ArevaEPRDCPEm Resource

From: WELLS Russell D (AREVA NP INC) [Russell.Wells@areva.com]
Sent: Tuesday, March 31, 2009 7:23 PM
To: Getachew Tesfaye
Cc: Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 123, FSAR Ch 14, Supplement 2
Attachments: RAI 123 Supplement 2 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 16 of the 28 questions of RAI No. 123 on December 12, 2008. AREVA NP submitted Supplement 1 to the response on February 13, 2009 to address 4 of the remaining 12 questions. The attached file, "RAI 123 Supplement 2 Response US EPR DC.pdf" provides technically correct and complete responses to the remaining 8 questions, as committed.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 123 Questions 14.03.05-9, 14.03.05-10, 14.03.05-11, 14.03.05-12, 14.03.05-14, 14.03.05-15, 14.03.05-16, and 14.03.05-17.

The following table indicates the respective pages in the response document, "RAI 123 Supplement 2 Response US EPR DC.pdf," that contain AREVA

Question #	Start Page	End Page
RAI 123 — 14.03.05-9	2	2
RAI 123 — 14.03.05-10	3	3
RAI 123 — 14.03.05-11	4	4
RAI 123 — 14.03.05-12	5	5
RAI 123 — 14.03.05-14	6	6
RAI 123 — 14.03.05-15	7	8
RAI 123 — 14.03.05-16	9	9
RAI 123 — 14.03.05-17	10	11

This concludes the formal AREVA NP response to RAI 123, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

(Russ Wells on behalf of)

Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
New Plants Deployment
AREVA NP, Inc.
An AREVA and Siemens company
3315 Old Forest Road
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Phone: 434-832-3694
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From: Pederson Ronda M (AREVA NP INC)
Sent: Friday, February 13, 2009 4:48 PM
To: Getachew Tesfaye
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); DUNCAN Leslie E (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 123(965_978_1037_1074),Supplement 1

Getachew,

AREVA NP Inc. provided responses to 16 of the 28 questions of RAI No. 123 on December 12, 2008. The attached file, "RAI 123 Supplement 1 Response US EPR DC.pdf" provides technically correct and complete responses to 4 of the remaining 12 questions, as committed.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 123 Question 14.03-4, 14.03-5, 14.03-6, and 14.03.03-1.

The following table indicates the respective pages in the response document, "RAI 123 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 123 — 14.03-4	2	2
RAI 123 — 14.03-5	3	3
RAI 123 — 14.03-6	4	4
RAI 123 — 14.03.03-1	5	5

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

Question #	**Response Date**
RAI 123 — 14.03.05-9	March 31, 2009
RAI 123 — 14.03.05-10	March 31, 2009
RAI 123 — 14.03.05-11	March 31, 2009
RAI 123 — 14.03.05-12	March 31, 2009
RAI 123 — 14.03.05-14	March 31, 2009
RAI 123 — 14.03.05-15	March 31, 2009
RAI 123 — 14.03.05-16	March 31, 2009
RAI 123 — 14.03.05-17	March 31, 2009

Sincerely,

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From: Pederson Ronda M (AREVA US)
Sent: Friday, December 12, 2008 4:47 PM
To: 'Getachew Tesfaye'
Cc: DELANO Karen V (AREVA US); BENNETT Kathy A (OFR) (AREVA US); DUNCAN Leslie E (AREVA US)
Subject: Response to U.S. EPR Design Certification Application RAI No. 123(965_978_1037_1074), FSAR Ch. 14

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 123 Response US EPR DC.pdf" provides technically correct and complete responses to 16 of the 28 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 123 Questions 14.03.03-3, 14.03.03-4, 14.03.03-7, 14.03.03-8, 14.03.03-9, 14.03.05-18, 14.03.05-19, 14.03.05-20, 14.03.05-21, 14.03.05-22, and 14.03.05-23.

The following table indicates the respective page(s) in the response document "RAI 123 Response US EPR DC.pdf" that contain AREVA NP's response to the each of the subject questions.

Question #	Start Page	End Page
RAI 123 — 14.03-4	2	2
RAI 123 — 14.03-5	3	3
RAI 123 — 14.03-6	4	4
RAI 123 — 14.03.03-1	5	5
RAI 123 — 14.03.03-2	6	6
RAI 123 — 14.03.03-3	7	7
RAI 123 — 14.03.03-4	8	8
RAI 123 — 14.03.03-5	9	9
RAI 123 — 14.03.03-6	10	10
RAI 123 — 14.03.03-7	11	11
RAI 123 — 14.03.03-8	12	12
RAI 123 — 14.03.03-9	13	13
RAI 123 — 14.03.05-8	14	14
RAI 123 — 14.03.05-9	15	15
RAI 123 — 14.03.05-10	16	16
RAI 123 — 14.03.05-11	17	17
RAI 123 — 14.03.05-12	18	18
RAI 123 — 14.03.05-13	19	19
RAI 123 — 14.03.05-14	20	20
RAI 123 — 14.03.05-15	21	21
RAI 123 — 14.03.05-16	22	22
RAI 123 — 14.03.05-17	23	24
RAI 123 — 14.03.05-18	25	25
RAI 123 — 14.03.05-19	26	26
RAI 123 — 14.03.05-20	27	27
RAI 123 — 14.03.05-21	28	28
RAI 123 — 14.03.05-22	29	29
RAI 123 — 14.03.05-23	30	30

A complete answer is not provided for 12 of the 28 questions. The schedule for a technically correct and complete response to each of these questions is provided below.

Question #	Response Date
RAI 123 — 14.03-4	February 13, 2009
RAI 123 — 14.03-5	February 13, 2009
RAI 123 — 14.03-6	February 13, 2009
RAI 123 — 14.03.03-1	February 13, 2009
RAI 123 — 14.03.05-9	March 31, 2009
RAI 123 — 14.03.05-10	March 31, 2009
RAI 123 — 14.03.05-11	March 31, 2009
RAI 123 — 14.03.05-12	March 31, 2009
RAI 123 — 14.03.05-14	March 31, 2009
RAI 123 — 14.03.05-15	March 31, 2009
RAI 123 — 14.03.05-16	March 31, 2009
RAI 123 — 14.03.05-17	March 31, 2009

Sincerely,

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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, November 12, 2008 7:24 PM
To: ZZ-DL-A-USEPR-DL
Cc: Edmund Kleeh; Richard Laura; Michael Miernicki; Joseph Colaccino; John Rycyna
Subject: U.S. EPR Design Certification Application RAI No. 123(965_978_1037_1074), FSAR Ch. 14

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on October 24, 2008, and on November 12, 2008, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager

NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 365

Mail Envelope Properties (1F1CC1BBDC66B842A46CAC03D6B1CD41014D6AF1)

Subject: Response to U.S. EPR Design Certification Application RAI No. 123, FSAR Ch 14, Supplement 2
Sent Date: 3/31/2009 7:23:05 PM
Received Date: 3/31/2009 7:23:08 PM
From: WELLS Russell D (AREVA NP INC)

Created By: Russell.Wells@areva.com

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Tracking Status: None
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Tracking Status: None

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Files	**Size**	**Date & Time**
MESSAGE	8015	3/31/2009 7:23:08 PM
RAI 123 Supplement 2 Response US EPR DC.pdf	223014	

