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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 318 Related to ESBWR Design Certification Application ESBWR RAI Number 14.3-450**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) dated March 31, 2009 (Reference 1).

The GEH response to RAI Number 14.3-450 is in Enclosure 1. The DCD markups associated with these responses are included in Enclosure 2.

Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box. The marked-up pages may contain unverified changes in addition to the verified changes resulting from this RAI response. Other changes shown in the markup(s) may not be fully developed and approved for inclusion in DCD Revision 6.
If you have any questions or require additional information, please contact me.

Sincerely,

Lee F. Dougherty for

Richard E. Kingston
Vice President, ESBWR Licensing

Reference:

1. MFN 09-226, Letter from U.S. Nuclear Regulatory Commission to Jerald G. head, GEH, *Request For Additional Information Letter No. 318 Related To ESBWR Design Certification Application*, dated March 31, 2009.

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 318 Related to ESBWR Design Certification Application DCD Tier 1 RAI Number 14.3-450

2. MFN 09-378, DCD Revision 6 Markups

cc: AE Cubbage USNRC (with enclosure)
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Enclosure 1

MFN 09-378,

Response to Portion of NRC Request for

Additional Information Letter No. 318

Related to ESBWR Design Certification Application

DCD Tier 1

RAI Number 14.3-450

NRC RAI 14.3-450

Revise the Design commitments for Tier 1 Table 2.2-13-4 and explain the intent of ITAAC item 3 GEH submitted Draft Tier 1, Revision 6 on December 18, 2008. The staff reviewed the Draft Tier 1 and identified concerns regarding the ITAAC related to control, interlocks, and bypasses in Tier 1 Table 2.2.13-4. The staff discussed their concerns with GEH during a conference call on January 28, 2009, and had follow up discussions with GEH during a meeting held on February 6, 2009. As result of those discussion, below the staff identified concerns that still need to be addressed by GEH.

A. The staff requests that GEH explain the intent of ITAAC item 3 in Tier 1 table 2.2.13- 4. Is the intent of ITAAC 3 to verify that systems controls, interlocks, and bypasses exist? Or is the intent to verify time delay values? If the intent is to verify time delay values, then these values should be included in Tier 1. Presently the values are listed in DCD Tier 2, Table 6.3-1. The staff also request GEH to clarify what is meant by "retrieved."

B. In ITAAC 3 in Tier 1 table 2.2.13-4, GEH lists controls, interlocks, and bypasses in the design commitment but omits bypasses in the acceptance criteria (AC). The AC should be revised to include bypasses so that the AC is aligned with the design commitment. The acceptance criteria should also be revised by replacing "or" with "and."

C. For consistency GEH should review and revise all Tier 1 tables with ITAACs addressing control, interlocks and bypasses as appropriate.

D. Also, the staff request GEH revised the design commitment for Item 3 in Tier 1 Table 2.2-13-4. Staff recommends that GEH consider revising the design commitment as suggested below:

*Design Commitment: "The SSLC/ESF provides controls, interlocks and bypasses in the main control room (MCR) as described in Table 2.2.13-3.
"*

E. The staff requests that GEH revise the design commitment for ITAAC item 2 in Tier 1, Table 2.2-13-4. Staff recommends that GEH consider revising the design commitment as stated below:

"The SSLC/ESF provides automatic trip initiators and associated interfacing systems as described in Table 2.2.13-2."

GEH Response

A. The staff requests that GEH explain the intent of ITAAC item 3 in Tier 1 table 2.2.13- 4. Is the intent of ITAAC 3 to verify that systems controls, interlocks, and bypasses exist? Or is the intent to verify time delay values? If the intent is to verify time delay values, then these values should be included in Tier 1. Presently the values are listed in DCD Tier 2, Table 6.3-1.

The intent of ITAAC 3 is to verify that controls, interlocks, and bypasses exist within the system (i.e., SSLC/ESF platform). The time delays within the SSLC/ESF platform have a practical range of 0 to infinity. Time delays will be determined during final design. Changes to the time delay values, from what is shown in DCD Tier 2, Table 6.3-1, and consolidated in Tables 7.3-2, 7.3-3, and 7.3-4, under the SRV and DPV group numbers and GDCS injection and equalization delay times, will require no physical change to the SSLC/ESF hardware configuration, which makes the actual time delay values hardware independent. The programming of the time delay values is controlled under the software development program that is described in DCD Tier 2, Subsections 7.1.1 and 14.3.3.2 and confirmed through the software project DAC and ITAAC in DCD Tier 1, Section 3.2. No change to the DCD will be made in response to this RAI.

