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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 347 Related to ESBWR Design Certification Application - RAI 14.3-449 Supplement 1**

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) response to Request for Additional Information (RAI) Number 14.3-449 Supplement 1 from the U.S. Nuclear Regulatory Commission (NRC) sent by NRC letter dated June 9, 2009 (see Reference 1). Enclosure 2 contains the DCD markup pages associated with the response.

Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box.

If you have any questions or require additional information, please contact me.

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

DO68
NRO

Reference:

1. MFN 09-400, Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, *Request for Additional Information Letter No. 347 Related to ESBWR Design Certification Application*, dated June 9, 2009.

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 347 Related to ESBWR Design Certification Application – RAI Number 14.3-449 Supplement 1
2. Response to Portion of NRC Request for Additional Information Letter No. 347 Related to ESBWR Design Certification Application – DCD Markups for RAI Number 14.3-449 Supplement 1

cc:

AE Cubbage	USNRC (with enclosures)
JG Head	GEH/Wilmington (with enclosures)
DH Hinds	GEH/Wilmington (with enclosures)
eDRF Section:	0000-0103-6436 (14.3-449 Supplement 1)

MFN 09-448

Enclosure 1

Response to Portion of NRC Request for Additional Information Letter No. 347 Related to ESBWR Design Certification Application

RAI Number 14.3-449 Supplement 1

NRC RAI 14.3-449 Supplement 1

Functional Arrangement

GEH has implemented substantive improvements related to the "functional arrangement" ITAAC, however, the NRC staff has identified one generic category of SSC attributes that appears to need additional attention. This category involves specific or implied "testing" criteria. In its response, GEH states that, "the functional arrangement tables will be revised to remove those items that describe components or features that would require tests or analyses to verify." However, the following examples cite cases where certain "functional arrangement" table line items continue to reference SSC attributes that do not comply with this commitment, because "tests" would be needed for the subject item/attribute verification:

• *Table 2.2.4-1 - Item 5, involving accumulator capability to maintaining nitrogen cover pressure*

• *Table 2.2.5-1 - Item 5, involving divisional alignment of the NMS power supplies to the safety-related UPS power sources*

- Item 9, involving LPRM signals proportional to neutron flux

- last item, the LPRM detector design pressure requirements

• *Table 2.2.6-1 - last two items, involving safety-related and nonsafety-related RSS systems receiving powers from the dedicated power supplies*

• *Table 2.2.7-1 - Item 4, involving the independence of the RPS automatic and manual scram initiation/logic systems*

• *Table 2.2.9-1 - Item 3, involving SB&PC system, with its three redundant AC power supplies, being capable of sustaining a single power source loss*

- last three items, involving interfaces with other system signals

• *Table 2.2.14-1 - Items 7 & 8, involving DPS sensors or hardware that is different, separate, and/or independent of other system components*

[Note : The above examples represent a sample NRC staff review. It is expected that GEH will perform a complete review of all "functional arrangement" line items to ensure the removal of items (as committed) "that would require tests or analyses to verify".]

GEH Response

The GEH response is divided into 7 subparts. Parts 1 through 6 respond to the specific examples in the RAI. Part 7 responds to the request to perform a "complete review of all 'functional arrangement' line items".

1. *Table 2.2.4-1 - Item 5, involving accumulator capability to maintaining nitrogen cover pressure*

   Concur. Table 2.2.4-1, Item 5 will be moved to the design description as a new Functional Requirement and added as a separate ITAAC. Note that Table 2.2.4-1, Items 3 and 4 are similar to Item 5 and will be also be moved and added as separate ITAAC.

2. *Table 2.2.5-1 - Item 5, involving divisional alignment of the NMS power supplies to the safety-related UPS power sources*

   - Item 9, involving LPRM signals proportional to neutron flux

   - last item, the LPRM detector design pressure requirements

   Concur. Table 2.2.5-1, Item 9 (counting only non-deleted items, or Item 13 counting all line items) will be deleted and moved to Functional Requirement (12) and ITAAC (12). This item is redundant as an ITAAC because the requirement will be demonstrated by ITAAC associated with design description, Functional Requirement (10). Table 2.2.5-1, last item, will be moved to the design description as a new Functional Requirement and added as a separate ITAAC.

3. *Table 2.2.6-1 - last two items, involving safety-related and nonsafety-related RSS systems receiving powers from the dedicated power supplies*

   Concur. Table 2.2.6-1, last two items, will be moved as new Functional Requirements (7) and (8). Table 2.2.6-3, ITAAC 7 and 8, will be added as new tests.

4. *Table 2.2.7-1 - Item 4, involving the independence of the RPS automatic and manual scram initiation/logic systems*

   Table 2.2.7-1, Item 4 (counting only non-deleted items, or Item 7 counting all line items), will be moved to the design description as a new Functional Requirement (10) and added as a separate ITAAC (10).

5. *Table 2.2.9-1 - Item 3, involving SB&PC system, with its three redundant AC power supplies, being capable of sustaining a single power source loss*

   - last three items, involving interfaces with other system signals

   Concur. Table 2.2.9-1, Item 3, will be moved to the design description as a new Functional Requirement (5) and revised to delete the acceptance criteria that will be shown in the ITAAC; Table 2.2.9-1, the last three items, Items 4, 5, and 6, will be revised to delete "receiving" for clarification. Inspections of these last three items is envisioned to comprise inspection of the instrument pull sheets and loop checkout records showing the interfaces with the listed systems.

6. *Table 2.2.14-1 - Items 7 & 8, involving DPS sensors or hardware that is different, separate, and/or independent of other system components*

   Concur. Table 2.2.14-1, Items 7 and 8 (counting only non-deleted items, or 12 and 13 counting all line items), will be will be moved to the design description as two new Functional Requirements and added as separate ITAAC.

7. *[Note : The above examples represent a sample NRC staff review. It is expected that GEH will perform a complete review of all "functional arrangement" line items to ensure the removal of items (as committed) "that would require tests or analyses to verify".]*

   Concur. Note that the following responses reference Table x.x.x-1 item numbers by counting all line items (which includes the (Deleted) items) in the Functional Arrangement tables.

   Table 2.2.1-1, Items 1 and 4, will be moved as new Functional Requirements (7) through (9). Table 2.2.1-1, Item 3, references to mild environments will be deleted because the environmental and seismic qualification of nonsafety-related equipment is not a requirement. Table 2.2.1-6, ITAAC 7, 8, and 9, will be added as new tests.

   Table 2.2.2-1, Items 1, 15, 17, and 26, will be deleted because Tables 2.2.2-5 and 2.2.2-6 list the pertinent equipment requiring qualification. The environmental and seismic qualification of equipment is not an inspection only feature and the design description refers to Section 3.8. The reference to Table 2.2.2-1 will be deleted from the third and fourth paragraphs in the design description because Tables 2.2.2-5 and 2.2.2-6, as appropriate, lists the applicable components. Table 2.2.2-1, Items 4, 5, 6, 8, 9, 10, 12, 18, 20, 21, 22, 24, and 27 will be moved as new Function Requirements (19) through (31). Table 2.2.2-1, Item 11, will be deleted because it is redundant to Functional Requirements (15). Table 2.2.2-1, Item 28, has been added to provide the location of the FMCRDs. Table 2.2.2-7, ITAAC 19 through 31, will be added as new inspections, tests, and type tests.

   Table 2.2.3-1, Items 1 and 2, will be deleted. Table 2.2.3-1, Item 3, will be added to show the locations of FWCS equipment. Functional Requirements (5) will be revised to add "triple redundant" from deleted Table 2.2.3-1, Item 2, to the description of the FWCS controllers. Table 2.2.3-4, ITAAC 5, will be revised to add "triple redundant" to the design commitment (DC). The inspections, tests, and analyses (ITA) and acceptance criteria (AC) are currently written for a triple redundant controller; therefore, no change will be made to the ITA and AC parts of ITAAC 5.

   Table 2.2.4-1 will be deleted because Figure 2.2.4-1 provides an equivalent functional arrangement. Accordingly, references to Table 2.2.4-1 and

Functional Arrangement (1) will be deleted in the design description. Table 2.2.4-1, Items 3, 4, 5, and 13, will be moved as new Functional Requirements (25) through (28). Table 2.2.4-1, Items 1, 2, 6, 7, 8, 9, 10, 11, and 12, will be deleted because these are redundant to features shown in Figure 2.2.4-1. Table 2.2.4-6, ITAAC 1, will be revised to delete reference to Table 2.2.4-1. Table 2.2.4-6, ITAAC 25 through 28, will be added as new analyses and tests.

Table 2.2.5-1, Item 2, will be deleted because it is redundant to Item 1. Table 2.2.5-1, Items 5 and 12, will be revised to delete references to mild and harsh environments because the environmental and seismic qualification of equipment is not an inspection only feature and the design description refers to Section 3.8. Table 2.2.5-1, Items 7, 13, and 15, will be moved as new Functional Requirements (11) through (13). Table 2.2.5-4, ITAAC 11 through 13, will be added as new tests.