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

Response to

Request for Additional Information No. 123, Supplement 2

11/12/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 14.03 - Inspections, Tests, Analyses, and Acceptance Criteria
SRP Section: 14.03.03 - Piping Systems and Components - Inspections, Tests, Analyses, and Acceptance Criteria
SRP Section: 14.03.05 - Instrumentation and Controls - Inspections, Tests, Analyses, and Acceptance Criteria
Application Section: FSAR Section 14.3

QUESTIONS for Construction Inspection and Allegations Branch (CCIB)

Question 14.03.05-9:

ITAAC Item 4.1 in Table 2.4.1-9

SRP 14.3 App. A IV.4.B states that Acceptance Criteria should be objective and unambiguous. The AC for Table 2.4.1-9, Item 4.1 states that the PS generates an automatic RT signal (singular) as identified in Table 2.4.1-3. However, Table 2.4.1-3 identifies several RT signals. This discrepancies needs clarification. Suggested wording is as follows:

- The Commitment Wording -change words 'an automatic RT signal, as identified' to 'an automatic RT signal for each of the parameters identified'.
- The AC -change words 'an automatic RT signal, as identified' to 'an automatic RT signal for each of the parameters identified'.

Response to Question 14.03.05-9:

Based on the suggestions provided in the question, U.S. EPR FSAR Tier 1, Section 2.4.1, Item 4.1 will be revised as follows:

> "The PS generates an automatic RT signal for each of the parameters identified in Table 2.4.1-3—Protection System Automatic Reactor Trips."

The commitment wording and the acceptance criteria for U.S. EPR FSAR Tier 1, Table 2.4.1-9, Item 4.1 will be revised as follows:

> "The PS generates an automatic RT signal for each of the parameters identified in Table 2.4.1-3."

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.4.1 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.05-10:

ITAAC Item 4.2 in Table 2.4.1-9

SRP 14.3 App. A IV.4.B states that Acceptance Criteria should be objective and unambiguous. The Commitment Wording in Table 2.4.1-9, Item 4.2 states that "the PS generates the automatically actuated engineered safety feature *signals listed in Table 2.4.1-4*." The AC states that "the PS generates automatic actuation of engineered safety *features*." The Commitment Wording requires the generation of *signals*, whereas the AC appears to require actuation of the final ESF actuation device. A test that either verifies actuation of the final device or just a signal at the input terminals to the actuation device would appear to satisfy the Commitment Wording.. Why are the wording in the Commitment Wording and the AC different? In addition, the ITA should be aligned with the Commitment Wording and AC by referencing Table 2.4.1-4 relative to using the test signals to simulate the RTs in Table 2.4.1-4.

Response to Question 14.03.05-10:

The acceptance criteria for U.S. EPR FSAR Tier 1, Table 2.4.1-9, Item 4.2 will be revised as follows to make the acceptance criteria agree with the commitment wording:

> "The PS generates automatic actuation of engineered safety feature signals, as identified in Table 2.4.1-4."

The inspections, tests, and analyses (ITA) for U.S. EPR FSAR Tier 1, Table 2.4.1-9, Item 4.1 will be revised as follows to align the ITA with the commitment wording and acceptance criteria:

> "Tests will be performed on the as-built PS using test signals to simulate the RT functions listed in Table 2.4.1-3."

The inspections, tests, and analyses (ITA) for U.S. EPR FSAR Tier 1, Table 2.4.1-9, Item 4.2 will be revised as follows to align the ITA with the commitment wording and acceptance criteria:

> "Tests will be performed on the as-built PS using test signals to simulate the engineered safety feature functions listed in Table 2.4.1-4."

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.4.1 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.05-11:

ITAAC Item 4.6 in Table 2.4.1.9

Table states that an inspection is performed for the existence of a document that describes the setpoint methodology. The inspection is to verify that there is an established methodology that can be used for determining the setpoints in question. In addition, an analysis is performed to verify that the PS setpoints are determined using that methodology..... These are two separate actions. The AC states that 'a report exists and concludes that the PS setpoints..... are determined using a methodology.....' The AC only addresses the second ITA. The existence of a document that establishes that methodology is not addressed. The document that the inspection is to verify the existence of is not the report stated in the AC, but is the analysis. Should there not be an AC that addresses the first ITA in which the inspection is performed?

Response to Question 14.03.05-11:

U.S. EPR FSAR Tier 1, Table 2.4.1-9, Item 4.6 will be revised to have two inspections, tests, and analyses (ITA) and two acceptance criteria (AC) to address the two separate actions. The ITA will be revised as follows:

> "a. An inspection will be performed to verify the existence of an established methodology for determining the PS setpoints."
>
> "b. An analysis will be performed to verify that the PS setpoints are determined using the documented methodology."

The AC of U.S. EPR FSAR Tier 1, Table 2.4.1-9, Item 4.6 will be revised as follows:

> "a. An established methodology for determining PS setpoints exists."
>
> "b. A report exists and concludes that the PS setpoints associated with the automatic reactor trips listed in Table 2.4.1-3 and the automatically actuated engineered safety features listed in Table 2.4.1-4 are determined using a documented methodology."

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.4.1 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.05-12:

ITAAC 4.11 in Table 2.4.1-9

If both the existence and operation of the controls are to be validated, It would seem that the design commitment could be revised to state: 'Controls exist in the MCR and the RSS and can be manually actuated to produce the functions identified in Table 2.4.1-5.'

ITA -' Inspections and tests will be performed to confirm the existence and operation of the controls that produce the manually actuated functions identified in Table 2.4.1-5.'

AC - 'A report exists and concludes that the inspection and test results confirm the existence and operation of the controls that produce the manually actuated functions identified in Table 2.4.1-5.'

This question is also applicable to ITAAC 4.12 in Table 2.4.1-9. In addition ITAAC 4.12 should reference the table where manual permissives are found.

This question is also applicable to ITAAC 4.2 in Table 2.4.2-2. In addition ITAAC 4.2 should reference the table where minimum inventory of controls, displays, and alarms are found.

Evaluate these deficiencies and respond/ revise as necessary.

Response to Question 14.03.05-12:

U.S. EPR FSAR Tier 1, Table 2.4.1-9, Item 4.11 will be divided into two ITAAC because the controls in the main control room (MCR) are not the same as those in the remote shutdown station (RSS):

- U.S. EPR FSAR Tier 1, Table 2.4.1-9, Item 4.11 will be revised to address controls in the MCR.
- U.S. EPR FSAR Tier 1, Table 2.4.1-9, Item 4.15 will be added for controls in the RSS.

U.S. EPR FSAR Tier 1, Table 2.4.1-9, Item 4.11, Item 4.12, and Item 4.15 will also be revised to clarify the operation of the MCR and RSS controls.

U.S. EPR FSAR Tier 1, Table 2.4.2-2, Item 4.2 was deleted in the Response to RAI 115, Question 14.03.05-7.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.4.1 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.05-14:

ITAAC Item 4.1 in Table 2.4.2-2

This ITAAC stresses the existence of procedures and the capabilities that arise from them. The existence of those procedures and the capability to make the transfer from the MCR to the RSS is what is really important.

