Table 2.4.14-1.	Inspections will be performed of the location of the HMS equipment.	The equipment listed in Table 2.4.14-1 is located as listed in Table 2.4.14-1.
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.	a. Type tests, analyses or a combination of type tests and analyses will be performed on the equipment listed as Seismic Category I in Table 2.4.14-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements. b. Inspections will be performed of the Seismic Category I equipment listed in Table 2.4.14-1 to verify that the equipment including anchorage is installed as specified on the construction drawings.	a. Tests/analysis reports exist and conclude that the equipment listed as Seismic Category I in Table 2.4.14-1 withstand seismic design basis loads without loss of safety function. b. Inspection reports exist and conclude that the Seismic Category I equipment listed in Table 2.4.14-1 including anchorage is installed as specified on the construction drawings.
4.1	The HMS equipment classified as Class 1E in Table 2.4.14-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.	Type tests or type tests and analysis of these will be performed for the Class 1E equipment listed in Table 2.4.14-1.	A report exists and concludes that the equipment listed as Class 1E in Table 2.4.14-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.
5.1	The components 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.

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

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
6.1	Components listed as Class 1E in Table 2.4.14-1 that are designated as harsh environment, will perform their function in the environments that exist during and following design basis events.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components listed as Class 1E in Table 2.4.14-1 to perform their function for the environmental conditions that could occur during and following design basis events.	a. Environmental Qualification Data Packages (EQDP) exist and conclude that the components listed as Class 1E in Table 2.4.14-1 can perform their function during and following design basis events including the time required to perform the listed function.
		b. Components listed as Class 1E in Table 2.4.14-1 will be inspected to verify installation in accordance with the construction drawings including the associated wiring, cables and terminations. Deviations to the construction drawings will be reconciled to the EQDP.	b. Inspection reports exists and conclude that the components listed as Class 1E in Table 2.4.14-1 has been installed per the construction drawings and any deviations have been reconciled to the EQDP.

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2.4.15 Reactor Control, Surveillance, and Limitation System

There are no Tier 1 entries for this system.

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~~1.0Description~~

~~The reactor control, surveillance, and limitation system (RCSL) implements non-safety related automatic and manual control functions, limitation functions, and monitoring functions required to control and limit the reactor core parameters.~~

~~2.0Equipment and System Performance~~

~~2.1The RCSL limits the rod control cluster assembly (RCCA) bank withdrawal rate to a maximum value.~~

~~3.0System Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Table 2.4.15-1 lists the RCSL ITAAC.~~

~~Table 2.4.15-1—Reactor Control, Surveillance, and Limitation System ITAAC~~

~~Commitment Wording~~		~~Inspections, Tests, Analyses~~	~~Acceptance Criteria~~
~~2.1~~	~~The RCSL limits the RCCA bank withdrawal rate to a maximum value.~~	~~Tests will be performed to determine the maximum RCCA bank withdrawal rate.~~	~~The RCSL limits the RCCA bank withdrawal rate to 30 inches per minute or less.~~

Next File

2.4.16 Reactor Pressure Vessel Level Measurement System

There are no Tier 1 entries for this system.

Next File

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:

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

2.0 Arrangement

2.1 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 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 listed in Table 2.4.17-2.

5.0 Electrical Power Design Features

5.1 The components 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.

6.0 Environmental Qualifications

6.1 Components listed as Class 1E in Table 2.4.17-1 that are designated as harsh environment, will perform their function in the environments that exist during and following design basis events.

7.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.17-3 lists the EIS ITAAC.

Table 2.4.17-1—Excore Instrumentation System Equipment (2 Sheets)

Description	Tag Number (1)	Location	Seismic Class	IEEE Class 1E (2)	Harsh Environment
Source Range Detector, Division 1	30JKT01CX851	Reactor Building	I	1^N 2^A	Yes
Source Range Detector, Division 2	30JKT01CX852	Reactor Building	I	2^N 1^A	Yes
Source Range Detector, Division 3	30JKT01CX853	Reactor Building	I	3^N 4^A	Yes
Intermediate Range Detector, Division 1	30JKT02CX851	Reactor Building	I	1^N 2^A	Yes
Intermediate Range Detector, Division 2	30JKT02CX852	Reactor Building	I	2^N 1^A	Yes
Intermediate Range Detector, Division 3	30JKT02CX853	Reactor Building	I	3^N 4^A	Yes
Intermediate Range Detector, Division 4	30JKT02CX854	Reactor Building	I	4^N 3^A	Yes
Upper Core Half Power Range Detector, Division 1	30JKT03CX851	Reactor Building	I	1^N 2^A	Yes
Lower Core Half Power Range Detector, Division 1	30JKT03CX855	Reactor Building	I	1^N 2^A	Yes
Upper Core Half Power Range Detector, Division 2	30JKT03CX852	Reactor Building	I	2^N 1^A	Yes
Lower Core Half Power Range Detector, Division 2	30JKT03CX856	Reactor Building	I	2^N 1^A	Yes
Upper Core Half Power Range Detector, Division 3	30JKT03CX853	Reactor Building	I	3^N 4^A	Yes
Lower Core Half Power Range Detector, Division 3	30JKT03CX857	Reactor Building	I	3^N 4^A	Yes
Upper Core Half Power Range Detector, Division 4	30JKT03CX854	Reactor Building	I	4^N 3^A	Yes

Table 2.4.17-1—Excore Instrumentation System Equipment (2 Sheets)

Description	Tag Number (1)	Location	Seismic Class	IEEE Class 1E (2)	Harsh Environment
Lower Core Half Power Range Detector, Division 4	30JKT03CX858	Reactor Building	I	4[N] 3[A]	Yes
Excore Instrumentation Conditioning Cabinets – Division 1	30CLE13	Safeguard Building 1	I	1[N] 2[A]	No
Excore Instrumentation Conditioning Cabinets – Division 2	30CLF13	Safeguard Building 2	I	2[N] 1[A]	No
Excore Instrumentation Conditioning Cabinets – Division 3	30CLG13	Safeguard Building 3	I	3[N] 4[A]	No
Excore Instrumentation Conditioning Cabinets – Division 4	30CLH13	Safeguard Building 4	I	4[N] 3[A]	No

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 2.4.17-2—Excore Instrumentation System Output Signals

Item #	Output Signal	~~Signal Generation~~	Recipient	# of Divisions	~~IEEE Class 1E~~
1	Intermediate Range Detector Signal	~~Auto~~	~~PS~~SCDS	4	~~Yes~~
2	Power Range Detector Signal	~~Auto~~	~~PS~~SCDS	4	~~Yes~~
3	Source Range Detector Signal		SCDS	43	

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

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The EIS equipment is located as listed in Table 2.4.17-1.	Inspections will be performed of the location of the EIS equipment.	The equipment listed in Table 2.4.17-1 is located as listed in Table 2.4.17-1.
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.	a. Type tests, analyses or a combination of type tests and analyses will be performed on the equipment listed as Seismic Category I in Table 2.4.17-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Tests/analysis reports exist and conclude that the equipment listed as Seismic Category I in Table 2.4.17-1 can withstand seismic design basis loads without loss of safety function.
		b. Inspections will be performed of the Seismic Category I equipment listed in Table 2.4.17-1 to verify that the equipment including anchorage is installed as specified on the construction drawings.	b. Inspection reports exist and conclude that the Seismic Category I equipment listed in Table 2.4.17-1 including anchorage is installed as specified on the construction drawings.
4.1	The EIS equipment classified as Class 1E in Table 2.4.17-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.	Type tests or type tests and analysis of these will be performed for the Class 1E equipment listed in Table 2.4.17-1.	A report exists and concludes that the equipment listed as Class 1E in Table 2.4.17-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.
4.2	The EIS system provides output signals listed in Table 2.4.17-2.	Tests will be performed to verify the existence of output signals.	The EIS system provides output signals to the recipients listed in Table 2.4.17-2.