Table 2.2.6-1, Item 1, will be revised to delete reference to Seismic Category I because the environmental and seismic qualification of equipment is not an inspection only feature and the design description refers to Section 3.8. Table 2.2.6-1, Item 2 and 3, will be combined into a single arrangement. Table 2.2.6-1, Items 5 and 6, will be moved as new Functional Requirements (7) and (8). Table 2.2.6-3, ITAAC 7 and 8, will be added as new tests.

Table 2.2.7-1, Item 1, will be revised to delete reference to Seismic Category I because the environmental and seismic qualification of equipment is not an inspection only feature and the design description refers to Section 3.8. Table 2.2.7-1, Items 6 and 7, will be moved as new Functional Requirements (9) and (10). Table 2.2.7-4, ITAAC 9 and 10, will be added as new analyses and tests.

Table 2.2.9-1, Item 1, will be deleted because it is redundant to Functional Requirements (4). Functional Requirements (4) will be revised to add "triple redundant" from deleted Table 2.2.3-1, Item 1, to the description of the SB&PC controllers. Table 2.2.9-1, Item 2, references to mild environments will be deleted because the environmental and seismic qualification of nonsafety-related equipment is not requirement. Table 2.2.9-1, Item 3, will be moved as new Functional Requirements (5) and revised to delete the acceptance criteria that will be shown in the ITAAC. Table 2.2.9-1, Items 4, 5, and 6, will be revised to delete "receiving" for clarification. Table 2.2.9-3, ITAAC 4, will be revised to add "triple redundant" to the design commitment (DC). The inspections, tests, and analyses (ITA) and acceptance criteria (AC) are currently written for a triple redundant controller; therefore, no change will be made to the ITA and AC parts of ITAAC 4. Table 2.2.9-3, ITAAC 5, will be added as new three part tests.

Table 2.2.12-1, Item 1, will be deleted because the environmental and seismic qualification of equipment is not an inspection only feature and the design description refers to Section 3.8. Table 2.2.12-1, Items 2 and 3, will be moved as new informational Design Description items. Table 2.2.12-1 and Functional

Arrangement (1) will be deleted because its functional arrangement belongs to the referenced SSLC/ESF and RTIF platforms. Table 2.2.12-3, will be revised to delete nonsafety-related functions as identified in Tier 2, Subsection 7.3.3.2. Table 2.2.12-5, ITAAC 1, will be deleted. Design Description will be revised to add new paragraphs 2 and 3, and will be revised to delete of reference to Table 2.2.12-1 in paragraph 5. Table 2.2.12-1 will be deleted because the LD&IS is physically implemented on the SSLC/ESF platform (Subsection 2.2.13) and RTIF platform (Subsection 2.2.7) that have their own functional arrangement tables in the referenced subsections.

Table 2.2.13-1, Item 1 and Item 2, will be revised to delete "seismic category I" and to add location of the SSLC/ESF structures, systems, and components for inspectability and because the environmental and seismic qualification of equipment is not an inspection only feature and the design description refers to Section 3.8. Table 2.2.13-1, Item 5, will be moved as new Functional Requirements (10). Table 2.2.13-4, ITAAC 10, will be added as new tests.

Table 2.2.14-1, Item 1, will be deleted and the information added to the design description. Table 2.2.14-1, Items 3 and 8, will be revised to delete references to mild environments because the environmental and seismic qualification of equipment is not an inspection only feature and the design description refers to Section 3.8. Table 2.2.14-1, Item 6, will be revised to add the location of the controller. Table 2.2.14-1, Item 7, will be deleted because it is redundant to Functional Requirements (15). Table 2.2.14-1, Items 12 and 13, will be moved as new Functional Requirements (17) and (18). Table 2.2.14-4, ITAAC 17 and 18, will be added as new analyses. The word "different" will be revised to "diverse" in Functional Requirements (17) and Table 2.2.14-4, ITAAC 17, to conform with the proposed revision to Chapter 7.

Table 2.2.16-1, Item 2, will be revised to delete references to mild environments because the environmental and seismic qualification of equipment is not an inspection only feature and the design description refers to Section 3.8.

DCD Impact

DCD Tier 1, Sections 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.9, 2.2.12, 2.2.13, 2.2.14; Tables 2.2.1-1, 2.2.1-6, 2.2.2-1, 2.2.2-7, 2.2.3-1, 2.2.3-4, 2.2.4-1, 2.2.4-6, 2.2.5-1, 2.2.5-4, 2.2.6-1, 2.2.6-3, 2.2.7-1, 2.2.7-4, 2.2.9-1, 2.2.9-3, 2.2.12-1, 2.2.12-3, 2.2.12-5; 2.2.13-1, 2.2.13-4, 2.2.14-1, 2.2.14-4, and 2.2.16-1; will be revised as noted in the attached markup.

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Enclosure 2

Response to Portion of NRC Request for
Additional Information Letter No. 347
Related to ESBWR Design Certification Application

DCD Markups for
RAI Number 14.3-449 Supplement 1

2.2 INSTRUMENTATION AND CONTROL SYSTEMS

The following subsections describe the major instrumentation and control (I&C) systems for the ESBWR.

2.2.1 Rod Control and Information System

Design Description

The Rod Control and Information System (RC&IS) automatically controls and monitors, and provides manual control capability for, positioning of the control rods in the reactor by the Control Rod Drive System (CRDS).

RC&IS minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.

Functional Arrangement

(1) RC&IS functional arrangement is defined in Table 2.2.1-1.

(2) RC&IS is divided into major functional groups as defined in Table 2.2.1-2.

Functional Requirements

(3) RC&IS provides automatic functions and initiators ~~are~~ as defined in Table 2.2.1-3.

(4) RC&IS provides rod block functions ~~are~~ as defined in Table 2.2.1-4.

(5) RC&IS provides controls, interlocks, and bypasses ~~are~~ as defined in Table 2.2.1-5.

(6) ~~RC&IS minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.~~ (Deleted)

(7) RC&IS has a dual redundant architecture.

(8) RC&IS equipment is powered by separate, non-divisional AC power sources.

(9) RC&IS has at least one power source being a nonsafety-related uninterruptible power supply.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.2.1-6 defines the inspections, tests, and/or analyses, together with associated acceptance criteria for the RC&IS.

Table 2.2.1-1

RC&IS Functional Arrangement

~~RC&IS is dual-redundant architecture divided into major functional groups as defined in Table 2.2.1-2.~~ (Deleted)
RC&IS Dedicated Operator Interface (DOI) is located in the MCR.
RC&IS equipment is located in a mild environment rooms within the Reactor Building (RB) and Control Building (CB).
~~RC&IS equipment is powered by separate, non-divisional AC power sources with at least one power source being a nonsafety-related uninterruptible power supply.~~ (Deleted)
~~RC&IS equipment provides the capability to perform the FMCRD-related surveillance tests, including periodic individual CRDS HCU scram performance testing.~~ (Deleted)
~~RC&IS is capable of continued operation when different subsystems of RC&IS are bypassed.~~ (Deleted)

Table 2.2.1-6

ITAAC For The Rod Control and Information System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6. RC&IS minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.(Deleted)	See Section 3.3.	See Section 3.3.
7. RC&IS has a dual redundant architecture.	Test(s) will be performed on the as-built system that simulate failure of each redundant channel.	Report(s) exist and conclude that the surviving channel continues to execute system functions with one failed channel.
8. RC&IS equipment is powered by separate, non-divisional AC power sources.	Test(s) will be performed on the as-built system by providing a test signal in only one channel at a time.	Report(s) exist and conclude that a test signal exists only in the channel under test.
9. RC&IS has at least one power source being a nonsafety-related uninterruptible power supply.	Test(s) will be performed on the as-built system by providing a test signal in only one channel at a time.	Report(s) exist and conclude that the test signal exists from an uninterruptible AC power supply only in the channel under test.

2.2.2 Control Rod Drive System

Design Description

The control rod drive (CRD) system, manually and automatically upon ~~command~~ signal from the RPS, DPS, and RC&IS, ~~executes~~ provides rapid control rod (CR) insertion (scram), performs fine CR positioning (reactivity control), detects CR separation (prevent rod drop accident), limits the rate of CR ejection due to a break in the CR pressure boundary (prevent fuel damage), and supplies high pressure makeup water to the reactor during events in which the feedwater system is unable to maintain reactor water level.

CRD system minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3.

Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components defined Table 2.2.2-6 is addressed in Subsection 2.2.15.

The environmental and seismic qualification of CRD system components defined in Tables 2.2.2-5 and 2.2.2-6 is addressed in Section 3.8.

CRD system software is developed in accordance with the software development program described in Section 3.2 as part of the PIP software project.

Functional Arrangement

(1) The functional arrangement of the CRD System comprises three major functional groups: fine motion control rod drive (FMCRD), hydraulic control unit (HCU), and CRD hydraulic subsystem ~~(CRDHS)~~, as defined in Table 2.2.2-1 and shown in Figure 2.2.2-1.