Suggested wording is as follows:

- Commitment Wording – "Transfer of control of the SICS from the MCR to the RSS can be performed."
- 1st ITA – "An inspection will be performed to verify the existence of procedures.
- 1st AC – "A report exists and concludes that procedures exist for transfer of control of the SICS from the MCR to the RSS.
- 2nd ITA – "A test will be performed to verify that control of the SICS can be transferred from the MCR to the RSS."
- 2nd AC – "A report exists and concludes that the test results confirm that control of the SICS can be transferred from the MCR to the RSS.

Evaluate these deficiencies and revise/respond as necessary.

Response to Question 14.03.05-14:

U.S. EPR FSAR Tier 1, Section 2.4.2, Item 4.1 and Table 2.4.2-2, Item 4.1 will be revised to clarify the capability to transfer control of the safety information and control system (SICS) from the main control room (MCR) to the remote shutdown station (RSS).

In addition, U.S. EPR FSAR Tier 1, Section 2.4.10, Item 2.5 and Table 2.4.10-1, Item 2.5 will be added for transferring control of the process information and control system (PICS) from the MCR to the RSS:

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.4.2 and Section 2.4.10 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.05-15:

ITAAC Item 4.3 in Table 2.4.2-2

SRP 14.3, App. A IV.4.B states that any differences in Design Commitment text between the design descriptions and the ITAAC should be minimized unless intended to better conform the commitments in the design descriptions with the ITAAC format. The Commitment Wording does not agree with section 4.3 of design description. Section 4.3 refers to "…safety related *parts*…." , and the Commitment Wording refers to"…safety related *portions*…." One of these should be changed.

SRP 14.3, App. A IV.4.B describes the three column format for ITAAC including the provision that the acceptance criteria in Column 3 for the inspections, test, or analyses described in Column 2 which, if met, demonstrate that the Design Commitments in Column 1 have been met.

The Commitment Wording, ITA, and AC are not aligned and are not focused on the topic of interest, electrical isolation of the as-built circuits. The Commitment Wording and AC talk about signal paths, while the ITA only talks about the isolation devices. Further, the AC only talks about the existence of isolation devices. It is suggested that this ITAAC have two ITA and AC. Suggested wording is as follows:

- Commitment Wording –'Electrical independence is achieved in the signal paths between the safety related parts of SICS and non-safety I&C systems using the isolation devices.'
- 1st ITA – 'Type tests, tests, and/or analyses will be performed to verify that the isolation devices provide electrical independence if inserted in the signal paths between safety related and non-safety circuits.'
- AC – 'A report exists and concludes that electrical independence is achieved in the signal paths between the safety related and non-safety circuits using the isolation devices.'
- 2nd ITA – 'An inspection will be performed to verify that the isolation devices exist in the signal paths between the safety related portions of SICS and the non-safety I&C systems.'
- AC – 'A report exists and concludes that the isolation devices exist in the signal paths between the safety related portions of SICS and the non-safety I&C systems.'

This change should also be reflected in the design description.

Also applicable to following ITAAC:

ITAAC Item 4.2 in Table 2.4.5-2 in regard to electrical independence being achieved by the isolators.

Evaluate these deficiencies and revise/respond as necessary.

Response to Question 14.03.05-15:

U.S. EPR FSAR Tier 1, Table 2.4.2-2, Item 4.3 will be revised to align the wording in the commitment wording column, the inspection, test, or analysis (ITA) column, and the acceptance criteria (AC) column.

- The first ITA and AC are aligned and are focused on producing the test specification for determining whether the isolation devices used will provide sufficient electrical isolation.

- The second ITA and AC are aligned and focused on producing the test results that show the isolation devices provide sufficient electrical isolation.

- The third ITA and AC are aligned and focused on verifying that qualified electrical isolation devices are present in the as-built safety information and control system (SICS).

The corresponding design commitment wording in U.S. EPR FSAR Tier 1, Section 2.4.2 will be revised to reflect the commitment wording used in U.S. EPR FSAR Tier 1, Table 2.4.2-2, Item 4.3.

U.S. EPR FSAR Tier 1, Section 2.4.5, Item 4.2 and Table 2.4.5-2, Item 4.2 will also be revised to align the wording in the commitment wording column, the ITA column, and the AC column.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.4.2 and Section 2.4.5 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.05-16:

ITAAC Item 4.2 in Table 2.4.4-5

SRP 14.3 App. A IV.1.A defines “inspection” as visual observations, physical observations, or a review of records of these activities. “Test” is defined as the actuation, or operation, or establishment or specified conditions to evaluate the performance of components. The Table 2.4.4-5, Item 4.2 ITA entry provides for “inspection” to verify the existence of input signals. Should the term 'test' be used instead of 'inspection' for this item?

Applicable also to Item 4.3 in Table 2.4.4-5

Evaluate and revise/respond as necessary.

Response to Question 14.03.05-16:

U.S. EPR FSAR Tier 1, Table 2.4.4-5, Item 4.2 and Item 4.3 in will be revised to replace “inspections” with “tests.”

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.4.4 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.05-17:

ITAAC Item 4.5 in Table 2.4.4-5

SRP 14.3 App. A IV.4.B describes the three column format for ITAAC including the provision that the acceptance criteria in Column 3 for the inspections, test, or analyses described in Column 2 which, if met, demonstrate that the Design Commitments in Column 1 have been met. The Commitment Wording ITA, and AC are not well aligned, as follows.

- The Commitment Wording refers to a design *process*, while the AC refers to design *outputs*. The AC should state that a report exists and provides conclusions about the *process* rather than the outputs of the various phases.
- The AC mentions activities not mentioned in the Commitment Wording. For instance, item 1b) refers to Concept and Requirements Activities, 2b) refers to Implementation Activities, 4b) refers to the Test Activity, and 5b) refers to the Installation and Checkout Activity . It was not clear whether verification of these activities was sufficient to draw conclusions about the life cycle phases mentioned in the Commitment Wording.
- The second activity under the ITA column is appears to be essentially the same as the first. The AC corresponding to this activity appear to relate to the validity of the design process outputs rather than to the process itself. The Commitment Wording only mentions the process, not whether it produced valid results. Consequently, the purpose of this activity is not clear.

Suggested wording:

Commitment Wording:

'The SAS hardware and software are developed using a design process composed of five life cycle phases with each phase having design outputs which must conform to the requirements of that phase.. The five life cycle phases are the following: .....'

1st ITA - 'Inspections will be performed to verify that the design process has five life-cycle phases with each one having design outputs.'

2nd ITA - ' A V&V analysis will be performed to verify that the design ouputs for each life cycle phase conform to the requirements of that phase.'

All the ACs that confirm there are design outputs for each phase could be adjacent to the first ITA.

All the ACs that confirm that the design outputs for each phase conform to the requirements of the phase could be adjacent to second ITA.

Applicable also to the following ITAAC:

ITAAC Item 4.14 in Table 2.4.1-9
ITAAC Item 4.5 in Table 2.4.2-2
ITAAC Item 3.1 in Table 2.4.9-3 The V&V analyses may or may not be required for non-safety related system.

Evaluate these deficiencies and revise/respond as necessary.

Response to Question 14.03.05-17:

The following U.S. EPR FSAR Sections will be revised as suggested in the question:

- U.S. EPR FSAR Tier 1, Section 2.4.1, Item 4.14 and Table 2.4.1-9, Item 4.14
- U.S. EPR FSAR Tier 1, Section 2.4.2, Item 4.5 and Table 2.4.2-2, Item 4.5
- U.S. EPR FSAR Tier 1, Section 2.4.4, Item 4.5 and Table 2.4.4-5, Item 4.5
- U.S. EPR FSAR Tier 1, Section 2.4.9, Item 3.1 and Table 2.4.9-3, Item 3.1, except that the analyses (V&V) will not be performed for each phase.