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

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
5.1	The components 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.	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.
6.1	Components listed as Class 1E in Table 2.4.17-1 that are designated as harsh environment, will perform their function in the environments that exist during and following design basis events.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components listed as Class 1E in Table 2.4.17-1 to perform their function for the environmental conditions that could occur during and following design basis events. b. Components listed as Class 1E in Table 2.4.17-1 will be inspected to verify installation in accordance with the construction drawings including the associated wiring, cables and terminations. Deviations to the construction drawings will be reconciled to the EQDP.	a. Environmental Qualification Data Packages (EQDP) exist and conclude that the components listed as Class 1E in Table 2.4.17-1 can perform their function during and following design basis events including the time required to perform the listed function. b. Inspection reports exists and conclude that the components listed as Class 1E in Table 2.4.17-1 has been installed per the construction drawings and any deviations have been reconciled to the EQDP.

Next File

2.4.18 Fatigue Monitoring System

There are no Tier 1 entries for this system.

Next File

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 related functions:

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- Provides self powered neutron detector (SPND) output signals to ~~be used by the protection system (PS)~~signal conditioning and distribution system (SCDS).
- Provides a measurement of core outlet temperatures.

2.0 Arrangement

2.1 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 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 listed in Table 2.4.19-2.

5.0 Environmental Qualifications

5.1 Components listed as Class 1E in Table 2.4.19-1 that are designated as harsh environment, will perform their function in the environments that exist during and following design basis events.

6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.19-3 lists the ICIS ITAAC.

Table 2.4.19-1—Incore Instrumentation Equipment (4 Sheets)

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Description	Tag Number (1)	Location	Seismic Class	IEEE Class 1E	Harsh Environment
SPND ~~detectors~~ Division 1	30JKS41CX811 30JKS41CX812 30JKS41CX813 30JKS41CX814 30JKS41CX815 30JKS41CX816 30JKS16CX811 30JKS16CX812 30JKS16CX813 30JKS16CX814 30JKS16CX815 30JKS16CX816 30JKS21CX811 30JKS21CX812 30JKS21CX813 30JKS21CX814 30JKS21CX815 30JKS21CX816	Reactor Building	I	Yes	Yes
SPND ~~detectors~~ Division 2	30JKS11CX821 30JKS11CX822 30JKS11CX823 30JKS11CX824 30JKS11CX825 30JKS11CX826 30JKS13CX821 30JKS13CX822 30JKS13CX823 30JKS13CX824 30JKS13CX825 30JKS13CX826 30JKS15CX821 30JKS15CX822 30JKS15CX823 30JKS15CX824 30JKS15CX825 30JKS15CX826	Reactor Building	I	Yes	Yes

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Table 2.4.19-1—Incore Instrumentation Equipment (4 Sheets)

Description	Tag Number [(1)]	Location	Seismic Class	IEEE Class 1E	Harsh Environment
SPND ~~detectors~~ Division 3	30JKS42CX831 30JKS42CX832 30JKS42CX833 30JKS42CX834 30JKS42CX835 30JKS42CX836 30JKS31CX831 30JKS31CX832 30JKS31CX833 30JKS31CX834 30JKS31CX835 30JKS31CX836 30JKS22CX831 30JKS22CX832 30JKS22CX833 30JKS22CX834 30JKS22CX835 30JKS22CX836	Reactor Building	I	Yes	Yes
SPND ~~detectors~~ Division 4	30JKS14CX841 30JKS14CX842 30JKS14CX843 30JKS14CX844 30JKS14CX845 30JKS14CX846 30JKS32CX841 30JKS32CX842 30JKS32CX843 30JKS32CX844 30JKS32CX845 30JKS32CX846 30JKS12CX841 30JKS12CX842 30JKS12CX843 30JKS12CX844 30JKS12CX845 30JKS12CX846	Reactor Building	I	Yes	Yes

Table 2.4.19-1—Incore Instrumentation Equipment
(4 Sheets)

Description	Tag Number [1]	Location	Seismic Class	IEEE Class 1E	Harsh Environment
Core Outlet Thermocouples (NR) Division 1	30JKS16CT812 30JKS21CT812 30JKS41CT812 30JKS16CT813 30JKS21CT813 30JKS41CT813	Reactor Building	I	Yes	Yes
Core Outlet Thermocouples (NR) Division 2	30JKS11CT822 30JKS13CT822 30JKS15CT822 30JKS11CT823 30JKS13CT823 30JKS15CT823	Reactor Building	I	Yes	Yes
Core Outlet Thermocouples (NR) Division 3	30JKS22CT832 30JKS31CT832 30JKS42CT832 30JKS22CT833 30JKS31CT833 30JKS42CT833	Reactor Building	I	Yes	Yes
Core Outlet Thermocouples (NR) Division 4	30JKS12CT842 30JKS14CT842 30JKS32CT842 30JKS12CT843 30JKS14CT843 30JKS32CT843	Reactor Building	I	Yes	Yes
Core Outlet Thermocouples (WR) Division 1	30JKS16CT811 30JKS21CT811 30JKS41CT811	Reactor Building	I	Yes	Yes
Core Outlet Thermocouples (WR) Division 2	30JKS11CT821 30JKS13CT821 30JKS15CT821	Reactor Building	I	Yes	Yes
Core Outlet Thermocouples (WR) Division 3	30JKS22CT831 30JKS31CT831 30JKS42CT831	Reactor Building	I	Yes	Yes

Table 2.4.19-1—Incore Instrumentation Equipment (4 Sheets)

Description	Tag Number (1)	Location	Seismic Class	IEEE Class 1E	Harsh Environment
Core Outlet Thermocouples (WR) Division 4	30JKS12CT841 30JKS14CT841 30JKS32CT841	Reactor Building	I	Yes	Yes
Incore Instrumentation Cabinets – Division 1	30CLE12GH001 30CLE15GH	Safeguard Building 1	I	1[N] 2[A]	No
Incore Instrumentation Cabinets – Division 2	30CLF12GH002 30CLF15GH	Safeguard Building 2	I	2[N] 1[A]	No
Incore Instrumentation Cabinets – Division 3	30CLG12GH003 30CLG15GH	Safeguard Building 3	I	3[N] 4[A]	No
Incore Instrumentation Cabinets – Division 4	30CLH12GH004 30CLH15GH	Safeguard Building 4	I	4[N] 3[A]	No

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 2.4.19-2—Incore Instrumentation System Output Signals

Item #	Output Signal	~~Signal Generation~~	Recipient	# Divisions	~~IEEE Class 1E~~
1	Neutron Flux Measurements	~~Auto~~	~~PS~~ SCDS	4	~~Yes~~

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

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The ICIS equipment is located as listed in Table 2.4.19-1.	Inspections will be performed of the location of the ICIS equipment.	The equipment listed in Table 2.4.19-1 is located as listed in Table 2.4.19-1.
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.	a. Type tests, analyses or a combination of type tests and analyses will be performed on the equipment listed as Seismic Category I in Table 2.4.19-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Tests/analysis reports exist and conclude that the equipment listed as Seismic Category I in Table 2.4.19-1 can withstand seismic design basis loads without loss of safety function.
		b. Inspections will be performed of the Seismic Category I equipment listed in Table 2.4.19-1 to verify that the equipment including anchorage is installed as specified on the construction drawings.	b. Inspection reports exist and conclude that the Seismic Category I equipment listed in Table 2.4.19-1 including anchorage is installed as specified on the construction drawings.
4.1	The ICIS equipment classified as Class 1E in Table 2.4.19-1 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 for the Class 1E equipment listed in Table 2.4.19-1.	A report exists and concludes that the equipment listed as Class 1E in Table 2.4.19-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.
4.2	The ICIS provides output signals listed in Table 2.4.19-2.	Tests will be performed to verify the existence of output signals.	The ICIS provides output signals to the recipients listed in Table 2.4.19-2.
5.1	Components listed as Class 1E in Table 2.4.19-1 that are designated as harsh environment, will perform their function in the environments that exist during and following design basis events.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components listed as Class 1E in Table 2.4.19-1 to perform their function for the environmental conditions that could occur during and following design basis events.	a. Environmental Qualification Data Packages (EQDP) exist and conclude that the components listed as Class 1E in Table 2.4.19-1 can perform their function during and following design basis events including the time required to perform the listed function.