Functional Requirements

(2) ~~ASME Code Section III~~ a1. The components identified in Table 2.2.2-5 as ASME Code Section III are designed in accordance with ASME Code Section III requirements and seismic Category I requirements.

a2. The components identified in Table 2.2.2-5 as ASME Code Section III shall be reconciled with the design requirements.

a3. The components identified in Table 2.2.2-5 as ASME Code Section III are fabricated, installed, and inspected in accordance with ASME Code Section III requirements.

b1. The piping identified in Table 2.2.2-5 as ASME Code Section III is designed in accordance with ASME Code Section III requirements and seismic Category I requirements.

b2. The as-built piping identified in Table 2.2.2-5 as ASME Code Section III shall be reconciled with the with the piping design requirements.

b3. The piping identified in Table 2.2.2-5 as ASME Code Section III is fabricated, installed, and inspected in accordance with ASME Code Section III requirements.

(3) ~~Pressure Boundary Welds~~ a. Pressure boundary welds in components defined in Table 2.2.2-5 as ASME Code Section III meet ASME Code Section III requirements.

b. The as-built location of valves on lines attached to the CRD system that require maintenance shall be reconciled to design requirements.

(17) HP CRD makeup water isolation valves are normally open and close on a signal and on loss of air.

(18) HP CRD makeup water isolation bypass valves are normally closed and open on a signal.

(19) FMCRDs have continuous CR position indication sensors that detect CR position based on motor rotation.

(20) FMCRDs have scram position indication switches that detect intermediate and scram completion CR positions.

(21) FMCRDs have a bayonet CR coupling mechanism that requires a minimum rotation to decouple.

(22) FMCRDs have spring-loaded latches in the hollow piston that engage slots in the guide tube to prevent rotation of the bayonet coupling except at predefined positions.

(23) FMCRDs have redundant safety-related rod separation switches that detect separation of the FMCRD from the CR.

(24) FMCRDs have a magnetic coupling that provides seal-less, leak-free operation of the CRD mechanism.

(25) FMCRDs have safety-related scram inlet port check valves that are installed to close under reverse flow.

(26) HCU scram pilot solenoid valves transfer open to vent on loss of power to both solenoids.

(27) Backup scram solenoid valves are closed on loss of power and transfer open to vent when energized.

(28) ARI valves are closed on loss of power and transfer open to vent when energized.

(29) Each HCU contains a nitrogen-water scram accumulator charged to a sufficiently high pressure and with the necessary valves and components to fully insert two CRs.

(30) Scram accumulators are continuously monitored for water leakage by level instruments.

(31) Divisional safety-related power supplies power safety-related FMCRD and HCU equipment.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.2.2-7 defines the inspections, tests, and/or analyses, together with associated acceptance criteria for the CRD system.

Table 2.2.2-1

CRDS Functional Arrangement

~~FMCRDs, including the equipment defined in Table 2.2.2-5 and 2.2.2-6, are safety-related, Seismic Category I.~~
~~FMCRDs are capable of rapid hydraulic insertion of the CRs during ATWS peak reactor pressure transient.~~ ~~FMCRDs are capable of maintaining RCPB continuously at the RPV design pressure and briefly during the ATWS peak reactor pressure transient.~~
~~FMCRDs have continuous CR position indication sensors that detect CR position based on motor rotation.~~ ~~FMCRDs have scram position indication switches that detect intermediate and scram completion CR positions.~~ ~~FMCRDs have a bayonet CR coupling mechanism that requires a minimum rotation to decouple.~~
~~FMCRD rotation, sufficient to decouple the CR, is precluded when fuel bundles are present.~~
~~FMCRDs have spring-loaded latches in the hollow piston that engage slots in the guide tube to prevent rotation of the bayonet coupling except at predefined positions.~~ ~~FMCRDs have redundant safety-related rod separation switches that detect separation of the FMCRD from the CR.~~ ~~FMCRDs have a magnetic coupling that provides seal-less, leak-free operation of the CRD mechanism.~~ ~~FMCRDs have safety-related holding brakes that engage on loss of power.~~ ~~FMCRDd have safety-related scram inlet port check valves that close under reverse flow.~~
~~FMCRD have passive safety-related integral internal blowout support that prevents ejection of the FMCRD and the attached control rod.~~ ~~FMCRD hydraulic scram feature moves a CR pair (except for one single CR) to defined scram positions, starting from loss of signal to the scram solenoid pilot valves in the HCUs, using only the stored energy in the CRDS HCU scram accumulators, in time spans equal to or less than the times defined in Table 2.2.2-2.~~
~~HCUs are safety-related, Seismic Category I.~~
HCUs are located in four dedicated rooms in the Reactor Building (RB).

Table 2.2.2-1

CRDS Functional Arrangement

~~HCU scram charging water header pressure instrumentation is safety-related, Seismic Category I.~~ ~~HCU scram pilot solenoid valves transfer open to vent on loss of power to both solenoids.~~
~~HCU air header dump valves transfer open to vent on loss of power.~~
~~HCU ARI solenoid valves are closed on loss of power and transfer open to vent when energized.~~ ~~Each HCU contains a nitrogen-water accumulator charged to a sufficiently high pressure and with the necessary valves and components to fully insert two CRs.~~
HCUs provide a flow path for purge water to the associated FMCRDs during normal operation.
~~HCU scram accumulators are continuously monitored for water leakage by level instruments.~~
HCU have a test port to allow connection of temporary test equipment for the conduct of FMCRD ball check valve testing and drive friction testing.
~~CRDHS FMCRD purge water header, HCU charging header, and scram air header, are classified Seismic Category II.~~ ~~Divisional safety-related power supplies power safety-related FMCRD and HCU equipment.~~ FMCRDs are mounted to the reactor vessel bottom head inside primary containment.

Table 2.2.2-7

ITAAC For The Control Rod Drive System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
16a. Valves on lines attached to the RPV that require maintenance have maintenance valves installed such that freeze seals will not be required.	Inspections of piping design isometric drawings will be conducted.	Report(s) exist and conclude that, based on a review of piping design isometric drawings, maintenance can be performed on valves without the use of freeze seals
16b. The as-built location of valves on lines attached to the CRD system that require maintenance shall be reconciled to design requirements.	A reconciliation analysis of valves on lines attached to the RPV system that require maintenance using as-designed and as-built information will be performed.	Report(s) exist and conclude that design reconciliation has been completed for the as-built location of valves relative to the design requirements. The report documents the results of the reconciliation analysis.
17. HP CRD makeup water isolation valves are normally open and close on a signal and on loss of air.	Tests of the as-built HP CRD makeup water isolation valves will be performed	Report(s) exist and conclude that as-built HP CRD makeup water isolation valves are normally open and close on a signal and on loss of air.
18. HP CRD makeup water isolation bypass valves are normally closed and open on a signal.	Tests of the as-built HP CRD makeup water isolation bypass valves will be performed.	Report(s) exist and conclude that as-built HP CRD makeup water isolation bypass valves are normally closed and open on a signal.
19. FMCRDs have continuous CR position indication sensors that detect CR position based on motor rotation.	Test(s) will be performed on the FMCRD continuous CR position indication sensors by simulating motor run-in of each CR.	Report(s) exist and conclude that the MCR indicates the position of each CR during the simulated motor run-in.
20. FMCRDs have scram position indication switches that detect intermediate and scram completion CR positions.	Test(s) will be performed on the FMCRD scram position indication switches by simulating motor run-in of each CR.	Report(s) exist and conclude that the MCR indicates the intermediate and scram completion positions of each CR during the simulated motor run-in.

Table 2.2.2-7

ITAAC For The Control Rod Drive System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
21. FMCRDs have a bayonet CR coupling mechanism that requires a minimum rotation to decouple.	Test(s) will be performed on each FMCRD CR coupling mechanism.	Report(s) exist and conclude that after being rotated at least one-eighth turn the CR coupling mechanism uncouples the FMCRD from the CR.
22. FMCRDs have spring-loaded latches in the hollow piston that engage slots in the guide tube to prevent rotation of the bayonet coupling except at predefined positions.	Type test(s) will be performed on the FMCRD latches by rotating the bayonet coupling.	Report(s) exist and conclude that the FMCRD bayonet coupling rotates less than one-eighth turn when the spring-loaded latches in the hollow piston are engaged in slots in the guide tube.
23. FMCRDs have redundant safety-related rod separation switches that detect separation of the FMCRD from the CR.	Test(s) will be performed on each FMCRD safety-related rod separation switch.	Report(s) exist and conclude that each separation switch detects separation of the FMCRD from the CR and indicates in the separation status in the MCR.
24. FMCRDs have a magnetic coupling that connect the drive motor to the drive shaft through the CRD housing.	Type test(s) will be performed on the FMCRD magnetic coupling.	Report(s) exist and conclude that the drive motor that is outside the CRD housing rotates the drive shaft that is inside the CRD housing up to the torque rating of the drive motor.
25. FMCRDs have safety-related scram inlet port check valves that are installed to close under reverse flow.	Inspection(s) will be performed of the as-built inlet port check valve installation.	Report(s) exist and conclude that the check valves are installed with normal flow direction going in to the reactor.
26. HCU scram pilot solenoid valves transfer open to vent on loss of power to both solenoids.	Test(s) will be performed on each HCU scram pilot solenoid valve.	Report(s) exist and conclude that each HCU scram pilot solenoid valve transfers open to vent on loss of power to both solenoids.