Also, information in the inspection, test, or analysis (ITA) column and the acceptance criteria (AC) column are split into separate items to align them with the five life-cycle phases.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.4.1, Section 2.4.2, Section 2.4.4, and Section 2.4.9 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 ~~of~~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.
- Provides for manual actuation of ESF 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.

2.0 Arrangement

2.1 The location of the safety related PS equipment is as listed in Table 2.4.1-1—Protection System Equipment.

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

3.0 Mechanical Design Features~~Seismic 1 Classifications~~

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

14.03.05-9

4.1 The PS generates an automatic RT signal ~~as~~ for each of the parameters identified in Table 2.4.1-3—Protection System Automatic Reactor Trips.

4.2 The PS generates automatically actuated engineered safety feature signals, as identified in Table 2.4.1-4—Protection System Automatically Actuated Engineered Safety Features.

4.3 The PS provides operating bypasses for the functions identified in Table 2.4.1-6—Protection System Operating Bypasses.

4.4 Communication independence is provided in the inter-division communication paths within the PS.

4.5 Bypassed or inoperable PS channels status information is retrievable in the MCR.

4.6 Setpoints associated with the automatic reactor trips listed in Table 2.4.1-3 and the automatically actuated engineered safety features listed in Table 2.4.1-4 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.

4.7 The PS receives input signals from the sources listed in Table 2.4.1-2—Protection System Input Signals.

4.8 The PS provides signals to the non safety related control systems through electrical isolation devices.

4.9 Electrical isolation devices exist in the data communication paths between the PS and the non safety related displays and controls.

4.10 The PS equipment listed as Class 1E in Table 2.4.1-1 can perform its safety function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

14.03.05-12

4.11 Controls exist in the MCR ~~and the remote shutdown station (RSS)~~ to allow manual actuation ~~of the manually actuated functions~~ at the system level of the functions identified in Table 2.4.1-5—Protection System Manually Actuated Functions.

4.12 Controls exist in the MCR and RSS to allow validation or inhibition of manual permissives listed in Table 2.4.1-7—Protection System Permissives.

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4.13 The PS interlocks exist as provided in Table 2.4.1-8— Protection System Interlocks.

4.14 The PS hardware and software are developed using a design process composed of five life cycle phases with each phase having design outputs which must conform to the requirements of that phase. The five life cycle phases are the following:

1. Basic design phase.
2. Detailed design phase.
3. Manufacturing phase.
4. Testing phase.
5. Installation and commissioning phase.

~~The PS hardware and software are developed using a design process with the following life cycle phases:~~

~~•Basic design phase.~~

~~•Detailed design phase.~~

~~•Manufacturing phase.~~

•~~Testing phase.~~

•~~Installation and commissioning phase.~~ 14.03.05-17

4.15 Controls exist in the RSS that allow manual actuation of RT. 14.03.05-12

5.0 Electrical Power Design Features

5.1 The components ~~equipment~~ identified as Class1E in Table 2.4.1-1 are powered from the Class 1E division as listed in Table 2.4.1-1 in a normal or alternate feed condition~~receives power from its respective Class 1E division~~.

6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

6.1 Table 2.4.1-9~~—~~ lists the ~~Protection System~~PS ITAAC ~~specifies the inspections, tests, analyses, and acceptance criteria for the PS~~.

Table 2.4.1-9—Protection System ITAAC (6 Sheets)

	Commitment Wording	Inspections, Tests, ~~or Analysis~~ 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 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.
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. ~~Inspections, t~~Type tests, ~~tests,~~ analyses or a combination of type tests and analyses will be performed on the equipment ~~designated~~ 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. b. Inspections will be performed of the as-installed 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.	~~(1) A report exists and concludes that the equipment listed as Seismic Category I in Table 2.4.1-1 is installed as designed.~~ ~~(2)~~a Tests/analysis ~~A~~ reports exist~~s~~ and conclude~~s~~ 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. Inspection reports exist and conclude that the as-installed 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 an automatic RT signal~~, as~~ for each of the parameters identified in Table 2.4.1-3.	Tests will be performed on the as- built PS using test signals to simulate the RT functions listed in Table 2.4.1-3.	The PS generates an automatic RT signal for each of the parameters ~~as~~ identified in Table 2.4.1-3.
4.2	The PS generates automatically actuated engineered safety feature signals, as identified in Table 2.4.1-4.	Tests will be performed on the as- built PS using test signals to simulate the engineered safety feature functions listed in Table 2.4.1-4.	The PS generates automatic actuation of engineered safety features signals, as identified in Table 2.4.1-4.

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14.03.05-9

14.03.05-10

Table 2.4.1-9—Protection System ITAAC (6 Sheets)

Commitment Wording		Inspections, Tests, ~~or Analysis~~ Analyses	Acceptance Criteria
4.3	The PS provides operating bypasses for the functions identified in Table 2.4.1-6.	Tests will be performed on the as- built PS using test signals.	The PS provides operating bypasses for the functions identified in Table 2.4.1-6.
4.4	Communication independence is provided in the inter-division communication paths within the PS.	Type tests, tests ,analyses or a combination of tests and analyses will be performed on components that establish communication independence in the inter-division communication paths within the PS	A verification and validation (V&V) report exists and concludes that communication independence exists in the inter-division communications paths within the PS.
4.5	Bypassed or inoperable PS channels status information is retrievable in the MCR.	A test of the as built PS will be performed.	Bypassed or inoperable PS channels status information is retrievable in the MCR.
4.6	Setpoints associated with the automatic reactor trips listed in Table 2.4.1-3 and the automatically actuated engineered safety features listed in Table 2.4.1-4 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 ~~a document that describes the methodology for~~ an established methodology for determining the PS setpoints ~~determination in the PS~~. b. An analysis will be performed to verify that the PS setpoints are determined using the documented methodology. 14.03.05-11	a. An established methodology for determining PS setpoints exists. b. A report exists and concludes that the PS setpoints associated with the automatic reactor trips listed in Table 2.4.1-3 and the automatically actuated engineered safety features listed in Table 2.4.1-4 are determined using a documented methodology ~~which provides a method~~: (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.

Table 2.4.1-9—Protection System ITAAC (6 Sheets)

Commitment Wording		Inspections, Tests, ~~or Analysis~~ Analyses	Acceptance Criteria
4.7	The PS receives input signals from the sources listed in Table 2.4.1-2.	Tests will be performed using simulated signals.	The PS receives the input signals listed in Table 2.4.1-2.
4.8	The PS provides signals to the non safety related control systems through electrical isolation devices.	Inspections will be performed on the existence of the electrical isolation devices.	Electrical isolation devices exist in the signal path from the PS to the non safety related control systems.
4.9	Electrical isolation devices exist in the data communication paths between the PS and the non safety related displays and controls.	Inspections will be performed on the existence of the electrical isolation devices.	Electrical isolations devices exist in the data communication paths between the PS and the non safety related displays and controls.
4.10	The PS equipment listed as Class 1E in Table 2.4.1-1 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 2.4.1-1.	A report exists and concludes that the equipment listed 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 exist in the MCR ~~and the RSS to~~ that allow manual actuation, at the system level, of the ~~manually actuated~~ functions identified in Table 2.4.1-5.	a. Inspections ~~and tests~~ will be performed ~~on~~ to verify the existence of controls in the MCR ~~or the RSS to allow manual actuation of the manually actuated functions~~. b. Tests will be performed to verify the correct functionality of the controls in the MCR.	a. Controls exist in the MCR ~~and RSS to~~ that allow manual actuation ~~of the manually actuated~~ at the system level of the functions ~~identified~~ listed in Table 2.4.1-5. b. For each function in Table 2.4.1-5, the correct actuation signals are present at the output of the PS actuation logic units (ALU) after the corresponding controls in the MCR are manually activated.