The staff also request GEH to clarify what is meant by "retrieved."

The wording of the ITAAC follows the example in NUREG 0800, Section 14.3, page 14.3-60, Item 6. The use of the word "retrieved" within the ITAAC means that the controls, interlocks, and bypasses in the main control room (MCR) exist within the MCR (equipment), that they may be currently visible or that they may be invisible, but that the operators can get and bring back (i.e., retrieve) the controls, interlocks, and bypasses by equipment, i.e., visual display units (VDUs), in the MCR.

B. In ITAAC 3 in Tier 1 table 2.2.13-4, GEH lists controls, interlocks, and bypasses in the design commitment but omits bypasses in the acceptance criteria (AC). The AC should be revised to include bypasses so that the AC is aligned with the design commitment. The acceptance criteria should also be revised by replacing "or" with "and."

Concur. The word "bypasses" will be added to the acceptance criteria (AC) as shown in the markup in DCD Tier 1, Table 2.2.13-4, ITAAC 3. The word "or" will be revised to the word "and" in the AC as shown in the markup for DCD Tier 1, Table 2.2.13-4, ITAAC 3. Additionally, the word "described" will be revised to the word "defined" for consistency in the AC as shown in the markup for DCD Tier 1, Table 2.2.13-4, ITAAC 3. Note that this comment applies to Table 2.2.12-5, Item 4.

C. For consistency GEH should review and revise all Tier 1 tables with ITAACs addressing control, interlocks and bypasses as appropriate.

Concur. The design commitments for Tier 1, Tables 2.2.1-6, ITAAC 3, 4, and 5; 2.2.2-7, ITAAC 9, 10 and 12; 2.2.3-4, ITAAC 2 and 3; 2.2.4-6, ITAAC 2 and 3; 2.2.5-4, ITAAC 2 and 3; 2.2.6-3, ITAAC 2; 2.2.7-4, ITAAC 2 and 3; 2.2.9-3, ITAAC 2; 2.2.12-5, ITAAC 2a, 2b, 3, and 4; 2.2.13-4, ITAAC 2 and 3; 2.2.14-4, ITAAC 2, and 3; and 2.2.16-4, ITAAC 2 and 3; will be revised as shown on the attached markup.

D. Also, the staff request GEH revised the design commitment for Item 3 in Tier 1 Table 2.2-13-4. Staff recommends that GEH consider revising the design commitment as suggested below:

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

Concur. The design commitments for Tier 1, Tables 2.2.1-6, ITAAC 3, 4, and 5; 2.2.2-7, ITAAC 9, 10, and 12; 2.2.3-4, ITAAC 2 and 3; 2.2.4-6, ITAAC 2 and 3; 2.2.5-4, ITAAC 2 and 3; 2.2.6-3, ITAAC 2; 2.2.7-4, ITAAC 2 and 3; 2.2.9-3, ITAAC 2; 2.2.12-5, ITAAC 4; 2.2.13-4, ITAAC 2 and 3; 2.2.14-4, ITAAC 2 and 3; and 2.2.16-4, ITAAC 2 and 3; will be revised to be consistent with the proposed wording for Design Commitment for Item 3 in Tier 1 Table 2.2.13-4. Note that control and protection functions may be performed by platform or network segment software projects that have a different name than the system. These software project names, i.e., PIP network segment for CRD, will be used to identify the control or protection system that will perform the defined functions. For consistency with the use of tables within the DCD in which tables define system attributes, the word "defined" will be used instead of the suggested word "described" in the design commitments.

Tier 1, Table 2.2.12-5, ITAAC 2a, 2b, and 3, has also been revised, but uses the verb "monitor" instead of "provide" as the action word.

E. The staff requests that GEH revise the design commitment for ITAAC item 2 in Tier 1, Table 2.2-13-4. Staff recommends that GEH consider revising the design commitment as stated below:

"The SSLC/ESF provides automatic trip initiators and associated interfacing systems as described in Table 2.2.13-2."

Concur. Design Commitments in Subsections 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, and 2.2.16, for the ITAAC listed and described in the response to D, above, will be revised to be consistent with the proposed wording for Design Commitment for Item 2 in Tier 1 Table 2.2.13-4. Note that control and protection functions may be performed by platform or network segment software projects that have a different name than the system. These software project names, i.e., PIP for CRD, will be used to identify the control or protection system that will perform the defined functions. For consistency with the use of tables within the DCD in which tables define system attributes, the word "defined" will be used instead of the suggested word "described" in the design commitments.