Table 2.2.2-7

ITAAC For The Control Rod Drive System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
27. Backup scram solenoid valves are closed on loss of power and transfer open to vent when energized.	Test(s) will be performed on each backup scram solenoid valve.	Report(s) exist and conclude that each backup scram solenoid valve closes on loss of power and transfers open to vent when energized.
28. ARI valves are closed on loss of power and transfer open to vent when energized.	Test(s) will be performed on each ARI valve.	Report(s) exist and conclude that each ARI valve closes on loss of power and transfers open to vent when energized.
29. Each HCU contains a nitrogen-water scram accumulator charged to a sufficiently high pressure and with the necessary valves and components to fully insert two CRs.	Test(s) will be performed on each HCU and CR pair, as applicable, with the reactor unpressurized, using simulated scram signals.	Report(s) exist and conclude that each HCU fully inserts both CR in the pair, as applicable.
30. Scram accumulators are continuously monitored for water leakage by level instruments.	Test(s) will be performed on the level instruments in each scram accumulator.	Report(s) exist and conclude that low scram accumulator water level is detected by each level instrument and is indicated in the MCR.
31. Divisional safety-related power supplies power safety-related FMCRD and HCU equipment.	Test(s) will be performed on the as-built system by providing a test signal in only one divisional safety-related power supply at a time.	Report(s) exist and conclude that a test signal exists only in the FMCRD and HCU equipment powered by the divisional power supply under test.

2.2.3 Feedwater Control System

Design Description

The Feedwater Control System (FWCS), automatically or manually, controls RPV water level by modulating the supply of feedwater flow to the RPV, the low flow control valve (LFCV), individual reactor feed pump ASD, or the RWCU/SDC system overboard control valve (OBCV).

The FWCS changes reactor power by automatically or manually controlling FW temperature by modulating the 7th FW heater steam heating valves or the high-pressure FW heater bypass valves.

FWCS minimum inventory of alarms, displays, controls and status indications in the main control room are addressed in Section 3.3.

Functional Arrangement

(1) FWCS functional arrangement is defined in Table 2.2.3-1.

Functional Requirements

(2) FWCS provides automatic functions, initiators, and associated interfacing systems ~~are~~ as defined in Table 2.2.3-2.

(3) FWCS provides controls ~~are~~ as defined in Table 2.2.3-3.

(4) ~~FWCS minimum inventory of alarms, displays, controls and status indications in the main control room are addressed in Table 3.3-1, Item 6.~~(Deleted)

(5) FWCS controllers are triple redundant fault tolerant.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.2.3-4 defines the inspections, tests, and/or analyses, together with associated acceptance criteria for the FWCS.

Table 2.2.3-1

FWCS Functional Arrangement

~~FWCS is nonsafety-related.~~ (Deleted)
~~FWCS uses triple redundant, fault tolerant digital controllers (FTDC)~~ (Deleted)
FWCS is located in the Control Building, Reactor Building, and Turbine Building.

Table 2.2.3-4

ITAAC For The Feedwater Control System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. FWCS controllers are triple redundant fault tolerant.	i. Test(s) will be performed simulating failure of each FWCS temperature controller.	i. ~~Test and type test r~~Report(s) exist and conclude ~~document~~ that failure of any one FWCS temperature controller will not affect FWCS output.
	~~a.~~ii.~~b.~~Test(s) will be performed simulating failure of each FWCS level controller.	~~a.~~ii~~b.~~ ~~Test and type test r~~Report(s) exist and conclude ~~document~~ that failure of any one FWCS level controller will not affect FWCS output.
	iii. Test(s) will be performed simulating discrepancy between field voter output and FTDC output of each FWCS level controller.	iii. Report(s) exist and conclude that "Lock-up" signal will be sent to ASD following discrepancy between field voter output and FTDC output of each FWCS level controller.
	iv. Test(s) will be performed simulating discrepancy between field voter output and FTDC output of each FWCS temperature controller.	iv. Report(s) exist and conclude that "Lock-Up" signal will be sent to the modulating steam admission valves of the seventh stage feedwater heater, and the modulating heater bypass valves following discrepancy between field voter output and FTDC output of each FWCS temperature controller.

2.2.4 Standby Liquid Control System

Design Description

The Standby Liquid Control (SLC) system is an alternative means to reduce core reactivity to ensure complete shutdown of the reactor core from the most reactive conditions at any time in core life, and provides makeup water to the RPV to mitigate the consequences of a Loss-of-Coolant-Accident (LOCA).

The SLC system minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.

Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components defined in Tables 2.2.4-4 and 2.2.4-5 is addressed in Subsection 2.2.15.

The environmental and seismic qualification of SLC system components defined in Tables 2.2.4-4 and 2.2.4-5 is addressed in Section 3.8.

SLC software is developed in accordance with the software development program described in Section 3.2 as part of the ATWS/SLC software project and SSLC/ESF software project.

Functional Arrangement

(1) The SLC system functional arrangement ~~is defined in Table 2.2.4-1 and~~as shown in Figure 2.2.4-1.

Functional Requirements

(2) The SLC system provides automatic functions, initiators, and associated interfacing systems ~~are~~ as defined in Table 2.2.4-2.

(3) The SLC system provides controls and interlocks ~~are~~ as defined in Table 2.2.4-3.

(4) ~~The SLC system minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.~~(Deleted)

(5) ~~Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components defined in Table 2.2.4-1 is addressed in Subsection 2.2.15.~~(Deleted)

(6) ~~The equipment qualification of SLC system components defined in Table 2.2.4-1 is addressed in Section 3.8.~~(Deleted)

(7) During an ATWS, the SLC system shall be capable of injecting borated water into the RPV at flowrates that assure rapid power reduction.

(8) The SLC system shall be capable of injecting borated water for use as makeup water to the RPV in response to a Loss-of-Coolant-Accident (LOCA).

(9) The redundant injection shut-off valves shown in Figure 2.2.4-1 as V1, V2, V3, and V4 are automatically closed by low accumulator level signals from the respective accumulator.

(18) Re-positionable (not squib) valves designated in Table 2.2.4-4 as having an active safety-related function open, close, or both open and close under differential pressure, fluid flow, and temperature conditions.

(19) The pneumatically operated valve(s) designated in Table 2.2.4-4 fail in the mode listed if either electric power to the valve actuating solenoid is lost, or pneumatic pressure to the valve(s) is lost.

(20) Check valves designated in Table 2.2.4-4 as having a safety-related function open, close, or both open and close under system pressure, fluid flow, and temperature conditions.

(21) The SLC System injection squib valve will open as designed.

(22) The equivalent natural boron concentration at cold shutdown conditions for the total solution injection volume is based on the liquid inventory in the RPV at the main steam line nozzle elevation plus the liquid inventory in the reactor shutdown cooling piping and equipment of the RWCU/SDC system.

(23) ~~SLC software is developed in accordance with the software development program described in Section 3.2.~~ (Deleted)

(24) a. Valves on lines attached to the RPV that require maintenance have maintenance valves installed such that freeze seals will not be required.

b. The as-built location of valves on lines attached to the RPV in the SLC system that require maintenance shall be reconciled to design requirements.

(25) Each accumulator tank has an injectable liquid volume of at least 7.8 m^3 (2061 gal).

(26) Each accumulator tank has a cover gas volume above the liquid of at least 14.8 m^3 (523 ft^3).

(27) Each accumulator tank is capable of maintaining an initial nitrogen cover gas absolute pressure of least 14.82 MPa (2150 psia).

(28) Each SLC system train is powered by a separate safety-related power supply.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.2.4-6 defines the inspections, tests, and/or analyses, together with associated acceptance criteria for the SLC system.

Table 2.2.4-1

SLC System Functional Arrangement(Deleted)
The SLC system is safety-related, Seismic Category I.
The SLC system comprises two 50% capacity trains with an accumulator tank for each train.
Each accumulator tank has an injectable liquid volume of at least 7.8 m^3 (2061 gal).
Each accumulator tank has a cover gas volume above the liquid of at least 14.8 m^3 (523 ft^3).
Each accumulator tank is capable of maintaining an initial nitrogen cover gas absolute pressure of least 14.82 MPa (2150 psia).
Each SLC train has redundant squib-type injection valves, installed in parallel, connected to a common injection line.
Each injection line is connected to manifolds within the RPV core region, which have injection nozzles in each quadrant.
Each accumulator has redundant level and pressure instrumentation.
Each accumulator has redundant shut-off valves, installed in series, which automatically close after injection.
Each accumulator has a pressure relief line and valve.
Each accumulator has vent piping and valves to permit depressurization of each accumulator.
Each accumulator has piping and valves used for initial and periodic solution addition and gas (nitrogen) charging.
Each SLC system train is powered by a separate safety-related power supply.
The SLC accumulators and piping upstream of the injection valves conforms with ASME Section III, Class NC.
The injection valves and piping downstream of the injection valves conforms with ASME Section III, Class NB.
Electronic equipment, including instrumentation, located in SLC tank room and SLC tank instrumentation room is environmentally qualified.