14.03.05-12

Table 2.4.1-9—Protection System ITAAC (6 Sheets)

	Commitment Wording	Inspections, Tests, ~~or Analysis~~ Analyses	Acceptance Criteria
4.12	Controls exist in the MCR and RSS to allow validation or inhibition of manual permissives listed in Table 2.4.1-7. 14.03.05-12	a. Inspections will be performed to verify the existence of controls in the RSS. b. Tests will be performed to verify the correct functionality of the controls in the RSS. ~~Inspections and tests will be performed on the existence of controls in the MCR and the RSS to allow validation or inhibition of manual permissives listed in Table 2.4.1-7.~~	a. Controls exist in the MCR and RSS to allow validation or inhibition of manual permissives listed in Table 2.4.1-7. b. For each of the manual permissives in Table 2.4.1-7, the correct permissive status is present in the PS actuation logic units (ALU) after the corresponding controls in the MCR and RSS are manually activated.
4.13	The PS interlocks exist as provided in Table 2.4.1-8.	Tests will be performed on the operation of the interlocks listed in Table 2.4.1-8.	The PS interlocks exist as provided in Table 2.4.1-8.
4.14	The PS hardware and software are developed using a design process composed of five life cycle phases with each phase having design outputs which must conform to the requirements of that phase. The five life cycle phases are the following: 1) Basic design phase. 2) Detailed design phase. 3) Manufacturing phase. 4) Testing phase. 5) Installation and commissioning phase. ~~The PS hardware and software are developed using a design process with the following life cycle phases:~~ ~~•Basic design phase.~~	a. Inspections will be performed to verify that the PS basic design phase process has design outputs. b. Analyses will be performed to verify that the design outputs for the PS basic design phase conform to the requirements of that phase. c. Inspections will be performed to verify that the PS detailed design phase process has design outputs. d. Analyses will be performed to verify that the design outputs for the PS detailed design phase conform to the requirements of that phase.	a. A report exists and provides the design outputs for the basic design phase of the PS hardware and software design process. b. A verification and validation (V&V) report exists and concludes that the design outputs conform to the requirements of the PS basic design phase. c. A report exists and provides the design outputs for the detailed design phase of the PS hardware and software design process. d. A V&V report exists and concludes that the design outputs conform to the requirements of the PS detailed design phase.

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Table 2.4.1-9—Protection System ITAAC (6 Sheets)

Commitment Wording	Inspections, Tests, ~~or Analysis~~ Analyses	Acceptance Criteria
~~•Detailed design phase.~~ ~~•Manufacturing phase.~~ ~~•Testing phase.~~ ~~•Installation and Commissioning phase.~~	e. Inspections will be performed to verify that the PS manufacturing phase process has design outputs.	e. A report exists and provides the design outputs for the manufacturing phase of the PS hardware and software design process.
	f. Inspections will be performed to verify that the PS testing phase process has design outputs.	f. A report exists and provides the design outputs for the testing phase of the PS hardware and software design process.
	g. Analyses will be performed to verify that the design outputs for the PS testing phase conform to the requirements of that phase.	g. A V&V report exists and concludes that the design outputs of the testing phase conform to the requirements of the PS testing phase.
	h. Inspections will be performed to verify that the PS installation and commissioning phase process has design outputs.	h. A report exists and provides the design outputs for the installation and commissioning phase of the PS hardware and software design process.
	i. Analyses will be performed to verify that the design outputs for the PS installation and commissioning phase conform to the requirements of that phase.	i. A V&V report exists and concludes that the design outputs of the PS installation and commissioning phase conform to the requirements of the installation and commissioning phase.

14.03.05-17

Table 2.4.1-9—Protection System ITAAC (6 Sheets)

Commitment Wording		Inspections, Tests, ~~or Analysis~~ Analyses	Acceptance Criteria
		~~Inspections will be performed on the design process for the PS hardware and software development.~~ ~~An analysis will be performed to verify that the PS hardware and software are developed in accordance with the design process.~~	~~1a) A design report exists and provides the design outputs of the basic design phase of the PS hardware and software design process.~~ ~~1b) V&V reports exist that address the Concept and Requirements Activities and conclude that the design outputs generated in the basic design phase conform to the requirements of this phase.~~ ~~2a) A report exists and provides the design outputs of the detailed design phase of the PS hardware and software design process.~~ ~~2b) V&V reports exist that address the Design and Implementation Activities and conclude that the design outputs generated in the detailed design phase conform to the requirements of this phase.~~ ~~3) A report exists and provides the design outputs of the manufacturing phase of the PS hardware and software design process.~~ ~~4a) A report exists and provides the design outputs of the testing phase of the PS hardware and software design process.~~

14.03.05-17

Table 2.4.1-9—Protection System ITAAC (6 Sheets)

Commitment Wording		Inspections, Tests, ~~or Analysis~~ Analyses	Acceptance Criteria
			~~4b) A V&V report exists that address the Test Activity and concludes that the design outputs generated in the testing phase conform to the requirements of this phase.~~ 14.03.05-17 ~~5a) A report exists and provides the design outputs of the installation and commissioning phase of the PS hardware and software design process.~~ ~~5b) A V&V report exists that addresses the Installation and Checkout Activity summary report, if required, for any changes following testing phase and concludes that the design outputs generated in the installation and commissioning phase conform to the requirements of this phase.~~
4.15	Controls exist in the RSS that allow manual actuation of RT.	a. Inspections will be performed to verify the existence of controls in the RSS. b. Tests will be performed to verify the correct functionality of the controls in the RSS.	a. Controls exist in the RSS that allow manual actuation of RT. b. The correct actuation signals are present at the RT devices after the corresponding controls in the RSS are manually activated.

14.03.05-12

2.4.2 Safety Information and Control System

1.0 Description

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 SICS provides the following safety related functions:

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

2.0 Arrangement

2.1 The location of the SICS equipment is as listed in Table 2.4.2-1—Safety Information and Control System Equipment.

2.2 ~~Physical separation exists between the four safety related divisions of the SICS.~~Deleted

3.0 Mechanical Design Features

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

4.0 I&C Design Features, Displays and Controls

14.03.05-14

4.1 The capability to transfer control of the SICS from the MCR to the RSS exists.~~Main Control Room actions required to transfer control to the RSS can be accomplished during a rapid evacuation of the MCR. This process provides for the transfer of control of the SICS from the MCR to the RSS. Procedures exist for the evacuation of the MCR and the transfer of control of the SICS from the MCR to RSS.~~

4.2 Deleted.~~The SICS provides a minimum inventory of controls, displays and alarms available in the MCR and the RSS.~~

4.3 Electrical isolation is provided on connections between the safety related parts of the SICS and the non safety I&C systems.~~Electrical isolation devices exist in the signal paths between the safety related parts of SICS and the non safety I&C systems.~~

14.03.05-15

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

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

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1) Basic design phase.