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

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
		b. Components listed as Class 1E in Table 2.4.19-1 will be inspected to verify installation in accordance with the construction drawings including the associated wiring, cables and terminations. Deviations to the construction drawings will be reconciled to the EQDP.	b. Inspection reports exists and conclude that the components listed as Class 1E in Table 2.4.19-1 has been installed per the construction drawings and any deviations have been reconciled to the EQDP.

Next File

2.4.20 Loose Parts Monitoring System

There are no Tier 1 entries for this system.

Next File

2.4.21 ~~Communication System~~Deleted

~~1.0Description~~

~~1.1 The communication system (COMS) provides intra-plant (inside buildings) and inter-plant (between buildings) communications.~~

~~2.0Arrangement~~

~~2.1The digital telephone system, the public address and alarm system, sound powered system, and portable wireless communication system provide station to station communication and area broadcasting between the main control room (MCR) and all the locations listed in Table 2.4.21-1—Communication Equipment Locations.~~

~~3.0System Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Table 2.4.21-2 lists the COMS ITAAC.~~

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Table 2.4.21-1—Communication Equipment Locations

Primary Area / Location
Remote Shutdown Station
Technical Support Center
Operational Support Center
Control Rod Drive Equipment Area
Refueling Platform Area
Turbine Generator Operating Area
Emergency Diesel Generator Operating Areas

Note:

1.Equipment is located in various rooms of the Safeguards Buildings, Emergency Power Generation Building and Essential Service Water Pump Station.

Table 2.4.21-2—Communication System ITAAC

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The digital telephone system, the public address and alarm system, sound powered system, and portable wireless communication system provide station to station communication and area broadcasting between the (MCR) and all the locations listed in Table 2.4.21-1.	Tests will be performed on the digital telephone system, the public address and alarm system, sound powered system, and portable wireless communication system.	a. The digital telephone system, public address and alarm system, and the sound powered system equipment exist in the MCR and the locations listed in Table 2.4.21-1. b. Voice transmission and reception via the digital telephone system and sound powered system is verified between the MCR and the locations listed in Table 2.4.21-1. c. The broadcasting of voice messages from the MCR to the locations listed in Table 2.4.21-1 via the public address and alarm system is verified. Voice transmission and reception via the portable wireless communication system is verified between the MCR and the locations listed in Table 2.4.21-1.

Next File

2.4.22 Radiation Monitoring System

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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 surveillance of ionizing radiation and provides a signal that initiates Reactor Building air filtration isolationsafety-related signals to the SCDS.

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

- Provides non-safety-related signals for the display of non-safety related radiological conditions to the SCDS.

2.0 Arrangement

2.1 The location of the radiation monitoring systemRMS equipment is located as listed in Table 2.4.22-1—Radiation Monitoring System Equipment Mechanical Design.

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 the safety function. listed in Table 2.4.22-1.

4.0 I&C Design Features, Displays and Controls

4.1 The RMS provides the output signals listed in Table 2.4.22-2.Each monitor listed in Table 2.4.22-1 initiates a MCR alarm when radiation level exceeds a preset limit.

4.2 Deleted.Each channel for monitors listed in Table 2.4.22-1 provides an indication of radiation level.

5.0 Electrical Power Design Features

5.1 The components identified as Class 1E in Table 2.4.22-2 1 are powered from the Class 1E division as listed in Table 2.4.22-2 1 in a normal or alternate feed condition.

6.0 Environmental Qualifications

6.1 Components in Table 2.4.22-21, that are designated as harsh environment, will perform their function listed in Table 2.4.22-1 in the environments that exist during and following design basis events.

7.0 Equipment and System Performance

7.1 Deleted.~~Containment High Range Dose Rate Monitors listed in Table 2.4.22-1 initiate Reactor Building air filtration isolation upon receipt of high radioactivity levels.~~

8.0 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.22-3 lists the ~~radiation monitoring system~~RMS ITAAC.

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Table 2.4.22-1—Radiation Monitoring System Equipment (2 Sheets)

Description	Tag Number	Location	Seismic Category	IEEE Class 1E	Harsh Environment
Containment High Range Dose Rate Monitor	30JYK15CR101	Reactor Building	I	1^N 2^A	Yes
Containment High Range Dose Rate Monitor	30JYK15CR102	Reactor Building	I	2^N 1^A	Yes
Containment High Range Dose Rate Monitor	30JYK15CR103	Reactor Building	I	3^N 4^A	Yes
Containment High Range Dose Rate Monitor	30JYK28CR101	Reactor Building	I	4^N 3^A	Yes
Main Steam Line Radiation Monitors Division 1	30LBA10CR811 30LBA10CR821 30LBA10CR831 30LBA10CR841	Main Steam Valve Room	I	1^N 2^A	Yes
Main Steam Line Radiation Monitors Division 2	30LBA20CR811 30LBA20CR821 30LBA20CR831 30LBA20CR841	Main Steam Valve Room	I	2^N 1^A	Yes
Main Steam Line Radiation Monitors Division 3	30LBA30CR811 30LBA30CR821 30LBA30CR831 30LBA30CR841	Main Steam Valve Room	I	3^N 4^A	Yes
Main Steam Line Radiation Monitors Division 4	30LBA40CR811 30LBA40CR821 30LBA40CR831 30LBA40CR841	Main Steam Valve Room	I	4^N 3^A	Yes
Radiation Monitoring Cabinet Division 1	30CLE20	Safeguard Building 1	I	1^N 2^A	~~Yes~~No
Radiation Monitoring Cabinet Division 2	30CLF20	Safeguard Building 2	I	2^N 1^A	~~Yes~~No
Radiation Monitoring Cabinet Division 3	30CLG20	Safeguard Building 3	I	3^N 4^A	~~Yes~~No

Table 2.4.22-1—Radiation Monitoring System Equipment (2 Sheets)

Description	Tag Number	Location	Seismic Category	IEEE Class 1E	Harsh Environment
Radiation Monitoring Cabinet Division 4	30CLH20	Safeguard Building 4	I	4N 3A	~~Yes~~No

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

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 2.4.22-1—Radiation Monitoring System Equipment Mechanical Design

Description	Tag Number [1]	Location	Function	Seismic Category
Containment High Range Dose Rate Monitor	30JYK15CR101	Reactor Building	Monitor Post Accident Radioactivity Levels	I
Containment High Range Dose Rate Monitor	30JYK15CR102	Reactor Building	Monitor Post Accident Radioactivity Levels	I
Containment High Range Dose Rate Monitor	30JYK15CR103	Reactor Building	Monitor Post Accident Radioactivity Levels	I
Containment High Range Dose Rate Monitor	30JYK28CR101	Reactor Building	Monitor Post Accident Radioactivity Levels	I

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

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Table 2.4.22-2—Radiation Monitoring System

Item No.	Output Signal	Recipient	No. of Divisions
1	Containment High Range Dose Rate Monitor Signal	SCDS	4
2	Main Steam Line Radiation Monitor Signal	SCDS	4

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Table 2.4.22-2—Radiation Monitoring System Equipment I&C and Electrical Design

Description	Tag Number (1)	Location	IEEE Class 1E (2)	EQ – Harsh Env.	MCR/RSS Displays
Containment High Range Dose Rate Monitor	30JYK15CR101	ContainmentReactor Building	1^N 2^A	Yes	Radiation Alarm/ Radiation Alarm
Containment High Range Dose Rate Monitor	30JYK15CR102	ContainmentReactor Building	2^N 1^A	Yes	Radiation Alarm/ Radiation Alarm
Containment High Range Dose Rate Monitor	30JYK15CR103	ContainmentReactor Building	3^N 4^A	Yes	Radiation Alarm/ Radiation Alarm
Containment High Range Dose Rate Monitor	30JYK28CR101	ContainmentReactor Building	4^N 3^A	Yes	Radiation Alarm/ Radiation Alarm