Table 2.2.4-6

ITAAC For The Standby Liquid Control System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The functional arrangement of the SLC system is defined in Table 2.2.4-1 andas shown in Figure 2.2.4-1.	Inspection(s), test(s), and type test(s) of the as-built system will be performed.	Report(s) exist and concludedocument(s) that the as-built system conforms to the functional arrangement defined in Table 2.2.4-1 and shown in Figure 2.2.4-1. For components and piping identified in Table 2.2.4-4 as ASME Code Section III, this report is an ASME Code report.
2. The SLC system provides automatic functions, initiators, and associated interfacing systems are as defined in Table 2.2.4-2.	Test(s) will be performed on the as-built SLC system Train A and Train B Logic Controllers using simulated signals and actuators for the automatic functions defined in Table 2.2.4-2.See Subsection 2.2.15	Report(s) exist and conclude that the SLC system Train A and Train B Logic Controllers are capable of performing the automatic functions defined in Table 2.2.4-2. See Subsection 2.2.15
3. The SLC system provides controls and interlocks are as defined in Table 2.2.4-3.	Test(s) will be performed on the as-built SLC system Train A and Train B Logic Controllers using simulated signals and actuators for the controls and interlocks defined in Table 2.2.4-3.See Subsection 2.2.15	Report(s) exist and conclude that the SLC system Train A and Train B Logic Controllers controls and interlocks exist, can be retrieved in the main control room, and are performed in response to simulated signals and manual actions as defined in Table 2.2.4-3. See Subsection 2.2.15
4. The SLC system minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.(Deleted)	See Section 3.3.	See Section 3.3.

Table 2.2.4-6

ITAAC For The Standby Liquid Control System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
24b. The as-built location of valves on lines attached to the RPV in the SLC system that require maintenance shall be reconciled to design requirements.	A reconciliation evaluation of valves on lines attached to the RPV that require maintenance using as-designed and as-built information will be performed.	Report(s) exist and conclude that design reconciliation has been completed for the as-built location of valves relative to the design requirements. The report documents the results of the reconciliation evaluation.
25. Each accumulator tank has an injectable liquid volume of at least 7.8 m^3 (2061 gal).	Analysis of each as-built accumulator tank will be performed.	Report(s) exist and conclude that each accumulator tank has an injectable volume of at least 7.8 m^3 (2061 gal).
26. Each accumulator tank has a cover gas volume above the liquid of at least 14.8 m^3 (523 ft^3).	Analysis of each as-built accumulator tank will be performed.	Report(s) exist and conclude that each accumulator tank has a cover gas volume above the liquid of at least 14.8 m^3 (523 ft^3).
27. Each accumulator tank is capable of maintaining an initial nitrogen cover gas absolute pressure of least 14.82 MPa (2150 psia).	Analysis of each as-built accumulator tank will be performed.	Report(s) exist and conclude that each accumulator tank is capable of maintaining an initial nitrogen cover gas absolute pressure of least 14.82 MPa (2150 psia).
28. Each SLC system train is powered by a separate safety-related power supply.	Tests will be performed on the SLC system by providing a test signal in only one safety-related division at a time.	Report(s) exist and conclude that the test signal exists only in the safety-related division under test in the System.

2.2.5 Neutron Monitoring System

Design Description

The Neutron Monitoring System (NMS) monitors thermal neutron flux and supports the Reactor Protection System (RPS).

NMS minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.

Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components defined in Table 2.2.5-1 is addressed in Subsection 2.2.15.

The environmental and seismic qualification of NMS components defined in Table 2.2.5-1 is addressed in Section 3.8.

NMS software is developed in accordance with the software development program described in Section 3.2 as part of the NMS software project.

Functional Arrangement

(1) NMS functional arrangement is defined in Table 2.2.5-1.

Functional Requirements

(2) NMS provides automatic functions, initiators, and associated interfacing systems ~~are~~ as defined in Table 2.2.5-2.

(3) NMS provides controls, interlocks, and bypasses ~~are~~ as defined in Table 2.2.5-3.

(4) ~~NMS minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.~~ (Deleted)

(5) ~~Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components defined in Table 2.2.5-1 is addressed in Subsection 2.2.15.~~ (Deleted)

(6) ~~The equipment qualification of NMS components defined in Table 2.2.5-1 is addressed in Section 3.8.~~ (Deleted)

(7) ~~NMS software is developed in accordance with the software development program described in Section 3.2.~~ (Deleted)

(8) NMS divisions fail-safe to a trip condition on critical hardware failure, power failure, or loss of communication failure.

(9) The SRNM subsystem monitors neutron flux from the source range to 15% of the reactor rated power.

(10) The LPRM subsystems monitor neutron flux from 1 % to 125 % of reactor rated power.

(11) Each NMS division is powered by its divisional safety-related UPS power supply.

(12) LPRM provides signals that are proportional to the local neutron flux.

(13) The LPRM detector assemblies have a design pressure of 8.62 MPa g (1250 psig).

Table 2.2.5-1

NMS Functional Arrangement

NMS comprises the safety-related startup range neutron monitor (SRNM) subsystem and the power range neutron monitor (PRNM) subsystem; and the nonsafety-related automatic fixed in-core probe (AFIP) subsystem and multi-channel rod block monitor (MRBM) subsystem.
~~NMS SRNM and PRNM subsystems are safety-related.~~
NMS is a four division, redundant, logic based system.
~~NMS divisions fail safe to a trip condition on critical hardware failure, power failure, or loss of communication failure.~~
NMS controllers and their preamplifiers are located ~~in mild environments~~ in divisionally separate rooms in the Control Building (CB) and Reactor Building (RB).
~~NMS logic is designed to provide a trip initiation by requiring coincident trip of at least two divisions to cause the trip output when non-coincident logic is not imposed.~~
~~Each NMS division is powered by its divisional safety-related UPS power supply.~~
The PRNM subsystem comprises the local power range monitors (LPRM), the average power range monitors (APRM), and the oscillation power range monitors (OPRM).
~~SRNM trip signal logic is interlocked with Coincident/Non-coincident switch and the Reactor Mode Switch.~~
The SRNM subsystem has 12 SRNM channels, each channel having one fixed in-core regenerative fission chamber sensor.
~~The SRNM subsystem monitors neutron flux from the source range to 15% of the reactor rated power.~~
The LPRM detector assemblies, SRNM detector assemblies, wiring, cables, and connector are located in ~~a harsh environment within~~ the lower DW in the RB. ~~LPRM provides signals that are proportional to the local neutron flux.~~
LPRM subsystem comprises 64 assemblies, divided into four divisions, distributed uniformly throughout the core, each assembly having four uniformly spaced fixed in-core fission chamber detectors and seven AFIP sensors .
~~The LPRM detector assemblies have a design pressure of 8.62 MPa g (1250 psig).~~
~~The LPRM subsystems monitor neutron flux from 1 % to 125 % of reactor rated power.~~

Table 2.2.5-1

NMS Functional Arrangement

~~Each APRM division generates the PRNM trip signals for the associated RPS division based on LPRM signals, APRM calculations, OPRM calculations.~~ ~~OPRM provides neutron flux oscillation trip signals for the APRM trip signal.~~

Table 2.2.5-4

ITAAC For The Neutron Monitoring System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
~~2.2.15.~~(Deleted)		
6. ~~The equipment qualification of NMS components defined in Table 2.2.5-1 is addressed in Section 3.8.~~(Deleted)	~~See Section 3.8.~~	~~See Section 3.8.~~
7. ~~NMS software is developed in accordance with the software development program described in Section 3.2.~~ (Deleted)	~~See Section 3.2.~~	~~See Section 3.2.~~
8. NMS divisions fail-safe to a trip condition on critical hardware failure, power failure, or loss of communication failure.	Test(s) will be performed using simulated signals.	Report(s) exist and conclude that NMS divisions fail-safe to a trip condition on critical hardware failure, power failure, or loss of communication failure.
9. The SRNM subsystem monitors neutron flux from the source range to 15% of the reactor rated power.	Test(s) will be performed using simulated signals.	Report(s) exist and conclude that SRNM subsystem monitors neutron flux from the source range to 15% of the reactor rated power.
10. The LPRM subsystems monitor neutron flux from 1 % to 125 % of reactor rated power.	Test(s) will be performed using simulated signals.	Report(s) exist and conclude that LPRM subsystems monitor neutron flux from 1 % to 125 % of reactor rated power.
11. Each NMS division is powered by its divisional safety-related UPS power supply.	Test(s) will be performed on the NMS by providing a test signal in only one safety-related division at a time.	Report(s) exist and conclude that the test signal exists only in the safety-related division under test in the System.
12. LPRM provides signals that are proportional to the local neutron flux.	Test(s) will be performed on the NMS by providing test signals to each LPRM.	Report(s) exist and conclude that the test signal exists and can be retrieved in the MCR.

Table 2.2.5-4

ITAAC For The Neutron Monitoring System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
13. The LPRM detector assemblies have a design pressure of 8.62 MPa g (1250 psig).	Test(s) will be performed on each LPRM detector assembly.	Report(s) exist and conclude that the LPRM detector assembly withstands a pressure greater than 8.62 Mpa g (1250 psig).