2) Detailed design phase.

3) Manufacturing phase.

4) Testing phase.

5) Installation and commissioning phase.

~~The SICS hardware and software are developed using a design process with the following life cycle phases:~~

~~•Basic design phase.~~

~~•Detailed design phase.~~

~~•Manufacturing phase.~~

~~•Testing phase.~~

~~•Installation and commissioning phase.~~

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

5.0 Electrical Power Design Features

5.1 The components ~~equipment~~ identified as Class 1E in Table 2.4.2-1 are powered from the Class 1E division as listed in Table 2.4.2-1 in a normal or alternate feed condition~~receives power from a Class 1E power source~~.

6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

6.1 Table 2.4.2-2~~—~~ lists the SICS ITAAC.~~Safety Information and Control System ITAAC specifies the inspections, tests, analyses, and acceptance criteria for the SICS.~~

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

14.03.05-14

	Commitment Wording	Inspections, Tests, ~~or~~ ~~Analysis~~Analyses	Acceptance Criteria
4.1	The capability to transfer control of the SICS from the MCR to the RSS exists.~~Procedures exist for the transfer of control of the SICS from the MCR to the RSS.~~	a. Inspections will be performed to verify the existence of procedures. b. Tests will be performed to verify that control of the SICS can be transferred from the MCR to the RSS. ~~An inspection will be performed on the existence of procedures for the transfer of control of the SICS from the MCR to the RSS.~~ ~~A test will be performed on the transfer of control of SICS from the MCR to the RSS.~~	a. A report exists and concludes that procedures exist for transfer of control of the SICS 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. ~~(1) Procedures exist for the transfer of control of the SICS from the MCR to the RSS~~ ~~(2) The procedures provide the capability to transfer control of the SICS from the MCR to the RSS.~~
4.2	Deleted.~~The SICS provides a minimum inventory of controls, displays, and alarms available in the MCR and the RSS.~~	Deleted.~~Inspections and tests will be performed to verify the existence of controls, displays, and alarms on the as-built SICS in the MCR and the RSS.~~	Deleted.~~The SICS provides a minimum inventory of controls, displays, and alarms in the MCR and RSS.~~ ~~The minimum inventory of controls, displays, and alarms on the SICS in the MCR and the RSS is provided by the human factors engineering (HFE) program discussed in Tier 1 Section 3.4.~~

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

	Commitment Wording	Inspections, Tests, ~~or~~ ~~Analysis~~Analyses	Acceptance Criteria
4.3	Electrical isolation is provided on connections between the safety related parts of the SICS and the non safety I&C systems.~~Electrical isolation devices exist in the signal paths between the safety related portions of SICS and the non safety I&C systems.~~	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 the non safety I&C systems. 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 the non safety I&C systems. c. Inspections will be performed on all connections between the safety related parts of the SICS and the non safety I&C systems. ~~Inspections, type tests, tests, analyses or a combination of tests and analyses will be performed on electrical isolation devices.~~	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 the non safety I&C systems. b. A report exists and concludes that the Class 1E isolation devices used between the safety related parts of the SICS and the non safety I&C systems prevent the propagation of credible electrical faults. c. Class 1E electrical isolation devices exist on all connections between the safety related parts of the SICS and the non safety I&C systems. ~~Electrical isolation devices exist in the signal paths between the safety related portion of SICS and the non safety I&C systems~~
4.4	The SICS equipment listed as Class 1E in Table 2.4.2-1 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 2.4.1-1.	A report exists and concludes that the equipment listed 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 (4 Sheets)

	Commitment Wording	Inspections, Tests, ~~or~~ ~~Analysis~~Analyses	Acceptance Criteria
4.5	The SICS hardware and software are developed using a design process composed of five life cycle phases with each phase having design outputs which must conform to the requirements of that phase. The five life cycle phases are the following: 1) Basic design phase. 2) Detailed design phase. 3) Manufacturing phase. 4) Testing phase. 5) Installation and commissioning phase. ~~The SICS hardware and software are developed using a design process with the following life cycle phases:~~ ~~•Basic design phase.~~ ~~•Detailed design phase.~~ ~~•Manufacturing phase.~~ ~~•Testing phase.~~ ~~•Installation and Commissioning phase.~~	a. Inspections will be performed to verify that the SICS basic design phase process has design outputs. b. Analyses will be performed to verify that the design outputs for the SICS basic design phase conform to the requirements of that phase. c. Inspections will be performed to verify that the SICS detailed design phase process has design outputs. d. Analyses will be performed to verify that the design outputs for the SICS detailed design phase conform to the requirements of that phase. e. Inspections will be performed to verify that the SICS manufacturing phase process has design outputs. f. Inspections will be performed to verify that the SICS testing phase process has design outputs. g. Analyses will be performed to verify that the design outputs for the SICS testing phase conform to the requirements of that phase.	a. A report exists and provides the design outputs for the basic design phase of the SICS hardware and software design process. b. A verification and validation (V&V) report exists and concludes that the design outputs conform to the requirements of the SICS basic design phase. c. A report exists and provides the design outputs for the detailed design phase of the SICS hardware and software design process. d. A V&V report exists and concludes that the design outputs conform to the requirements of the SICS detailed design phase. e. A report exists and provides the design outputs for the manufacturing phase of the SICS hardware and software design process. f. A report exists and provides the design outputs for the testing phase of the SICS hardware and software design process. g. A V&V report exists and concludes that the design outputs of the testing phase conform to the requirements of the SICS testing phase.

14.03.05-17

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

Commitment Wording		Inspections, Tests, ~~or Analysis~~Analyses	Acceptance Criteria
		h. Inspections will be performed to verify that the SICS installation and commissioning phase process has design outputs. i. Analyses will be performed to verify that the design outputs for the SICS installation and commissioning phase conform to the requirements of that phase. ~~Inspections will be performed on the design process for the SICS hardware and software development.~~ ~~An analysis will be performed to verify that the SICS hardware and software are developed in accordance with the design process.~~	h. A report exists and provides the design outputs for the installation and commissioning phase of the SICS hardware and software design process. i. A V&V report exists and concludes that the design outputs of the SICS installation and commissioning phase conform to the requirements of the installation and commissioning phase. ~~1a) A report exists and provides the design outputs of the basic design phase of the SICS hardware and software design process.~~ ~~1b) V&V reports exist that address the Concept and Requirements Activities and conclude that the design outputs generated in the basic design phase conform to the requirements of this phase.~~ ~~2a) A report exists and provides the design outputs of the detailed design phase of the SICS hardware and software design process.~~ ~~2b) V&V reports exist that address the Design and Implementation Activities and conclude that the design outputs generated in the detailed design phase conform to the requirements of this phase.~~

14.03.05-17

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

Commitment Wording	Inspections, Tests, ~~or~~ ~~Analysis~~Analyses	Acceptance Criteria
		~~3) A report exists and provides the design outputs of the manufacturing phase of the SICS hardware and software design process.~~ ~~4a) A report exists and provides the design outputs of the testing phase of the SICS hardware and software design process.~~ ~~4b) A V&V report exists that address the Test Activity and concludes that the design outputs generated in the testing phase conform to the requirements of this phase.~~ ~~5a) A report exists and provides the design outputs of the installation and commissioning phase of the SICS hardware and software design process.~~ ~~5b) A V&V report exists that addresses the Installation and Checkout Activity summary report, if required, for any changes following testing phase and concludes that the design outputs generated in the installation and commissioning phase conform to the requirements of this phase.~~

14.03.05-17

2.4.4 Safety Automation System

1.0 Description

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

The SAS has 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 a 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 The 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.