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, 2.2.16; and Tables 2.2.1-6, 2.2.2-7, 2.2.3-4, 2.2.4-6, 2.2.5-4, 2.2.6-3, 2.2.7-4, 2.2.9-3, 2.2.12-5, 2.2.13-4, 2.2.14-4, 2.2.16-4, will be revised as shown in the attached markup in Revision 6 in response to this RAI. In addition, the following editorial and generic changes appear in this set of markups:

1. The type of report will be revised simply to Report(s) and the phrases “Report(s) exist(s) and conclude(s)”, “Report(s) exist and conclude(s)”, “Report(s) exist(s) and conclude” will be replaced by “Report(s) exist and conclude” for consistency.
2. The word “defined” will replace the word “describe” when referring to the content of a table.
3. The word “describe” will replace the word “define” when referring to the content of sections and subsections.
4. The word “or” will be replaced with the word “and”.
5. ITA will be pared down to single activities, i.e., inspections, tests, or analyses, in accordance with previous generic comment and for consistency with ITA in similar items.
6. Added reference to Section 3.2 for CRD software for consistency with other subsections in Section 2.2.
7. Revised DC Section 2.2.14 and Table 2.2.14-4 for consistency with other subsections in Section 2.2.

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MFN 09-378

DCD Revision 6 Markups

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)

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 2.2.1-6

ITAAC For The Rod Control and Information System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. RC&IS functional arrangement is defined in Table 2.2.1-1.	Test(s) and iInspection(s) of the as-built system will be performed.	Test and inspection rReport(s) document exist and conclude that the as-built system conforms with the functional arrangement defined in Table 2.2.1-1.
2. RC&IS is divided into major functional groups as defined in Table 2.2.1-2.	Test(s) and iInspection(s) of the as-built system will be performed.	Test and inspection rReport(s) document exist and conclude that the as-built system is divided into major functional groups as defined in Table 2.2.1-2.
3. RC&IS provides automatic functions, initiators, and associated interfacing systems are as defined in Table 2.2.1-3.	Test(s) and type test(s) will be performed for the initiators on the as-built RC&IS using simulated signals and actuators to perform for the automatic functions listed defined in Table 2.2.1-3.	Test and type test rReport(s) document exist and conclude that the RC&IS is capable of performing the automatic functions for the initiators as defined in Table 2.2.1-3.
4. RC&IS provides rod block functions and the permissive conditions under which the rod block is active are as defined in Table 2.2.1-4.	Test(s) and type test(s) will be performed using simulated signals and manual actions to confirm that the rod withdrawal and insertion commands are blocked as defined in Table 2.2.1-4.	Test and type test rReport(s) document exist and conclude that the rod block functions defined in Table 2.2.1-4 are performed in response to simulated signals and manual actions.
5. RC&IS provides controls, interlocks, and bypasses are as defined in Table 2.2.1-5.	Inspection(s), test(s) and type tTest(s) will be performed on the as-built system using simulated signals and manual actions.	Inspection, test and type test rReport(s) document exist and conclude that the system controls, interlocks, and bypasses exist, can be retrieved in the main control room, or are performed in response to simulated signals and manual actions as defined in Table 2.2.1-5.

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 in Tier 1 Tables 2.2.2-1 and 2.2.2-6 is addressed in Subsection 2.2.15.

The environmental and seismic qualification of CRDS components defined in Tables 2.2.2-1, 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. Pressure boundary welds in piping defined in Table 2.2.2-5 as ASME Code Section III meet ASME Code Section III requirements.

(4) Pressure Boundary Integritya.The Pressure boundary integrity components defined in Table 2.2.2-5 as ASME Code Section III retain their pressure boundary integrity at their design pressure.

b. The Pressure boundary integrity piping defined in Table 2.2.2-5 as ASME Code Section III retains its pressure boundary integrity at design pressure.

(5) The Seismic Category I safety-related equipment, including components and associated piping, defined in Table 2.2.2-1 and 2.2.2-5 can withstand sSeismic design basisCategory I loads without loss of structural integrity and safety-related function.

(6) The FMCRD is capable of positioning CR incrementally and continuously over its entire range.

(7) Valves defined in Table 2.2.2-5 and 2.2.2-6 as having an active safety-related function open, close, or both open and close under differential pressure, fluid flow, and temperature conditions.