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

1)^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 2.4.22-3—Radiation Monitoring System ITAAC (3 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	The location of the radiation monitoring systemRMS equipment is located as listed in Table 2.4.22-1.	An inspection will be performed of the location of the RMS equipment listed in Table 2.4.22-1.	The equipment listed in Table 2.4.22-1 is located as listed in Table 2.4.22-1.
3.1	Components identified as Seismic Category I in Table 2.4.22-1 can withstand seismic design basis loads without a loss of the safety function listed in Table 2.4.22-1.	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the components identified as Seismic Category I in Table 2.4.22-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Seismic qualification reports (SQDP, EQDP, or analyses) exist and conclude that the Seismic Category I components identified in Table 2.4.22-1 can withstand seismic design basis loads without a loss of the safety function. listed in Table 2.4.22-1 including the time required to perform the listed function.
		b. Inspections will be performed of the Seismic Category I components identified in Table 2.4.22-1 to verify that the components, including anchorage, are installed as specified on the construction drawings. and deviations have been reconciled to the seismic qualification reports (SQDP, EQDP, or analyses).	b. Inspection reports exist and conclude that the Seismic Category I components identified in Table 2.4.22-1, including anchorage, are installed as specified on the construction drawings. and deviations have been reconciled to the seismic qualification reports (SQDP, EQDP, or analyses).
4.1	The RMS provides the output signals listed in Table 2.4.22-2.Each monitor listed in Table 2.4.22-1 initiates a MCR alarm when radiation level exceeds a preset limit.	Tests will be performed to verify the existence of output signals.A test will be performed to verify that the MCR alarm is initiated when radiation level exceeds a preset limit.	The RMS provides output signals to the recipients listed in Table 2.4.22-2. The monitors listed in Table 2.4.22-1 initiate MCR alarm when a radiation level exceeds a preset limit.
4.2	Each channel for monitors listed in Table 2.4.22-1 provides an indication of radiation level.Deleted.	A test will be performed to verify that each channel responds to radiationDeleted.	The monitors listed in Table 2.4.22-1 indicate radiation levels for each channel.Deleted.

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

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
5.1	The components identified as Class 1E in Table 2.4.22-2 1 are powered from the Class 1E division as listed in Table 2.4.22-2 1 in a normal or alternate feed condition.	a. Testing will be performed for components identified as Class 1E in Table 2.4.22-2 -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 2.4.22-21.
		b. Testing will be performed for components identified as Class 1E in Table 2.4.22-2 -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 2.4.22-21.
6.1	Components in Table 2.4.22-2-1, that are designated as harsh environment, will perform their function listed in Table 2.4.22-1 in the environments that exist during and following design basis events.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components listed as harsh environment in Table 2.4.22-2 1 to perform their function listed in Table 2.4.22-1 for the environmental conditions that could occur during and following design basis events.	a. Environmental Qualification Data Packages (EQDP) exist and conclude that the components listed as harsh environment in Table 2.4.22-2 1 can perform their function listed in Table 2.4.22-1 during and following design basis events including the time required to perform the listed function.
		b. Components listed as harsh environment in Table 2.4.22-2 1 will be inspected to verify installation in accordance with the construction drawings including the associated wiring, cables and terminations. Deviations to the construction drawings will be reconciled to the EQDP.	b. Inspection reports exists and conclude that the components listed in Table 2.4.22-2 1 as harsh environment has been installed per the construction drawings and any deviations have been reconciled to the EQDP.

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

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
7.1	~~Containment High Range Dose Rate Monitors listed in Table 2.4.22-1 initiates Reactor Building air filtration isolation upon receipt of high radioactivity levels.~~Deleted.	~~A test will be performed to verify that the Reactor Building air filtration is isolated upon radiation levels exceeding a preset limit.~~Deleted.	~~Containment High Range Dose Rate Monitors listed in Table 2.4.22-1 initiate Reactor Building air filtration isolation when radiation level exceeds a preset limit.~~Deleted.

Next File

2.4.23 Turbine-Generator I&C

There are no Tier 1 entries for this system. ~~Covered in Section 2.8.1, Turbine-Generator.~~

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2.4.24 Diverse Actuation System

1.0 Description

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The diverse actuation system (DAS) is a non-safety related ~~digital~~ I&C system.

~~The DAS provides the following non-safety related functions:~~

- ~~Automatic anticipated transient without scram (ATWS) mitigation functions.~~
- ~~Automatic PS software common cause failure mitigation functions.~~
- ~~Automatic station blackout (SBO) mitigation functions.~~

The DAS is provided to mitigate anticipated operational occurrences (AOOs) or postulated accidents (PAs) concurrent with a software common-cause failure of the protection system (PS).

2.0 Arrangement

2.1 The DAS equipment is located as listed in Table 2.4.24-1—Diverse Actuation System Equipment.

2.2 Physical separation exists between the four divisions of the DAS.

3.0 I&C Design Features, Displays and Controls

3.1 The DAS system design is accomplished through a phased approach which includes the following (or equivalent) phases:

1. System Requirements Phase.
2. System Design Phase.
3. Software/Hardware Requirements Phase.
4. Software/Hardware Design Phase.
5. Software/Hardware Implementation Phase.
6. Software/Hardware Validation Phase.
7. System Integration Phase.
8. System Validation Phase.

3.2 The technology used by the DAS is a technology that is not microprocessor based.~~The system hardware and system software in the DAS are~~ is ~~diverse from the system hardware and system software in the protection system (PS).~~

3.4 The DAS allows manual, system-level actuation of the functions listed in Table 2.4.24-3.

3.5 Deleted.~~Functions of the DAS that are not tested by the self-test features are identified and included in the periodic testing procedures.~~

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4.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.24-4 lists the DAS ITAAC.

Table 2.4.24-1—Diverse Actuation System Equipment

Description	Location
DAS Cabinets~~Units~~ Division 1	Safeguard Building 1
DAS Cabinets~~Units~~ Division 2	Safeguard Building 2
DAS Cabinets~~Units~~ Division 3	Safeguard Building 3
DAS Cabinets~~Units~~ Division 4	Safeguard Building 4

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Table 2.4.24-2—Functions Automatically Actuated by the DAS

Reactor trip on low SG pressure
Reactor trip on low SG level
Reactor trip on high SG level
Reactor trip on low reactor coolant system (RCS) flow (two loops)
Reactor trip on low-low RCS flow (one loop)
Reactor trip on high neutron flux (power range)
Reactor trip on low hot leg pressure
Reactor trip on high pressurizer (PZR) pressure
Turbine trip on reactor trip
EFWS actuation on low SG level
SIS actuation on low PZR pressure
Main steam isolation on low SG pressure ~~with signal to PAS to generate partial cooldown through TBS~~
Containment isolation on high containment activity (also includes functions that cascade from containment isolation: Annulus ventilation and Safeguard Building HVAC reconfiguration)
MFWS isolation on low SG pressure
MFWS isolation on high SG level
Opening of containment ~~H_2~~ hydrogen mixing dampers on high containment pressure or high containment service compartment/containment equipment compartment differential pressure
Start station blackout diesels

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Table 2.4.24-3—Functions Manually Actuated through the DAS

Safety Injection System Actuation
Containment Isolation (Stage 1)
EFW Actuation
Reactor Trip
Containment Hydrogen Mixing Dampers Open

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Table 2.4.24-4—Diverse Actuation System ITAAC (3 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	The DAS equipment is located as listed in Table 2.4.24-1.	Inspections will be performed of the location of the DAS equipment.	The equipment listed in Table 2.4.24-1 is located as listed in Table 2.4.24-1.
2.2	Physical separation exists between the four divisions of the DAS.	Inspections will be performed to verify that the divisions of the DAS are located in separate buildings.	The four divisions of the DAS are located in separate Safeguard Buildings as listed in Table 2.4.24-1.
3.1	The DAS system design is accomplished through a phased approach which includes the following (or equivalent) phases: 1. System Requirements Phase. 2. System Design Phase. 3. Software/Hardware Requirements Phase. 4. Software/Hardware Design Phase. 4. Software/Hardware Implementation Phase. 6. Software/Hardware Validation Phase. 7. System Integration Phase. 8. System Validation Phase.	a. Analyses will be performed to verify that the outputs for the DAS system requirements phase conform to the requirements of that phase. ~~{{DAC}~~ b. Analyses will be performed to verify that the outputs for the DAS system design phase conform to the requirements of that phase. ~~{{DAC}}~~ c. Analyses will be performed to verify that the outputs for the DAS software/hardware requirements phase conform to the requirements of that phase. ~~{{DAC}}~~ d. Analyses will be performed to verify that the outputs for the DAS software/hardware design phase conform to the requirements of that phase. ~~{{DAC}}~~ e. Analyses will be performed to verify that the outputs for the DAS software/hardware implementation phase conform to the requirements of that phase.	a. A report exists and concludes that the outputs for the DAS system requirements phase conform to the requirements of that phase. ~~{{DAC}}~~ b. A report exists and concludes that the outputs for the DAS system design phase conform to the requirements of that phase. ~~{{DAC}}~~ c. A report exists and concludes that the outputs for the DAS software/hardware requirements phase conform to the requirements of that phase. ~~{{DAC}}~~ d. A report exists and concludes that the outputs for the DAS software/hardware design phase conform to the requirements of that phase. ~~{{DAC}}~~ e. A report exists and concludes that the outputs for the DAS software/hardware implementation phase conform to the requirements of that phase.