2.2.6 Remote Shutdown System

Design Description

The Remote Shutdown System (RSS) provides remote manual control of the systems necessary to: (a) perform a prompt shutdown (scram) of the reactor, (b) perform safe (hot) shutdown of the reactor after a scram, (c) perform subsequent cold shutdown of the reactor, and (d) monitor the reactor to ensure safe conditions are maintained during and following a reactor shutdown.

RSS minimum inventory of alarms, displays, controls, and status indications is addressed in Section 3.3.

Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components defined in Table 2.2.6-1 is addressed in Subsection 2.2.15.

The environmental and seismic qualification of RSS components defined in Table 2.2.6-1 is addressed in Section 3.8.

RSS software is developed in accordance with the software development program described in Section 3.2 as part of the RTIF software project and SSLC/ESF software project.

Functional Arrangement

(1) RSS functional arrangement is described in Subsection 2.2.6 and defined in Table 2.2.6-1.

Functional Requirements

(2) RSS provides dedicated controls are as defined in Table 2.2.6-2.

(3) ~~RSS minimum inventory of alarms, displays, controls, and status indications is addressed in Section 3.3.~~ (Deleted)

(4) ~~Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components defined in Table 2.2.6-1 is addressed in Subsection 2.2.15.~~ (Deleted)

(5) ~~The equipment qualification of RSS components defined in Table 2.2.6-1 is addressed in Section 3.8.~~ (Deleted)

(6) ~~RSS software is developed in accordance with the software development program described in Section 3.2.~~ (Deleted)

(7) Safety-related systems in each RSS panel receive power from divisionally separate safety-related uninterruptible power supplies.

(8) Nonsafety-related systems in each RSS panel receive power from nonsafety-related power supplies.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.2.6-3 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria for the RSS.

Table 2.2.6-1

RSS Functional arrangement

RSS is safety-related~~, Seismic Category I~~
RSS has two redundant, independent, panels located in two separate rooms in different divisional quadrants of the Reactor Building
~~RSS panels are located in two separate rooms in different divisional quadrants of the Reactor Building~~
RSS panels have a safety-related Division 1 visual display unit (VDU), a safety-related Division 2 VDU, and a nonsafety-related VDU
~~Safety-related systems in each RSS panel receive power from divisionally separate safety-related uninterruptible power supplies~~
~~Nonsafety-related systems in each RSS panel receive power from nonsafety-related power supplies~~

Table 2.2.6-3

ITAAC For The Remote Shutdown System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. Safety-related systems in each RSS panel receive power from divisionally separate safety-related uninterruptible power supplies.	Test(s) will be performed on the RSS by providing a test signal in only one safety-related division at a time.	Report(s) exist and conclude that the test signal exists only in the safety-related division under test in the System.
8. Nonsafety-related systems in each RSS panel receive power from nonsafety-related power supplies.	Test(s) will be performed on the RSS by providing a test signal in only one channel at a time.	Report(s) exist and conclude that the test signal exists from an uninterruptible AC power supply only in the channel under test.

2.2.7 Reactor Protection System

Design Description

The Reactor Protection System (RPS) initiates a reactor trip (scram) automatically whenever selected plant variables exceed preset limits or by manual operator action.

Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components is addressed in Subsection 2.2.15.

RPS minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.

The environmental and seismic qualification of RPS components is addressed in Section 3.8.

RPS software is developed in accordance with the software development program described in Section 3.2 as part of the RTIF software project.

Functional Arrangement

(1) RPS functional arrangement is defined in Table 2.2.7-1.

Functional Requirements

(2) RPS provides automatic trip initiators and associated interfacing systems ~~are~~ as defined in Table 2.2.7-2.

(3) RPS provides controls, interlocks (system interfaces), and bypasses ~~are~~ as defined in Table 2.2.7-3.

(4) ~~Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components is addressed in Subsection 2.2.15.~~ (Deleted)

(5) ~~RPS minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.~~ (Deleted)

(6) ~~The equipment qualification of RPS components is addressed in Section 3.8.~~ (Deleted)

(7) ~~RPS software is developed in accordance with the software development program described in Section 3.2.~~ (Deleted)

(8) The RPS logic is designed to provide a trip initiation by requiring a coincident trip of at least two divisions to cause the trip output.

(9) The RPS is fail-safe such that on loss of redundant divisional electrical power supplies the load drivers of that division change to the tripped state.

(10) Redundant safety-related power supplies are provided for each division.

(11) Automatic and manual scram initiation logic systems are independent of each other.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.2.7-4 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria, which will be performed for the RPS.

Table 2.2.7-1

RPS Functional Arrangement

The RPS comprises four redundant safety-related~~, Seismic Category I,~~ divisions of sensor channels, trip logics and trip actuators.
The RPS comprises two divisions of manual scram controls and scram logic circuitry.
~~The RPS logic is designed to provide a trip initiation by requiring a coincident trip of at least two divisions to cause the trip output.~~
~~The RPS trip actuator load drivers interrupt circuit power to scram pilot solenoids and scram air header dump valves.~~
~~The RPS is fail-safe such that on loss of redundant divisional electrical power supplies the load drivers of that division change to the tripped state.~~
~~Redundant safety-related power supplies are provided for each division.~~
~~Automatic and manual scram initiation logic systems are independent of each other.~~

Table 2.2.7-4

ITAAC For The Reactor Protection System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
displays, and status indications in the main control room (MCR) are addressed in Section 3.3.(Deleted)		
6. The equipment qualification of RPS components is addressed in Section 3.8.(Deleted)	See Section 3.8.	See Section 3.8.
7. RPS software is developed in accordance with the software development program described in Section 3.2. (Deleted)	See Section 3.2.	See Section 3.2.
8. The RPS logic is designed to provide a trip initiation by requiring a coincident trip of at least two divisions to cause the trip output.	Test(s) will be performed on the as-built RTIF platform of the RPS functions.	Report(s) exist and conclude that the RTIF platform performs the RPS function trip outputs when a coincident trip of at least two divisions occurs.
9. The RPS is fail-safe such that on loss of redundant divisional electrical power supplies the load drivers of that division change to the tripped state.	Test(s) will be performed on the as-built RTIF platform of the RPS functions by de-energizing the RTIF platform by division.	Report(s) exist and conclude that the RTIF platform de-energizes the RPS trip outputs when a coincident de-energization of at least two divisions occurs.
10. Redundant safety-related power supplies are provided for each division.	Test(s) will be performed on the RPS by providing a test signal in only one safety-related division at a time.	Report(s) exist and conclude that the test signal exists only in the safety-related division under test in the System.

Table 2.2.7-4

ITAAC For ~~The~~ Reactor Protection System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11. Automatic and manual scram initiation logic systems are independent of each other.	Analysis(es) will be performed on the automatic and manual scram initiation logic systems.	Report(s) exist and conclude that single failures in an automatic scram initiation logic system do not propagate to the manual scram initiation logic system and single failures in a manual scram initiation logic system do not propagate to the automatic scram initiation logic system.

2.2.9 Steam Bypass and Pressure Control System

Design Description

The Steam Bypass and Pressure Control (SB&PC) System controls the reactor pressure during reactor startup, power generation, and reactor shutdown by control of the turbine bypass valves and signals to the Turbine Generator Control System (TGCS), which controls the turbine control valves.

The SB&PC System minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.

Functional Arrangement

(1) The SB&PC System functional arrangement is ~~described~~ defined in Table 2.2.9-1.

Functional Requirements

(2) The SB&PC System provides functions and initiating conditions as ~~described~~ defined in Table 2.2.9-2.

(3) ~~The SB&PC System minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.~~ (Deleted)

(4) SB&PC controllers are triple redundant fault tolerant.

(5) SB&PC System has three redundant nonsafety-related uninterruptible AC power supplies.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.2.9-3 ~~specifies~~defines~~of~~ the inspections, tests, and/or analyses, together with associated acceptance criteria for the SB&PC system.

Table 2.2.9-1

SB&PC System Functional Arrangement

~~SB&PC System is a triple-redundant, fault-tolerant, digital controller.~~
SB&PC System fault-tolerant digital controllers are located ~~in a mild environment~~ in the Control Building.
~~SB&PC System has three redundant nonsafety-related AC uninterruptible power supplies designed so that loss of one power supply or incoming power source does not affect SB&PC system functional operation.~~
SB&PC System interfaces with Nuclear Boiler System (NBS) ~~receiving~~ reactor steam dome pressure signals.
SB&PC System interfaces with the TGCS ~~receiving (1)~~ turbine power load unbalance signal, ~~(2)~~ turbine trip signal, and ~~(3)~~ turbine steam flow demand signal.
SB&PC System interfaces with the main condenser ~~receiving~~ main condenser pressure signal.