(8) a. The HPCRD hydraulic subsystem has a high-pressure makeup mode of operation that injects water to the RPV via the RWCU/SDC return path.

b. The CRD hydraulic subsystem has a safety-related isolation capability terminating injection into the RPV.

c. The CRD hydraulic subsystem has an isolation bypass capability allowing injection to the RPV.

(9) PIP software project for the CRD system provides automatic functions, initiators, and associated interfacing systems are as defined in Table 2.2.2-3.

(10) PIP software project for the CRD system provides controls and interlocks are as defined in Table 2.2.2-4.

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

(12) CRD maximum allowable scram times are defined in Table 2.2.2-2.The CRD system provides rapid CR insertion in response to a scram signal.

(13) Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components defined in Tier 1 Tables 2.2.2-1 and 2.2.2-6 is addressed in Subsection 2.2.15.(Deleted)

(14) The equipment qualification of CRDS components defined in Tables 2.2.2-1, 2.2.2-5, and 2.2.2-6, is addressed in Section 3.8.(Deleted)

(15) The FMCRD has an electro-mechanical brake with a minimum required holding torque on the motor drive shaft.

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

Table 2.2.2-7

ITAAC For The Control Rod Drive System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
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.	Inspection(s), test(s), and type test(s) of the as-built CRD system will be conducted.	A rReport(s) exists thatand documents concludethe results of inspection(s), test(s), and type test(s) that confirm the CRD system conforms to the functional arrangement as defined in Table 2.2.2-1 and as shown in Figure 2.2.2-1. For components and piping identified in Table 2.2.2-5 as ASME Code Section III, this report is an ASME Code report.
2.. ASME Code Section III a1. The components iindentified 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.	Inspection of ASME Code Design Reports (NCA-3350) and required documents will be conducted.	ASME Code Design Report(s) (NCA-3550) (certified, when required by ASME Code) exist and conclude that the design of the CRD system components identified in Table 2.2.2-5 as ASME Code Section III complies with the requirements of the ASME Code, Section III, including for those stresses and loads related to fatigue (including environmental effects), thermal expansion, seismic, and combined.

Table 2.2.2-7

ITAAC For The Control Rod Drive System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8c. The CRD hydraulic subsystem has an isolation bypass capability allowing injection to the RPV.	Test(s) of the CRD hydraulic subsystem high pressure makeup mode of operation will be conducted on the as-built system verifying that water is injected to the RPV via the isolation bypass.	Report(s) exist and conclude that the CRD hydraulic subsystem high pressure makeup mode of operation injects water to the RPV via the isolation bypass.
9. PIP software project for the CRD system provides automatic functions, initiators, and associated interfacing systems ~~are~~ as defined in Table 2.2.2-3.	~~Inspections will be performed to verify that the as-built CRD system conforms with the automatic functions, initiators, and associated interfacing systems defined in Table 2.2.2-3.~~ Test(s) ~~and type test(s)~~ will be performed on the as-built system using simulated signals initiated from all of the associated interfacing as-built systems ~~specified~~ as defined in Table 2.2.2-3.	~~Inspection report(s) document that the as-built CRD system conforms with the automatic functions, initiators, and associated interfacing systems defined in Table 2.2.2-3.~~ ~~Test and type test r~~Report(s) ~~document~~ exist and conclude that the PIP network segments for the CRD system are ~~is~~ capable of performing the automatic functions defined in Table 2.2.2-3 using simulated signals initiated from all of the associated interfacing as-built systems ~~specified~~ as defined in Table 2.2.2-3.
10. PIP software project for the CRD system provides controls and interlocks ~~are~~ as defined in Table 2.2.2-4.	Test(s) ~~and type test(s)~~ will be performed on the as-built system using simulated signals.	~~Test and type test r~~Report(s) exist and conclude ~~document~~ that the PIP network segments for the CRD system controls and interlocks exist, can be retrieved in the main control room, ~~or~~ and are performed in response to simulated signals and manual actions as defined in Table 2.2.2-4.