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Table 2.4.24-4—Diverse Actuation System ITAAC (3 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
		f. Analyses will be performed to verify that the outputs for the DAS software/hardware validation phase conform to the requirements of that phase. g. Analyses will be performed to verify that the outputs for the DAS system integration phase conform to the requirements of that phase. h. Analyses will be performed to verify that the outputs for the DAS system validation phase conform to the requirements of that phase.	f. A report exists and concludes that the outputs for the DAS software/hardware validation phase conform to the requirements of that phase. g. A report exists and concludes that the outputs for the DAS system integration phase conform to the requirements of that phase. h. A report exists and concludes that the outputs for the DAS system validation phase conform to the requirements of that phase.
3.2	The technology used by the DAS is a technology that is not microprocessor based.~~The system hardware and system software in the DAS are~~ is ~~diverse from the system hardware and system software in the protection system (PS).~~	Inspection will be performed to demonstrate that the technology in the DAS is a technology that is not microprocessor based.~~An analysis will be performed to demonstrate that the system hardware and system software in the DAS are~~ is ~~diverse from the system hardware and system software in the PS.~~	The technology used by the DAS is a technology that is not microprocessor based.~~A report exists and concludes that the system hardware and system software in the DAS are~~ is ~~diverse from the system hardware and system software in the PS.~~
3.3	The DAS generates signals for automatic actuation of the functions identified in Table 2.4.24-2.	Tests will be performed on the ~~as-built~~ DAS using test signals.	The DAS generates signals for automatic actuation of the functions identified in Table 2.4.24-2.
3.4	The DAS allows manual, system-level actuation of the functions listed in Table 2.4.24-3.	Tests will be performed on the ~~as-built~~ DAS using test signals.	The DAS generates signals allowing manual actuation of the functions identified in Table 2.4.24-3.

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Table 2.4.24-4—Diverse Actuation System ITAAC (3 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
3.5	Deleted.~~Functions of the DAS that are not tested by the self-test features are identified and included in the periodic testing procedures.~~	Deleted.~~a. An analysis is performed to identify functions of the DAS that are not tested by self-test features.~~	Deleted.~~a. A report exists which identifies any functions of the DAS that are not tested by self-test features.~~
		~~b. An inspection is performed to verify that functions of the DAS that are not tested by self-test features are included in periodic testing procedures.~~	~~b. Functions of the DAS that are not tested by self-test features are included in periodic testing procedures.~~

Next File

2.4.25 Signal Conditioning and Distribution System

1.0 Description

The signal conditioning and distribution system (SCDS) provides signal conditioning and distribution of signals.

The SCDS provides the following safety-related functions:

- Receives safety-related signals from Class 1E sensors or black boxes.
- Sends safety-related signals to the protection system (PS) and safety automation system (SAS).
- Sends Type A, B and C post accident monitoring variable signals to the safety information and control system (SICS).

2.0 Arrangement

2.1 SCDS equipment is located as listed in Table 2.4.25-1—SCDS Equipment.

2.2 Physical separation exists between the four divisions of the SCDS.

2.3 Physical separation exists between Class 1E SCDS equipment and non-Class 1E equipment.

3.0 Mechanical Design Features

3.1 Equipment identified as Seismic Category I in Table 2.4.25-1 can withstand seismic design basis loads without loss of safety function.

4.0 I&C Design Features, Displays and Controls

4.1 The SCDS receives input signals from the sources listed in Table 2.4.25-2—Signal Conditioning and Distribution System Input Signals.

4.2 The SCDS provides the output signals listed in Table 2.4.25-3—Signal Conditioning and Distribution System Output Signals.

4.3 Bypassed or inoperable SCDS channel status information is retrievable in the MCR.

4.4 Electrical isolation is provided on connections between SCDS Class 1E equipment and non-Class 1E equipment.

4.5 The SCDS equipment listed as Class 1E in Table 2.4.25-1 can perform its safety function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

5.0 Electrical Power Design Features

5.1 Class 1E SCDS components are powered from a Class 1E division in a normal or alternate feed condition.

6.0 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.25-4 lists the SCDS ITAAC.

Table 2.4.25-1—Signal Conditioning and Distribution System Equipment

Description	Tag Number(1)	Location	Seismic Category	IEEE Class 1E(2)
SCDS Cabinets, Division 1	30CLE51	Safeguard Building 1	I	1N 2A
SCDS Cabinets, Division 2	30CLF51	Safeguard Building 2	I	2N 1A
SCDS Cabinets, Division 3	30CLG51	Safeguard Building 3	I	3N 4A
SCDS Cabinets, Division 4	30CLH51	Safeguard Building 4	I	4N 3A

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 2.4.25-2—Signal Conditioning and Distribution System Input Signals (2 Sheets)

Item #	Signal	Source	# Divisions
1	6.9 kV Bus Voltage	Emergency Power Supply System	4
2	Annulus Ventilation System Gamma Activity	Annulus Ventilation System	4
3	Chemical and Volume Control System (CVCS) Boron Concentration Measurement	Boron Concentration and Measurement System	4
4	Cold Leg Temperature (NR)	Reactor Coolant System	4
5	Cold Leg Temperature (WR)	Reactor Coolant System	4
6	Containment Equipment Compartments Pressure	Containment Ventilation System	4
7	Containment Equipment Compartments Pressure / Containment Service Compartments Delta Pressure	Containment Ventilation System	4
8	Containment High Range Activity	Radiation Monitoring System	4
9	Containment Service Compartments Pressure (NR)	Containment Ventilation System	4
10	Containment Service Compartments Pressure (WR)	Containment Ventilation System	4
11	Core Outlet Thermocouples Wide Range Temperature	Incore Instrumentation System	4
12	CVCS Charging Flow	Chemical Volume and Control System	4
13	RCP Differential Pressure	Reactor Coolant System	4
14	Emergency Feedwater Flow	Emergency Feedwater System	4
15	Hot Leg Pressure (NR)	Safety Injection & Residual Heat Removal System	4
16	Hot Leg Pressure (WR)	Safety Injection & Residual Heat Removal System	4
17	Hot Leg Temperature (NR)	Reactor Coolant System	4
18	Hot Leg Temperature (WR)	Reactor Coolant System	4
19	Low Head Safety Injection Flow (WR)	Safety Injection and Residual Heat Removal System	4
20	Main Control Room (MCR) Air Intake Activity	Sampling Activity Monitoring Systems	4
21	Main Steam Line Activity	Main Steam System	4

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Table 2.4.25-2—Signal Conditioning and Distribution System Input Signals (2 Sheets)