3.0 ~~Seismic 1 Classifications~~Mechanical Design Features

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

4.0 I&C Design Features, Displays and Controls

4.1 The SAS equipment classified as Class 1E in Table 2.4.4-1 can perform its safety function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

4.2 The SAS receives input signals from the sources listed in Table 2.4.4-2.

4.3 The SAS provides output signals listed in Table 2.4.4-3.

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

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

1) Basic design phase.

14.03.05-17

2) Detailed design phase.

3) Manufacturing phase.

4) Testing phase.

5) Installation and commissioning phase.

~~The SAS hardware and software are developed using a design process with the following life cycle phases:~~

~~•Basic design phase.~~

~~•Detailed design phase.~~

~~•Manufacturing phase.~~

~~•Testing phase.~~

~~•Installation and commissioning phase.~~

5.0 Electrical Power Design Features

14.03.05-17

5.1 The components ~~equipment~~ identified as Class 1E in Table 2.4.4-1 are powered from the Class 1E division as listed in Table 2.4.4-1 in a normal or alternate feed condition~~receives power from its respective Class 1E division power supply~~.

6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

6.1 Table 2.4.4-5~~—~~ lists the SAS ITAAC~~Safety Automation System ITAAC specifies the inspections, tests, analyses, and acceptance criteria for the SAS~~.

Table 2.4.4-5—Safety Automation System ITAAC (~~3~~ 4 Sheets)

Commitment Wording		Inspections, Tests, ~~or Analysis~~ Analyses	Acceptance Criteria
4.1	Equipment listed 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.	Type tests, tests, analyses or a combination 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 listed 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.	~~Inspections~~ 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 output signals listed in Table 2.4.4-3.	~~Inspections~~ 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 ~~SAS provides the~~ interlocks listed in Table 2.4.4-4 respond as specified when activated by a test signal.
4.5	The SAS hardware and software are developed using a design process composed of five life cycle phases with each phase having design outputs which must conform to the requirements of that phase. The five life cycle phases are the following: 1) Basic design phase. 2) Detailed design phase. 3) Manufacturing phase. 4) Testing phase. 5) Installation and commissioning phase. ~~The SAS hardware and software are developed using a design process with the following life cycle phases:~~	a. Inspections will be performed to verify that the SAS basic design phase process has design outputs. b. Analyses will be performed to verify that the design outputs for the SAS basic design phase conform to the requirements of that phase. c. Inspections will be performed to verify that the SAS detailed design phase process has design outputs. d. Analyses will be performed to verify that the design outputs for the SAS detailed design phase conform to the requirements of that phase.	a. A report exists and provides the design outputs for the basic design phase of the SAS hardware and software design process. b. A verification and validation (V&V) report exists and concludes that the design outputs conform to the requirements of the SAS basic design phase. c. A report exists and provides the design outputs for the detailed design phase of the SAS hardware and software design process. d. A V&V report exists and concludes that the design outputs conform to the requirements of the SAS detailed design phase.

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Table 2.4.4-5—Safety Automation System ITAAC (~~3~~ 4 Sheets)

Commitment Wording	Inspections, Tests, ~~or Analysis~~ Analyses	Acceptance Criteria
~~•Basic design phase.~~ ~~•Detailed design phase.~~ ~~•Manufacturing phase.~~ ~~•Testing phase.~~ ~~•Installation and commissioning phase.~~	e. Inspections will be performed to verify that the SAS manufacturing phase process has design outputs.	e. A report exists and provides the design outputs for the manufacturing phase of the SAS hardware and software design process.
	f. Inspections will be performed to verify that the SAS testing phase process has design outputs.	f. A report exists and provides the design outputs for the testing phase of the SAS hardware and software design process.
	g. Analyses will be performed to verify that the design outputs for the SAS testing phase conform to the requirements of that phase.	g. A V&V report exists and concludes that the design outputs of the testing phase conform to the requirements of the SAS testing phase.
	h. Inspections will be performed to verify that the SAS installation and commissioning phase process has design outputs.	h. A report exists and provides the design outputs for the installation and commissioning phase of the SAS hardware and software design process.
	i. Analyses will be performed to verify that the design outputs for the SAS installation and commissioning phase conform to the requirements of that phase.	i. A V&V report exists and concludes that the design outputs of the SAS installation and commissioning phase conform to the requirements of the installation and commissioning phase.

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Table 2.4.4-5—Safety Automation System ITAAC (~~3~~ 4 Sheets)

Commitment Wording		Inspections, Tests, ~~or Analysis~~ Analyses	Acceptance Criteria
		~~Inspections will be performed on the design process for the SAS hardware and software development.~~ ~~An analysis will be performed to Verify that the SAS hardware and software are developed in accordance with the design process.~~	~~1a) A report exists and provides the design outputs of the basic design phase of the SAS hardware and software design process.~~ ~~1b) V&V reports exist that address the Concept and Requirements Activities and conclude that the design outputs generated in the basic design phase conform to the requirements of this phase.~~ ~~2a) A report exists and provides the design outputs of the detailed design phase of the SAS hardware and software design process.~~ ~~2b) V&V reports exist that address the Design and Implementation Activities and conclude that the design outputs generated in the detailed design phase conform to the requirements of this phase.~~ ~~3) A report exists and provides the design outputs of the manufacturing phase of the SAS hardware and software design process.~~ ~~4a) A report exists and provides the design outputs of the testing phase of the SAS hardware and software design process.~~

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Table 2.4.4-5—Safety Automation System ITAAC (~~3~~ 4 Sheets)			
Commitment Wording		Inspections, Tests, ~~or Analysis~~ Analyses	Acceptance Criteria
			~~4b) A V&V report exists that address the Test Activity and concludes that the design outputs generated in the testing phase conform to the requirements of this phase.~~ ~~5a) A report exists and provides the design outputs of the installation and commissioning phase of the SAS hardware and software design process.~~ ~~5b) A V&V report exists that addresses the Installation and Checkout Activity summary report, if required, for any changes following testing phase and concludes that the design outputs generated in the installation and commissioning phase conform to the requirements of this phase.~~

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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 has 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 The 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.

3.0 Mechanical Design Features~~Seismic I Classifications~~

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 The order of priority of automatic functions performed by PACS is listed from highest to lowest:

- Safety-related I&C functions.
- Non-safety related I&C functions.

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4.2 Electrical isolation is provided on connections between the PACS and the non-safety I&C systems. ~~Isolation devices exist in the signal paths between the PACS and the non-Class 1E I&C systems.~~

4.3 The PACS equipment classified as Class 1E in Table 2.4.5-1 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 ~~equipment~~ identified as Class 1E in Table 2.4.5-1 are powered from the Class 1E division as listed in Table 2.4.5-1 in a normal or alternate feed condition~~receives power from its respective Class 1E division~~.