Table 2.2.2-7

ITAAC For The Control Rod Drive System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11. ~~CRD system minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3.~~(Deleted)	~~See Section 3.3.~~	~~See Section 3.3.~~
12. ~~CRD maximum allowable scram times are defined in Table 2.2.2-2.~~The CRD system provides rapid CR insertion in response to a scram signal.	Test(s) will be performed of each CRD control rod pair scram function using simulated signals.	~~Test r~~Report(s) ~~document~~ exist and conclude that the scram insertion time~~s~~ for each control rod pair ~~are~~ is less than or equal to the maximum allowable scram times as defined in Table 2.2.2-2.
13. ~~Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components defined in Tables 2.2.2-1, 2.2.2-5, and 2.2.2-6, is addressed in Subsection 2.2.15.~~(Deleted)	~~See Subsection 2.2.15.~~	~~See Subsection 2.2.15.~~
14. ~~The equipment qualification of CRDS components defined in Tables 2.2.2-1, 2.2.2-5, and 2.2.2-6, is addressed in Section 3.8.~~(Deleted)	~~See Section 3.8.~~	~~See Section 3.8.~~
15. The FMCRD has an electro-mechanical brake with a minimum required holding torque on the motor drive shaft.	Tests of each FMCRD brake will be conducted in a test facility	The FMCRD electro-mechanical brake has a minimum required holding torque of 49 N. m (36 ft-lb$_f$) on the motor drive shaft.

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 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 2.2.3-4

ITAAC For The Feedwater Control System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The FWCS functional arrangement is defined in Table 2.2.3-1.	Inspections ~~and tests~~ will be performed on the FWCS functional arrangement using simulated signals and simulated actuators.	~~Inspection and test r~~Report(s) exist and conclude~~document(s)~~ that FWCS functional arrangement is as defined in Table 2.2.3-1.
2. FWCS provides automatic functions, initiators, and associated interfacing systems ~~are~~ as defined in Table 2.2.3-2.	Test(s) ~~and type test(s)~~ will be performed on the as-built system using simulated signals.	~~Test and type test r~~Report(s) exist and conclude ~~document~~ the system performs the functions defined in Table 2.2.3-2.
3. FWCS provides controls ~~are~~ as defined in Table 2.2.3-3.	~~Inspection(s), t~~Test(s) ~~and type test(s)~~ will be performed on the as-built system using simulated signals and manual actions.	~~Test and type test r~~Report(s) exist and conclude ~~document~~ that the ~~system~~ FWCS controls and interlocks exist, can be retrieved in the main control room, ~~or~~ and are performed in response to simulated signals and manual actions 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)	~~See Table 3.3-1, Item 6.~~	~~See Table 3.3-1, Item 6.~~

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 Table 2.2.4-1 is addressed in Subsection 2.2.15.

The environmental and seismic qualification of SLC system components defined in Table 2.2.4-1 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 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.

(10) ~~ASME Code Section III~~a1.The components identified in Table 2.2.4-4 as ASME Code Section III are designed in accordance with ASME Code Section III requirements and seismic Category I requirements.

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 and 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
	bii. Inspection of the as-installed safety-related divisions in the SLC System will be performed.	bii. Inspection rReport(s) of the as-installed safety-related divisions in the SLC System exist and concludedocument(s) that for the as-installed safety-related divisions in the SLC System: • i)Physical separation or electrical isolation exists between these safety-related divisions in accordance with RG 1.75. • ii)Physical separation or electrical isolation exists between safety-related Divisions and nonsafety-related equipment in accordance with RG 1.75.
17a. Each mechanical train of the SLCS located outside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.	Inspections or analysis will be conducted for each of the SLCS mechanical trains located outside the containment.	Report(s) exist and conclude that each mechanical train of SLCS located outside containment is protected against design basis events and their direct consequences by spatial separation, barriers, restraints, or enclosures so as not to preclude accomplishment of the intended safety-related function.

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.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.2.5-4 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria for the NMS.

Table 2.2.5-4

ITAAC For The Neutron Monitoring System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. NMS functional arrangement is defined in Table 2.2.5-1.	Inspection(s), test(s), and/or type test(s) will be performed on the as-built configuration as described defined in Table 2.2.5-1.	Inspection, test, and/or type test rReport(s) documentexist and conclude(s) that the system conforms to the functional arrangement as described defined in Table 2.2.5-1.
2. NMS provides automatic functions, initiators, and associated interfacing systems are as defined in Table 2.2.5-2.	Test(s) will be performed on the as-built NMS using simulated signals and actuators for the automatic functions defined in Table 2.2.5-2.See Subsection 2.2.15.	Report(s) exist and conclude that the NMS performs the automatic functions defined in Table 2.2.5-2.See Subsection 2.2.15.
3. NMS provides controls, interlocks, and bypasses are as defined in Table 2.2.5-3.	Test(s) will be performed on the as-built NMS and MCRP SSLC/ESF VDUs using simulated signals and actuators for the controls, interlocks, and bypasses defined in Table 2.2.5-3.See Subsection 2.2.15.	Report(s) exist and conclude that the NMS 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 2.2.7-3.See Subsection 2.2.15.
4. The NMS 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.
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	See Subsection 2.2.15.	See Subsection 2.2.15.