Item #	Signal	Source	# Divisions
22	Medium Head Safety Injection Flow (WR)	Safety Injection and Residual Heat Removal System	4
23	Neutron Flux from Intermediate Range Detector (IRD)	Excore Instrumentation System	4
24	Neutron Flux from Power Range Detector (PRD)	Excore Instrumentation System	4
25	Neutron Flux from Self Powered Neutron Detectors (SPND)	Incore Instrumentation System	4
26	Neutron Flux from Source Range (SRD)	Excore Instrumentation System	4
27	Pressurizer Level (NR)	Reactor Coolant System	4
28	Pressurizer Pressure (NR)	Reactor Coolant System	4
29	RCP Bus Breaker Position	Normal Power Supply System	4
30	RCP Breaker Position	Normal Power Supply System	4
31	RCS Loop Flow	Reactor Coolant System	4
33	RCS Loop ~~Flow~~Level	Reactor Coolant System	4
34	RCP Speed	Reactor Coolant System	4
~~35~~	~~Reactor Trip Circuit Breaker Position~~	~~Non-Class 1E Uninterruptible Power Supply System~~	~~4~~
~~36~~35	SG Level (NR)	Reactor Coolant System	4
~~37~~36	SG Level (WR)	Reactor Coolant System	4
~~38~~37	SG Pressure	Main Steam System	4
~~39~~38	Temperature compensated rod ~~control~~ cluster control assembly (RCCA) positions	Rod Position Measurement System	4

Table 2.4.25-3—Signal Conditioning and Distribution System Output Signals (3 Sheets)

Item #	Signal	Destination	# Divisions
1	6.9 kV Bus Voltage	Protection System	4
2	Annulus Ventilation System Gamma Activity	Safety Information and Control System	4
3	Chemical and Volume Control System (CVCS) Boron Concentration ~~Measurement~~	Protection System	4
4	Cold Leg Temperature (NR)	Protection System	4
5	Cold Leg Temperature (WR)	Protection System, Safety Information and Control System	4
6	Containment Equipment Compartment~~s~~ Pressure	Protection System	4
7	Containment Equipment Compartment~~s~~ ~~Pressure /~~ Containment Service Compartment~~s~~ Delta Pressure	Protection System	4
8	Containment High Range Activity	Protection System, Safety Information and Control System	4
9	Containment Service Compartment~~s~~ Pressure (NR)	Protection System	4
10	Containment Service Compartment~~s~~ Pressure (WR)	Protection System, Safety Information and Control System	4
11	Core Outlet Thermocouples Wide Range Temperature	Safety Information and Control System	4
12	CVCS Charging Flow	Protection System	4
13	RCP Differential Pressure	Protection System	4
14	Emergency Feedwater Flow	Safety Automation System, Safety Information and Control System	4
15	Hot Leg Pressure (NR)	Protection System	4
16	Hot Leg Pressure (WR)	Protection System, Safety Information and Control System	4
17	Hot Leg Temperature (NR)	Protection System	4
18	Hot Leg Temperature (WR)	Protection System, Safety Information and Control System	4

Table 2.4.25-3—Signal Conditioning and Distribution System Output Signals (3 Sheets)

Item #	Signal	Destination	# Divisions
19	Low Head Safety Injection Flow (WR)	Safety Information and Control System	4
20	Main Control Room (MCR) Air Intake Activity	Protection System	4
21	Main Steam Line Activity	Protection System, Safety Information and Control System	4
22	Medium Head Safety Injection Flow (WR)	Safety Information and Control System	4
23	Neutron Flux from Intermediate Range Detector (IRD)	Protection System, Safety Information and Control System	4
24	Neutron Flux from Power Range Detector (PRD)	Protection System, Safety Automation System	4
25	Neutron Flux from Self Powered Neutron Detectors (SPND)	Protection System	4
26	Neutron Flux from Source Range (SRD)	Safety Information and Control System	4
27	Pressurizer Level (NR)	Protection System	4
28	Pressurizer Pressure (NR)	Protection System, Safety Information and Control System	4
29	RCP Bus Breaker Position	Protection System	4
30	RCP Breaker Position	Protection System	4
31	RCS Loop Flow	Protection System	4
33	RCS Loop Level	Protection System	4
34	RCP Speed	Protection System	4
35	Reactor Trip Circuit Breaker Position	Non-Class 1E Uninterruptible Power Supply System	4
3635	SG Level (NR)	Protection System	4
3736	SG Level (WR)	Protection System, Safety Information and Control System, Safety Automation System	4

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Table 2.4.25-3—Signal Conditioning and Distribution System Output Signals (3 Sheets)

Item #	Signal	Destination	# Divisions
~~38~~37	SG Pressure	Protection System, Safety Information and Control System, Safety Automation System	4
~~39~~38	Temperature compensated rod control cluster assembly (RCCA) positions	Protection System	4

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

	Commitment Wording	Inspection, Tests, Analyses	Acceptance Criteria
2.1	SCDS equipment is located as listed in Table 2.4.25-1.	Inspections will be performed for the location of the SCDS equipment.	The SCDS equipment listed in Table 2.4.25-1 is located as listed in Table 2.4.25-1.
2.2	Physical separation exists between the four divisions of the SCDS.	Inspections will be performed to verify that the divisions of the SCDS are located in separate Safeguard Buildings	The four divisions of the SCDS are located in separate Safeguard Buildings as listed in Table 2.4.25-1.
2.3	Physical separation exists between Class 1E SCDS equipment and non-Class 1E equipment.	a. Design analyses will be performed to determine the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E SCDS equipment and non-Class 1E equipment. b. Inspections will be performed to verify that the required safety-related structures, separation distance, barriers, or any combination thereof exist between the Class 1E SCDS equipment and non-Class 1E equipment.	a. A report exists and defines the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E SCDS equipment and non-Class 1E equipment. b. The required safety-related structures, separation distance, barriers, or any combination thereof exist between Class 1E SAS equipment and non-Class 1E equipment. Reconciliation is performed of any deviations to the design.

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

	Commitment Wording	Inspection, Tests, Analyses	Acceptance Criteria
3.1	Equipment identified as Seismic Category I in Table 2.4.25-1 can withstand seismic design basis loads without loss of safety function.	a. Type tests, analyses or a combination of type tests and analyses will be performed on the equipment listed as Seismic Category I in Table 2.4.25-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Test/analysis reports exist and conclude that the as designed equipment listed in Table 2.4.25-1 can with stand seismic design basis loads without loss of safety function.
		b. Inspections will be performed of the Seismic Category I equipment listed in Table 2.4.25-1 to verify that the equipment including anchorage is installed as specified on the construction drawings.	b. Inspection reports exist and conclude that the Seismic Category I equipment listed in Table 2.4.25-1 including anchorage is installed as specified on the construction drawings.
4.1	The SCDS receives input signals from the sources listed in Table 2.4.25-2.	Tests will be performed to verify the existence of input signals.	The SCDS receives the input signals listed in Table 2.4.25-2.
4.2	The SCDS provides the output signals listed in Table 2.4.25-3	Tests will be performed to verify the existence of output signals.	The SCDS provides output signals to the recipients listed in Table 2.4.25-3.
4.3	Bypassed or inoperable SCDS channel status information is retrievable in the MCR.	A test of the SCDS will be performed.	Bypassed or inoperable SCDS channels status information is retrievable in the MCR.

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

	Commitment Wording	Inspection, Tests, Analyses	Acceptance Criteria
4.4	Electrical isolation is provided on connections between SCDS Class 1E equipment and non-Class 1E equipment	a. Analyses will be performed to determine the test specification for electrical isolation devices on connections between the Class 1E 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 the SCDS Class 1E 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 SCDS Class 1E equipment and non-Class 1E equipment.	b. A report exists and concludes that the Class 1E isolation devices used between the SCDS Class 1E equipment and non-Class 1E equipment prevent the propagation of credible electrical faults.
		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 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 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.

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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 components are powered from a Class 1E division 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. 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.	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. 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.

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2.4.26 Rod Position Measurement System

1.0 Description

The rod position measurement system (RPMS) measures the position of a rod ~~control~~ cluster control assembly (RCCA) located within the reactor vessel and provides the measurement to the distributed control systems.

The RPMS provides the following safety-related functions:

- Receives safety-related RCCA position signals and ~~temperature compensation~~ signals from the control rod drive mechanisms.
- Sends safety-related temperature compensated analog RCCA position signals to the signal conditioning and distribution system (SCDS).

2.0 Arrangement

2.1 RPMS equipment is located as listed in Table 2.4.26-1—Rod Position Measurement System Equipment.

2.2 Physical separation exists between the four divisions of the RPMS.

2.3 Physical separation exists between Class 1E RPMS equipment and non-Class 1E equipment.

3.0 Mechanical Design Features

3.1 Equipment identified as Seismic Category I in Table 2.4.26-1 can withstand seismic design basis loads without loss of safety function.