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

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	Commitment Wording	Inspections, Tests, ~~or Analysis~~Analyses	Acceptance Criteria
4.2	Electrical isolation is provided on connections between the PACS and the non-safety I&C systems.~~Isolation devices exist in the signal paths between the PACS and the non-Class 1E I&C systems.~~	a. Analyses will be performed to determine the test specification for electrical isolation devices on connections between the PACS and the non safety I&C systems.	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 PACS and the non safety I&C systems.
		b. Type tests, analyses, or a combination of type tests and analyses will be performed on the electrical isolation devices between the PACS and the non safety I&C systems.	b. A report exists and concludes that the Class 1E isolation devices used between the PACS and the non safety I&C systems prevent the propagation of credible electrical faults.
		c. Inspections will be performed on all connections between the PACS and the non safety I&C systems.~~Inspections will be performed to verify the existence of isolation devices.~~	c. Class 1E electrical isolation devices exist on all connections between the PACS and the non safety I&C systems. ~~Isolation devices exist in the signal paths between the PACS and the non-Class 1E I&C systems.~~
4.3	The PACS equipment classified as Class 1E in Table 2.4.5-1 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 2.4.5-1.	A report exists and concludes that the equipment listed as Class 1E in Table 2.4.5-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.
5.1	The components ~~equipment~~ identified as Class 1E in Table 2.4.5-1 are powered from the Class 1E division as listed in Table 2.4.5-1 in a normal or alternate feed	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.	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.

2.4.9 Process Automation System

1.0 Description

The process automation system (PAS) is a non-safety related digital I&C system. The PAS consists of the following four subsystems:

- Nuclear island subsystem.
- Turbine island subsystem.
- Balance of plant subsystem.
- Diverse actuation subsystem (DAS).

The PAS provides the following non-safety related functions:

- Automatic anticipated transient without scram (ATWS) mitigation functions.
- Automatic software common cause failure mitigation functions.
- Automatic station blackout (SBO) mitigation functions.
- Automatic primary plant limitation functions.
- Automatic operational functions.
- Manual control of non-safety functions.
- Processing of information for display.

2.0 Arrangement

2.1 The location of the PAS equipment is as listed in Table 2.4.9-1—Process Automation System Equipment.

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

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3.0 I&C Design Features, Displays and Controls

3.1 The DAS hardware and software are developed using a design process composed of five life cycle phases with each phase having design outputs which must conform to the requirements of that phase. The five life cycle phases are the following:

1) Basic design phase.

2) Detailed design phase.

3) Manufacturing phase.

4) Testing phase.

5) Installation and commissioning phase.

~~3.1The DAS hardware and software are developed using a design process with the following life cycle phases:~~

~~•Basic design phase.~~

~~•Detailed design phase.~~

~~•Manufacturing phase.~~

~~•Testing phase.~~

~~•Installation and commissioning phase.~~

3.2 ~~The DAS consists of equipment from sensor output to the final actuator device that is independent and diverse from the protection system (PS) and safety automation system (SAS) I&C platforms.~~The system hardware and system software in the PAS is diverse from the system hardware and system software in the protection system (PS) and the safety automation system (SAS).

3.3 The DAS generates signals for automatic actuation of the functions identified in Table 2.4.9-2—Functions Automatically Actuated by the DAS.

4.0 System Inspections, Tests, Analyses, and Acceptance Criteria

4.1 Table 2.4.9-3~~—~~ lists the PAS ITAAC~~Process Automation System ITAAC specifies the inspections, tests, analyses, and acceptance criteria for the PAS~~.

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Table 2.4.9-3—Process Automation System ITAAC (2 Sheets)

Commitment Wording		Inspections, Tests, ~~or~~ ~~Analysis~~Analyses	Acceptance Criteria
2.1	The PAS equipment is located as listed in Table 2.4.~~1~~9-1.	Inspections will be performed of the location of the PAS equipment.	The equipment listed in Table 2.4.~~1~~9-1 is located as listed in Table 2.4.~~1~~9-1.
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 buildings.
3.1	The DAS hardware and software are developed using a design process composed of five life cycle phases with each phase having design outputs which must conform to the requirements of that phase. The five life cycle phases are the following: 1) Basic design phase. 2) Detailed design phase. 3) Manufacturing phase. 4) Testing phase. 5) Installation and commissioning phase. ~~The DAS hardware and software are developed using a design process with the following life cycle phases:~~ ~~•Basic design phase.~~ ~~•Detailed design phase.~~ ~~•Manufacturing phase.~~ ~~•Testing phase.~~ ~~•Installation and commissioning phase.~~	a. Inspections will be performed to verify that the DAS basic design phase process has design outputs. b. Inspections will be performed to verify that the DAS detailed design phase process has design outputs. c. Inspections will be performed to verify that the DAS manufacturing phase process has design outputs. d. Inspections will be performed to verify that the DAS testing phase process has design outputs. e. Inspections will be performed to verify that the DAS installation and commissioning phase process has design outputs. ~~Inspection will be performed on the design process for the DAS hardware and software development.~~	a. A report exists and provides the design outputs for the basic design phase of the DAS hardware and software design process. b. A report exists and provides the design outputs for the detailed design phase of the DAS hardware and software design process. c. A report exists and provides the design outputs for the manufacturing phase of the DAS hardware and software design process. d. A report exists and provides the design outputs for the testing phase of the DAS hardware and software design process. e. A report exists and provides the design outputs for the installation and commissioning phase of the DAS hardware and software design process. ~~1) A report exists and provides the design outputs of the basic design phase of the DAS hardware and software~~

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Table 2.4.9-3—Process Automation System ITAAC (2 Sheets)

Commitment Wording	Inspections, Tests, ~~or Analysis~~Analyses	Acceptance Criteria
		~~design process.~~ ~~2) A report exists and provides the design outputs of the detailed design phase of the DAS hardware and software design process.~~ ~~3) A report exists and provides the design outputs of the manufacturing phase of the DAS hardware and software design process.~~ ~~4) A report exists and provides the design outputs of the testing phase of the DAS hardware and software design process.~~ ~~5) A report exists and provides the design outputs of the installation and commissioning phase of the DAS hardware and software design process.~~

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2.4.10 Process Information and Control System

1.0 Description

The process information and control system (PICS) is 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 ~~The PICS consists of hardware that is diverse from the safety-related hardware of~~ 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 consists of software that is diverse from the safety-related software of the Safety Information and Control System (SICS).~~Deleted

2.3 ~~The PICS consists of displays that are diverse from the safety-related Qualified Display System (QDS) of the Safety Information and Control System (SICS).~~Deleted 14.03.05-14

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

2.5 The capability to transfer control of the PICS from the MCR to the RSS exists.

3.0 System Inspections, Tests, Analyses, and Acceptance Criteria

3.1 Table 2.4.10-1— lists the PICS ITAAC~~Process Information and Control System ITAAC specifies the inspections, tests, analyses, and acceptance criteria for the PICS~~.

Table 2.4.10-1—Process Information and Control System ITAAC

Commitment Wording		Inspections, Tests, ~~or Analysis~~Analyses	Acceptance Criteria
2.5	The capability to transfer control of the PICS from the MCR to the RSS exists.	a. Inspections will be performed to verify the existence of procedures. b. Tests will be performed to verify that control of the PICS can be transferred from the MCR to the RSS.	a. A report exists and concludes that procedures exist for transfer of control of the PICS 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.

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