Table 2.2.9-2

SB&PC System Functions and Initiating Conditions

Function	Initiating Condition
Close TBV	Main condenser pressure high
Modulate TBV	SB&PC System normal pressure control function

Table 2.2.9-3

ITAAC For The Steam Bypass and Pressure Control System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The SB&PC System functional arrangement is described defined in Table 2.2.9-1.	Inspections of the as-built system will be conducted.	Inspection rReports(s) exist and concludedocument that the as-built SB&PC system conforms to the functional arrangement as defined in Table 2.2.9-1.
2. SB&PC System provides functions and initiating conditions as defined in Table 2.2.9-2.	Tests will be performed on the SB&PC system using simulated signals.	Test rReport(s) exist and confirm conclude that the SB&PC system is capable of performingperforms the functions as defined in Table 2.2.9-2.
3. SB&PC system minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.(Deleted)	See Section 3.3	See Section 3.3.
4. SB&PC controllers are triple redundant fault tolerant.	ia. Test(s) will be performed simulating failure of any one SB&PC controller. iib. Test(s) will be performed simulating failure of any two SB&PC controllers.	ia. Test rReport(s) exist and concludedocument that failure of any one SB&PC controller has no effect on SB&PC valve position demand signal. bii. Test rReport(s) exist and concludedocument that failure of any two SB&PC controllers generates a turbine trip signal.

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. SB&PC System has three redundant nonsafety-related uninterruptible AC power supplies.	i. Test(s) will be performed on the SB&PC system by providing a test signal in only one power supply channel at a time.	i. Report(s) exist and conclude that the test signal exists only in the power channel under test.
	ii. Test(s) will be performed on the SB&PC system power supply configuration simulating failure of any one power supply.	ii. Report(s) exist and conclude that loss of any one power supply at a time has no effect on SB&PC valve position demand signal.
	iii. Test(s) will be performed on the SB&PC system power supply configuration simulating failure of any two power supplies.	iii. Report(s) exist and conclude that loss of any two power supplies at a time has no effect on SB&PC valve position demand signal.

2.2.12 Leak Detection and Isolation System

Design Description

The Leak Detection and Isolation System (LD&IS) detects and monitors leakage from the containment, and initiates closure of inboard and outboard main steamline isolation valves (MSIVs), containment isolation valves (CIVs), and Reactor Building (RB) isolation dampers by the safety-related reactor trip and isolation function (RTIF) and SSLC/ESF programmable logic controller ~~platforms~~software projects.

The LD&IS functional arrangement is described in Tables 2.2.12-1.

LD&IS MSIV isolation function is implemented by the RTIF platform.

Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components is addressed in Subsection 2.2.15.

The environmental and seismic qualification of LD&IS components is addressed in Section 3.8.

The LD&IS minimum inventory of alarms, displays, and status indications in the main control room are addressed in Section 3.3.

The containment isolation components that correspond to the isolation functions defined in Tables 2.2.12-2 and 2.2.12-3 are addressed in Subsection 2.15.1.

LD&IS software is developed in accordance with the software development program described in Section 3.2 as part of the RTIF software project and SSLC/ESF software project.

Functional Arrangement

(1) ~~The LD&IS functional arrangement is described in Tables 2.2.12-1.~~ (Deleted)

Functional Requirements

(2) a. ~~The~~ RTIF LD&IS software monitors isolation function ~~monitored~~ variables ~~are~~ as ~~described~~ defined in Table 2.2.12-2.

b. SSLC/ESF LD&IS software monitors isolation function variables as defined in Table 2.2.12-2.

(3) ~~The~~ RTIF and SSLC/ESF LD&IS software monitor leakage source ~~monitored~~ variables ~~are~~ as ~~described~~ defined in Table 2.2.12-3.

(4) ~~The~~ RTIF and SSLC/ESF LD&IS software provide controls, interlocks, and bypasses ~~are~~ as ~~described~~ defined in Table 2.2.12-4.

(5) ~~Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components is addressed in Subsection 2.2.15.~~ (Deleted)

(6) ~~The equipment qualification of LD&IS components described in Table 2.2.12-1 is addressed in Section 3.8.~~ (Deleted)

(7) ~~The LD&IS minimum inventory of alarms, displays, and status indications in the main control room are addressed in Section 3.3.~~ (Deleted)

(8) ~~The containment isolation components that correspond to the isolation functions described in Tables 2.2.12-2 and 2.2.12-3 are addressed in Subsection 2.15.1.~~ (Deleted)

Table 2.2.12-1

LD&IS Functional Arrangement(Deleted)
LD&IS is safety-related, Seismic Category I.
LD&IS functions, other than MSIV isolation function, are implemented by SSLC/ESF platform.
LD&IS MSIV isolation function is implemented by the RTIF platform.
LD&IS isolation functions logic is designed to provide an actuation by requiring coincident trip of at least two divisions to cause the trip output.
LD&IS logic is de-energized to initiate the isolation function (i.e., fail safe).
LD&IS logic channels and associated sensors are powered from safety-related power supplies.
DW floor drain high conductivity waste (HCW) sump instrumentation is designed with the sensitivity to detect a leakage step-change (increase) of 3.8 liters/min (1.0 gpm) within one hour and to alarm at sump flow rates in excess of 19 liters/min (5 gpm).

Table 2.2.12-5

ITAAC For The Leak Detection and Isolation System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. ~~The LD&IS functional arrangement is described in Tables 2.2.12-1.~~ (Deleted)	~~Inspections and/or tests will be conducted on the as-built configuration as defined in Tables 2.2.12-1.~~	~~Report(s) document(s) that the system conforms to the functional arrangement described in Tables 2.2.12-1.~~
2a. ~~The~~ RTIF LD&IS software monitors isolation function ~~monitored~~ variables ~~are~~ as ~~described~~ defined in Table 2.2.12-2.	Test(s) will be performed on the as-built RTIF using simulated signals and actuators for the MSIV isolation functions defined in Table 2.2.12-2. ~~See Subsection 2.2.15.~~	Report(s) exist and conclude that the RTIF performs the MSIV isolation functions defined in Table 2.2.12-2. ~~See Subsection 2.2.15.~~
2b. SSLC/ESF LD&IS software monitors isolation function variables as defined in Table 2.2.12-2.	Test(s) will be performed on the as-built SSLC/ESF using simulated signals and actuators for the non-MSIV isolation functions defined in Table 2.2.12-2.	Report(s) exist and conclude that the SSLC/ESF performs the non-MSIV isolation functions defined in Table 2.2.12-2.
3. ~~The~~ RTIF and SSLC/ESF LD&IS software monitor leakage source ~~monitored~~ variables ~~are~~ as ~~described~~ defined in Table 2.2.12-3.	Test(s) will be performed on the as-built RTIF software project, SSLC/ESF software project, and SSLC/ESF VDUs using simulated signals and actuators for the monitored variables defined in Table 2.2.12-3. ~~See Subsection 2.2.15.~~	Report(s) exist and conclude that the monitored variables exist and can be retrieved in the main control room in response to simulated signals as defined in Table 2.2.12-3.~~See Subsection 2.2.15.~~
4. ~~The~~ RTIF and SSLC/ESF LD&IS software provide controls, interlocks, and bypasses ~~are~~ as ~~described~~ defined in Table 2.2.12-4.	Test(s) will be performed on the as-built RTIF software project, and SSLC/ESF software project, (including the SSLC/VDUs) using simulated signals and actuators for the controls, interlocks, and bypasses as defined in Table 2.2.12-4. ~~See Subsection 2.2.15.~~	Report(s) exist and conclude that the RTIF and SSLC/ESF controls, interlocks, and bypasses exist, can be retrieved in the main control room, and are performed in response to simulated signals and manual actions as defined in Table 2.2.12-4. ~~See Subsection 2.2.15.~~

2.2.13 Engineered Safety Features Safety System Logic and Control

Design Description

The Safety System Logic and Control for the Engineered Safety Features systems (SSLC/ESF) addressed in this subsection performs the safety-related Emergency Core Cooling System (ECCS) control logic, the isolation logic for the Control Room Habitability System (CRHS), and controls the safety-related video display units (VDUs) for the Q-DCIS.

Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components is addressed in Subsection 2.2.15.

The SSLC/ESF minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.

The environmental and seismic qualification of SSLC/ESF components defined in Table 2.2.13-1 is addressed in Section 3.8.

The SSLC/ESF software is developed in accordance with the software development program described in Section 3.2 as part of the SSLC/ESF software project.

Functional Arrangement

(1) The SSLC/ESF functional arrangement is ~~described~~ defined in Table 2.2.13-1.

Functional Requirements

(2) The SSLC/ESF provides automatic functions, initiators, and associated interfacing systems ~~are~~ as described in Table 2.2.13-2.

(3) The SSLC/ESF provides controls, interlocks, and bypasses in the main control room (MCR) ~~are~~ as described in Table 2.2.13-3.

(4) ~~Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components is addressed in Subsection 2.2.15.~~ (Deleted)

(5) ~~The SSLC/ESF minimum inventory of alarms, displays, and status indications in the main control room (MCR) are addressed in Section 3.3.~~ (Deleted)

(6) ~~The equipment qualification of SSLC/ESF components described in Table 2.2.13-1 is addressed in Section 3.8.~~ (Deleted)

(7) ~~The SSLC/ESF software is developed in accordance with the software development program described in Section 3.2.~~ (Deleted)

(8) SSLC/ESF logic is designed to provide a trip initiation by requiring a coincident trip of at least two divisions to cause the trip output.