4.0 I&C Design Features, Displays and Controls

4.1 The RPMS receives input signals from the sources listed in Table 2.4.26-2—Rod Position Measurement System Input Signals.

4.2 The RPMS provides the output signals listed in Table 2.4.26-3—Rod Position Measurement System Output Signals.

4.3 The RPMS design and application software are developed using a process composed of six lifecycle phases with each phase having outputs which must conform to the requirements of that phase. The six lifecycle phases are the following:

1. Basic Design Phase.
2. Detailed Design Phase.
3. Manufacturing Phase.
4. System Integration and Testing Phase.

5. Installation and Commissioning Phase.

6. Final Documentation Phase.

4.4 The RPMS equipment listed as Class 1E 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 and each divisional monitoring and service interface (MSI) of the RPMS. The hardwired disconnects prevent the connection of the service unit to more than a single division of the RPMS.

5.0 Electrical Power Design Features

5.1 Class 1E RPMS components are powered from a Class 1E division in a normal or alternate feed condition.

6.0 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.26-4 lists the RPMS ITAAC.

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Table 2.4.26-1—Rod Position Measurement System Equipment

Description	Tag Number(1)	Location	Seismic Category	IEEE Class 1E(2)
RPMS Cabinets, Division 1	30CLE11	Safeguard Building 1	I	1[N] 2[A]
RPMS Cabinets, Division 2	30CLF11	Safeguard Building 2	I	2[N] 1[A]
RPMS Cabinets, Division 3	30CLG11	Safeguard Building 3	I	3[N] 4[A]
RPMS Cabinets, Division 4	30CLH11	Safeguard Building 4	I	4[N] 3[A]

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 2.4.26-2—Rod Position Measurement System Input Signals

Item #	Signal	Source	# Divisions
1	RCCA positions Division 1 (22 RCCA positions) Division 2 (22 RCCA positions) Division 3 (22 RCCA positions) Division 4 (23 RCCA positions)	Control Rod Drive Mechanisms	4
2	Temperature measurement signal for compensation	Control Rod Drive Mechanisms	4

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Table 2.4.26-3—Rod Position Measurement System Output Signals

Item #	Signal	Destination	# Divisions
1	~~Temperature compensated~~ RCCA positions Division 1 (22 RCCA positions) Division 2 (22 RCCA positions) Division 3 (22 RCCA positions) Division 4 (23 RCCA positions)	SCDS	4

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

	Commitment Wording	Inspection, Tests, Analyses	Acceptance Criteria
2.1	RPMS equipment is located as listed in Table 2.4.26-1.	Inspections will be performed for the location of the RPMS equipment.	The RPMS equipment listed in Table 2.4.26-1 is located as listed in Table 2.4.26-1.
2.2	Physical separation exists between the four divisions of the RPMS.	Inspections will be performed to verify that the divisions of the RPMS are located in separate Safeguard Buildings.	The four divisions of the RPMS are located in separate Safeguard Buildings as listed in Table 2.4.26-1.
2.3	Physical separation exists between Class 1E RPMS equipment and non-Class 1E equipment.	a. Design analyses will be performed to determine the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E RPMS equipment and non-Class 1E equipment. b. Inspections will be performed to verify that the required safety-related structures, separation distance, barriers, or any combination thereof exist between the Class 1E RPMS equipment and non-Class 1E equipment.	a. A report exists and defines the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E RPMS equipment and non-Class 1E equipment. b. The required safety-related structures, separation distance, barriers, or any combination thereof exist between Class 1E RPMS equipment and non-Class 1E equipment. Reconciliation is performed of any deviations to the design.

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

Commitment Wording		Inspection, Tests, Analyses	Acceptance Criteria
3.1	Equipment identified as Seismic Category I in Table 2.4.26-1 can withstand seismic design basis loads without loss of safety function.	a. Type tests, analyses or a combination of type tests and analyses will be performed on the equipment listed as Seismic Category I in Table 2.4.26-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements. b. Inspections will be performed of the Seismic Category I equipment listed in Table 2.4.1-1 to verify that the equipment including anchorage is installed as specified on the construction drawings.	a. Test/analysis reports exist and conclude that the as designed equipment listed in Table 2.4.26-1 can with stand seismic design basis loads without loss of safety function. b. Inspection reports exist and conclude that the Seismic Category I equipment listed in Table 2.4.26-1 including anchorage is installed as specified on the construction drawings.
4.1	The RPMS receives input signals from the sources listed in Table 2.4.26-2.	Tests will be performed to verify the existence of input signals.	The RPMS receives the input signals listed in Table 2.4.26-2.
4.2	The RPMS provides the output signals listed in Table 2.4.26-3.	Tests will be performed to verify the existence of output signals.	The RPMS provides output signals to the recipients listed in Table 2.4.26-3.

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

Commitment Wording		Inspection, Tests, Analyses	Acceptance Criteria
4.3	The RPMS system design and application software are developed using a process composed of six lifecycle phases, with each phase having outputs which must conform to the requirements of that phase. The six lifecycle phases are the following: 1) Basic Design Phase. 2) Detailed Design Phase. 3) Manufacturing Phase. 4) System Integration and Testing Phase. 5) Installation and Commissioning Phase. 6) Final Documentation Phase.	a. Analyses will be performed to verify that the outputs for the RPMS basic design phase conform to the requirements of that phase. b. Analyses will be performed to verify that the outputs for the RPMS detailed design phase conform to the requirements of that phase. c. Analyses will be performed to verify that the outputs for the RPMS manufacturing phase conform to the requirements of that phase. d. Analyses will be performed to verify that the outputs for the RPMS system integration and testing phase conform to the requirements of that phase. e. Analyses will be performed to verify that the outputs for the RPMS installation and commissioning phase conform to the requirements of that phase. f. Analyses will be performed to verify that the outputs for the RPMS final documentation phase conform to the requirements of that phase.	a. A report exists and concludes that the outputs conform to the requirements of the basic design phase of the RPMS. b. A report exists and concludes that the outputs conform to the requirements of the detailed design phase of the RPMS. c. A report exists and concludes that the outputs conform to the requirements of the manufacturing phase of the RPMS. d. A report exists and concludes that the outputs conform to the requirements of the system integration and testing phase of the RPMS. e. A report exists and concludes that the outputs conform to the requirements of the installation and commissioning phase of the RPMS. f. A report exists and concludes that the outputs conform to the requirements of the final documentation phase of the RPMS.
4.4	The RPMS equipment listed as Class 1E in Table 2.4.26-1 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 2.4.26-1.	A report exists and concludes that the equipment listed as Class 1E in Table 2.4.26-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.

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

	Commitment Wording	Inspection, Tests, Analyses	Acceptance Criteria
4.5	Hardwired disconnects exist between the Service Unit and each divisional Monitoring and Service Interface (MSI) of the RPMS. The hardwired disconnects prevent the connection of the Service Unit to more than a single division of the RPMS.	a. Inspections will be performed on the RPMS to verify the existence of a hardwired disconnects between the Service Unit and each divisional MSI of RPMS. b. Tests will be performed on the RPMS to verify that the hardwired disconnects prevent the connection of the Service Unit to more than a single division of the RPMS.	a. Hardwired disconnects exist between the Service Unit and each divisional Monitoring and Service Interface (MSI) of the RPMS. b. The hardwired disconnects prevent the connection of the Service Unit to more than a single division of the RPMS.
5.1	Class 1E RPMS components are powered from a Class 1E division 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. 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.	a. The test signal provided in the normally aligned division is present at the respective Class 1E component identified in Table 2.4.26-1. 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 2.4.26-1.

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2.5.12 Communication System

1.0 Description

The communication system (COMS) provides intra-plant (inside buildings) and inter-plant (between buildings) communications.

2.0 Arrangement

2.1 The digital telephone system, the public address and alarm system, sound powered system, and portable wireless communication system provide station to station communication and area broadcasting between the main control room (MCR) and all the locations listed in Table 2.5.12-1—Communication Equipment Locations.