(9) SSLC/ESF uses "energized-to-trip" and "fail-as-is" logic.

(10) Redundant safety-related power supplies are provided for each division.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.2.13-4 defines the inspections, tests, and/or analyses, together with associated acceptance criteria for the SSLC/ESF system.

Table 2.2.13-1

SSLC/ESF Functional Arrangement

SSLC/ESF comprises four redundant, safety-related, Seismic Category I, divisions of trip logics and trip actuators, located in divisionally separate rooms in the Control Building (CB) and Reactor Building (RB).
SSLC/ESF video display units (VDUs) comprise two redundant sets of four divisions of safety-related, VDUs, housed in two separate main control room panels.
SSLC/ESF receives inputs from, and sends outputs to interfacing systems as described in Tables 2.2.13-2 and 2.2.13-3.
SSLC/ESF logic is designed to provide a trip initiation by requiring a coincident trip of at least two divisions to cause the trip output.
Redundant safety-related power supplies are provided for each division.
SSLC/ESF uses "energized-to-trip" and "fail-as-is" logic.
ADS (SRVs and DPVs), ICS, GDCS, and SLC are actuated sequentially and/or in groups.
SSLC/ESF transmits and receives safety-related human-system interface (HSI) information as described in Table 3.3-1, Item 6, to and from the safety-related VDUs.

Table 2.2.13-4

ITAAC For The Safety System Logic and Control/ESF System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6. The equipment qualification of SSLC/ESF components is addressed in Section 3.8(Deleted).	See Section 3.8.	See Section 3.8.
7. The SSLC/ESF software is developed in accordance with the software development program described in Section 3.2. (Deleted)	See Section 3.2.	See Section 3.2.
8. SSLC/ESF logic is designed to provide a trip initiation by requiring a coincident trip of at least two divisions to cause the trip output.	Test(s) will be performed of the as-built SSLC/ESF system using simulated signals and actuators.	Report(s) exist and conclude that the as-built SSLC/ESF system performs trip initiation when a coincident trip occurs in at least two divisions.
9. SSLC/ESF uses "energized-to-trip" and "fail-as-is" logic.	Test(s) will be performed of the as-built SSLC/ESF system using simulated signals and actuators.	Report(s) exist and conclude that the as-built SSLC/ESF system uses "energized-to-trip" and "fail-as-is" logic.
10. Redundant safety-related power supplies are provided for each division.	Test(s) will be performed on the RPS by providing a test signal in only one safety-related division at a time.	Report(s) exist and conclude that the test signal exists only in the safety-related division under test in the System.

2.2.14 Diverse Instrumentation and Controls Systems

Design Description

The Ddiverse Iinstrumentation and Ccontrol Ssystems (DICS) comprise the safety-related Anticipated Transients Without Scram Standby Liquid Control (ATWS/SLC) system and the nonsafety-related Diverse Protection System (DPS).

The ATWS/SLC and DPS minimum inventory of alarms, displays, controls, and status indications in the MCR are addressed in Section 3.3.

The environmental and seismic qualification of ATWS/SLC and DPS components defined in Table 2.2.14-1 is addressed in Section 3.8.

The containment isolation components that correspond to the DPS isolation functions are addressed in Subsection 2.15.1.

Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components defined in Table 2.2.14-1 are addressed in Subsection 2.2.15.

ATWS/SLC hardware and software is developed in accordance with the software development program described in Section 3.2 as part of the ATWS/SLC software project.

DPS hardware and software is developed in accordance with the software development program described in Section 3.2 as part of the GENE DPS software project.

Functional Arrangement

(1) The ATWS/SLC and DPSDICS diverse instrumentation and control systems functional arrangement is as defined in Tables 2.2.14-1 and 2.2.14-2.

Functional Requirements

(2) The ATWS/SLC and DPSDICS diverse instrumentation and control systems provide automatic functions, initiators, and associated interfacing systems are as defined in Table 2.2.14-2.

(3) The ATWS/SLC and DPSDICS diverse instrumentation and control systems provide controls, interlocks and bypasses in the MCR are as defined in Table 2.2.14-3.

(4) DICS minimum inventory of alarms, displays, controls, and status indications in the MCR are addressed in Section 3.3. (Deleted)

(5) The equipment qualification of DICS ATWS/SLC and DPS components defined in Table 2.2.14-1 is addressed in Section 3.8. (Deleted)

(6) The containment isolation components that correspond to the DPS isolation functions defined in Table 2.2.14-2 are addressed in Subsection 2.15.1. (Deleted)

(7) Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components defined in Table 2.2.14-1 is addressed in Subsection 2.2.15. (Deleted)

(8) Confirmatory analyses to support and validate the DPS design scope and fire separation criteria.

(9) Failure Modes and Effects Analysis (FMEA) per NUREG/CR-6303 of safety-related protection system platforms (RPS and SSLC/ESF) completed to validate the DPS diverse protection function. (Deleted)

(10) DICS software is developed in accordance with the software development program described in Section 3.2. (Deleted)

(11) DPS cabinet separation exists from the other N-DCIS, RMU, and Q-DCIS cabinets.

(12) ATWS/SLC system logic is designed to provide a trip initiation by requiring coincident trip of at least two divisions to cause the trip output.

(13) Each ATWS/SLC system division is powered from its respective safety-related power supply.

(14) DPS is powered from nonsafety-related load group power supplies.

(15) DPS triple redundant digital controllers require agreement in at least two channels out of three channels for a coincident trip actuation.

(16) DPS logic is "energize-to-actuate".

(17) DPS process variable sensors are diverse from those used by the RPS and SSLC/ESF.

(18) The DPS network segment uses diverse hardware and software from that used by the RPS and SSLC/ESF.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.2.14-4 defines the inspections, tests, and/or analyses, together with associated acceptance criteria for the ATWS/SLC and DPSDICS.

Table 2.2.14-1

Diverse Instrumentaion and Control Systems Functional Arrangement

ATWS/SLC system is safety-related.
ATWS/SLC system is housed within each of the divisional safety-related reactor trip and isolation function (RTIF) cabinets on a separate chassis from the other equipment within the cabinet.
RTIF cabinets housing the ATWS/SLC system are located within the divisional electrical rooms in the control building (CB) in a mild environment.
ATWS/SLC system logic is designed to provide a trip initiation by requiring coincident trip of at least two divisions to cause the trip output.
Each ATWS/SLC system is powered by a divisionally separated safety-related power supply.
ATWS/SLC has RPV dome pressure sensors and RPV water level sensors that are hardwired to their respective divisional controller in the CB.
DPS uses a triple redundant, digital controller, powered from nonsafety-related load group power supplies.
DPS triple redundant digital controllers require agreement in at least two channels out of three channels for a coincident trip actuation.
DPS is housed in a cabinet located in a mild environment in the CB.
DPS scram initiation logic is "energize-to-actuate" applied at the power return side of the control circuit going to the scram pilot valve solenoids.
DPS logic is "energize-to-actuate".
DPS process variable sensors are different from those used by the RPS and SSLC/ESF.
DPS uses hardware and software that is separate and independent from that used by the RPS and SSLC/ESF.

Table 2.2.14-4

ITAAC For The Diverse Instrumentation and Controls

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
13. Each ATWS/SLC system division is powered from its respective safety-related power supply.	Test(s) will be performed on the ATWS/SLC system by providing a test signal in only one safety-related division at a time.	Report(s) exist and conclude that a test signal exists in the safety-related division under test in the ATWS/SLC system.
14. DPS is powered from nonsafety-related load group power supplies.	Test(s) will be performed on the DPS by providing a test signal in only one DPS load group at a time	Report(s) exist and conclude that a test signal exists in the load group under test in the DPS.
15. DPS triple redundant digital controllers require agreement in at least two channels out of three channels for a coincident trip actuation.	Test(s) will be performed on the DPS by providing simulated signals to each DPS channel.	Report(s) exist and conclude that trip actuation signals exist only when at least two channels are in coincident agreement.
16. DPS logic is "energize-to-actuate".	Test(s) will be performed on the DPS system logic.	Report(s) exist and conclude that trip actuation signals are "energize-to-actuate".
17. DPS process variable sensors are diverse from those used by the RPS and SSLC/ESF.	Analysis(es) will be performed on the DPS sensor failure modes and effects.	Report(s) exist and conclude that the DPS sensors are diverse from the RPS and SSLC/ESF sensors.
18. The DPS network segment uses diverse hardware and software from that used by the RPS and SSLC/ESF.	Analysis(es) will be performed on the DPS network segment failure modes and effects.	Report(s) exist and conclude that the DPS network segment is diverse from the RPS and SSLC/ESF hardware and software.

Table 2.2.16-1

HP CRD Isolation Bypass Function ICP Functional Arrangement

HP CRD Isolation Bypass Function ICP is a four division, redundant, logic controller. HP CRD Isolation Bypass Function ICP and RMUs are located in divisionally separate rooms in the Control Building (CB) and Reactor Building (RB).