3.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.5.12-2 lists the COMS ITAAC.

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Table 2.5.12-1—Communication Equipment Locations

Primary Area / Location
Remote Shutdown Station
Technical Support Center
Operational Support Center
Control Rod Drive Equipment Area
Refueling Platform Area
Turbine Generator Operating Area
Emergency Diesel Generator Operating Areas

Note:

1. Equipment is located in various rooms of the Safeguard Buildings, Emergency Power Generation Building and Essential Service Water Pump Station.

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Table 2.5.12-2—Communication System ITAAC

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	The digital telephone system, the public address and alarm system, sound powered system, and portable wireless communication system provide station to station communication and area broadcasting between the MCR and all the locations listed in Table 2.5.12-1.	Tests will be performed on the digital telephone system, the public address and alarm system, sound powered system, and portable wireless communication system.	a. The digital telephone system, public address and alarm system, and the sound powered system equipment exist in the MCR and the locations listed in Table 2.5.12-1. b. Voice transmission and reception via the digital telephone system and sound powered system is verified between the MCR and the locations listed in Table 2.5.12-1. c. The broadcasting of voice messages from the MCR to the locations listed in Table 2.5.12-1 via the public address and alarm system is verified. Voice transmission and reception via the portable wireless communication system is verified between the MCR and the locations listed in Table 2.5.12-1.

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3.7 Post-Accident Monitoring Instrumentation

1.0 Description

The post-accident monitoring (PAM) variables ~~instrumentation (AMI) provides plant process variable information and system status, known as post accident monitoring (PAM) variables, to the operator in the main control room (MCR) to~~ permit the operator to perform the following:

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- Preplanned, required, manual safety functions where no automatic control is provided (Type A).
- Capability to assess critical plant safety functions (Type B).
- Capability to assess the potential for an actual breech of the three fission product barriers (Type C).
- ~~Preplanned manual safety functions.~~
- ~~Capability to assess plant conditions, safety system performance and determine appropriate actions to take to respond to abnormal events.~~
- ~~Capability to bring the plant to a safe shutdown condition.~~

The instruments that are determined as ~~AMI~~ PAM are contained in various plant systems. The performance, design, and qualification of the ~~AMI~~ PAM are selected in accordance with the accident management functions defined by the emergency procedures, emergency guidelines, and licensing basis documents.

2.0 Analyses

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2.1 PAM indications are provided to perform Type A, B, and C accident management functions defined by the emergency procedures and licensing basis documents.~~A PAM variable list is developed in accordance with the accident management functions defined by the emergency procedures, emergency guidelines, and licensing basis documents.AMI that are credited in emergency procedures and that are not addressed by existing ITAAC are identified.~~

3.0 Design Features

3.1 The PAM instrumentation are designed and qualified based on the level of importance of the variable type that each instrument supports.~~The AMI identified in 3.7.2.1 are provided with divisional separation.~~

~~3.2The AMI identified in 3.7.2.1 can withstand seismic design basis loads without a loss of their function.~~

~~3.3The AMI identified in 3.7.2.1 that monitor type A, B, and C type variables are powered from the Class 1E power sources specified in Table 3.7-1.~~

3.4The AMI identified in 3.7.2.1 will perform their function in the environments that exist before and during the time required to perform their function.

4.0 Inspections, Tests, Analyses, and Acceptance Criteria

Table 3.7-2 1 lists the accident monitoring instrumentation ITAAC.

Table 3.7-1—Class 1E Power for Accident Monitoring Instrumentation

Location of Instrument to Monitor Type A, B, or C PAM Variables	Class 1E Power Source	
	Normally Aligned	Alternate Feed Aligned
Division 1	Division 1	Division 2
Division 2	Division 2	Division 1
Division 3	Division 3	Division 4
Division 4	Division 4	Division 3

Table 3.7-21—Accident Monitoring Instrumentation ITAAC (2 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	PAM indications are provided to perform Type A, B, and C accident management functions defined by the emergency procedures and licensing basis documents. A PAM variable list is developed in accordance with the accident management functions defined by the emergency procedures, emergency guidelines, and licensing basis documents. AMI that are credited in emergency procedures and that are not addressed by existing ITAAC are identified.	An analysis of emergency procedures, emergency guidelines, and licensing basis documents will be performed to identify a list of PAM variables required for accident management functions. An analysis will be performed to identify those instruments that are credited in emergency procedures and that are not addressed by existing ITAAC. (divisional separation, seismic design, Class 1E power source, and environmental qualification). {{DAC}}	A report exists that documents the PAM variables that are provided for required for accident management functions. The PAM variable list are documented in a table format that includes the following: • Variable name that indicates the variable function. • Variable Type (A, B, C, D or E). • Range. • Safety classification (1E or non-1E). • Environmental and Seismic Qualification. • Minimum number of instruments required. • Monitoring duration for the variable. A report exists and provides a list of AMI that monitor type A, B, C, and D variables credited in emergency procedures and that are not addressed by existing ITAAC (divisional separation, seismic design, Class 1E power source, and environmental qualification). {{DAC}}

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Table 3.7-~~2~~1—Accident Monitoring Instrumentation ITAAC (2 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
3.1	The PAM instrumentation are designed and qualified based on the level of importance of the variable type that each instrument supports.~~The AMI identified in 3.7.2.1 are provided with divisional separation.~~	a. An analysis will be performed to determine the performance, design, and qualification criteria for each PAM instrument based on the level of importance of the variable type that each instrument supports. b. Inspections, tests, or analyses will be performed to verify that the PAM instrumentation meets the documented performance, design, and qualification criteria. ~~Inspection will be performed to verify the AMI identified in 3.7.2.1 is divisionally separated.~~	a. A report exists that documents the performance, design, and qualification, criteria for each PAM instrument. b. A report exists and concludes that the PAM instrumentation meets the documented performance, design, and qualification criteria. ~~The AMI identified in 3.7.2.1are divisionally separated.~~
~~3.2~~	~~The AMI identified in 3.7.2.1 can withstand seismic design basis loads without a loss of their function.~~	~~a. Type tests, analyses, or a combination of type tests and analyses will be performed on the AMI identified in 3.7.2.1 using analytical assumptions, or under conditions, which bound the seismic design requirements.~~	~~a. Seismic qualification reports (SQDP, EQDP, or analyses) exist and conclude that the AMI identified in 3.7.2.1 can withstand seismic design basis loads without a loss of the function including the time required to perform the listed function.~~
		~~b. Inspections will be performed of the as-built AMI identified in 3.7.2.1 to verify that the components, including anchorage, are installed as specified on the construction drawings and deviations have been reconciled to the seismic qualification reports (SQDP, EQDP, or analyses).~~	~~b. Inspection reports exist and conclude that the as-built AMI identified in 3.7.2.1, including anchorage, are installed as specified on the construction drawings and deviations have been reconciled to the seismic qualification reports (SQDP, EQDP, or analyses).~~

Table 3.7-21—Accident Monitoring Instrumentation ITAAC (2 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
3.3	The AMI identified in 3.7.2.1 that monitor type A, B, and C type variables are powered from the Class 1E power sources specified in Table 3.7-1.	a. Testing will be performed to verify the Class 1E power sources specified in Table 3.7-1for the type A, B, and C AMI identified in 3.7.2.1 by providing a test signal in each normally aligned division.	a. The test signal provided in the normally aligned division as specified in Table 3.7-1 is present at the type A, B, and C AMI identified in 3.7.2.1.
		b. Testing will be performed to verify the Class 1E power sources specified in Table 3.7-1for the type A, B, and C AMI identified in 3.7.2.1 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 as specified in Table 3.7-1 is present at the type A, B, and C AMI identified in 3.7.2.1.
3.4	The AMI identified in 3.7.2.1 will perform their function in the environments that exist before and during the time required to perform their function.	Type tests or type tests and analysis of tests and analyses will be performed to demonstrate the ability of the AMI identified in 3.7.2.1 to perform their function in the environments that exist before and during the time required to perform their function.	A report exists and concludes that the AMI identified in 3.7.2.1 are qualified to perform their associated function in the environments that exist before and during the time required to perform their function.

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