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)

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 2.2.6-3

ITAAC For The Remote Shutdown System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. RSS functional arrangement is described in Subsection 2.2.6 and defined in Table 2.2.6-1.	Inspection(s) and test(s) will be performed to confirm that the as-built panels are configured as described in Subsection 2.2.6 and defined in Table 2.2.6-1.	Test rReport(s) documentexist and conclude(s) that the as-built panels are configured as described in Subsection 2.2.6 and defined Table 2.2.6-1.
2. RSS provides dedicated controls are as defined in Table 2.2.6-2.	Test(s) and type test(s) will be performed on the dedicated controls as defined in Table 2.2.6-2.	Test rReport(s) exist and concludedocument(s) that the RSS panels are capable of issuing control signals from the dedicated controls 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)	See Section 3.3	See Section 3.3.
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)	See Subsection 2.2.15.	See Subsection 2.2.15.
5. The equipment qualification of DICS components defined in Table 2.2.6-1 is addressed in Section 3.8.(Deleted)	See Section 3.8.	See Section 3.8.
6. RSS software is developed in accordance with the software development program described in Section 3.2. (Deleted)	See Section 3.2.	See Section 3.2.

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.

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 2.2.7-4

ITAAC For The Reactor Protection System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The functional arrangement is as described defined in Table 2.2.7-1.	Inspection(s), test(s), and/or type test(s) will be performed on the as-built configuration as described defined in Table 2.2.7-1.	Inspection, test, and/or type test rReport(s) exist and concludedocument(s) that the system conforms to the functional arrangement as described defined in Table 2.2.7-1.
2. RPS provides automatic functions, initiators, and associated interfacing systems are as defined in Table 2.2.7-2.	Test(s) will be performed on the as-built RPS using simulated signals and actuators for the automatic functions defined in Table 2.2.7-2. Test(s) and type test(s) will be performed on the as-built system using simulated signals.	Test and type test rReport(s) exist and concludedocument that the system is capable of performing theRPS performs the automatic functions 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.	Test(s) will be performed on the as-built RPS and SSLC/ESF VDUs using simulated signals and actuators for the controls, interlocks (system interfaces), and bypasses defined in Table 2.2.7-3.Test(s) and type test(s) will be performed on the as-built system using simulated signals.	Test and type test rReport(s) exist and concludedocument that the system RPS controls and interlocks (system interfaces), and bypasses exist, can be retrieved in the main control room SSLC/ESF VDUs, or and are performed in response to simulated signals and manual actions 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)	See Subsection 2.2.15.	See Subsection 2.2.15.
5. RPS minimum inventory of alarms,	See Section 3.3.	See Section 3.3.

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 fault tolerant.

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 2.2.9-3

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 r~~Reports(s) exist and conclude~~document~~ 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 r~~Report(s) exist and ~~confirm~~ conclude that the SB&PC system ~~is capable of performing~~performs 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 fault tolerant.	i~~a~~. Test(s) will be performed simulating failure of any one SB&PC controller.	i~~a~~. ~~Test r~~Report(s) exist and conclude~~document~~ that failure of any one SB&PC controller has no effect on SB&PC valve position demand signal.
	ii~~b~~. Test(s) will be performed simulating failure of any two SB&PC controllers.	~~b~~ii. ~~Test r~~Report(s) exist and conclude~~document~~ that failure of any two SB&PC controllers generates a turbine trip 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 platformssoftware projects.

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 defined in Table 2.2.12-1 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.

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 2.2.12-5

ITAAC For The Leak Detection and Isolation System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The LD&IS functional arrangement is described defined in Tables 2.2.12-1.	Inspections and/or tests will be conducted on the as-built configuration as defined in Tables 2.2.12-1.	Report(s) exist and concludedocument(s) that the system conforms to the functional arrangement described defined 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.

Table 2.2.12-5

ITAAC For The Leak Detection and Isolation System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9. ~~LD&IS software is developed in accordance with the software development program described in Section 3.2.~~ (Deleted)	~~See Section 3.2.~~	~~See Section 3.2.~~
10. 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.	Test(s) will be performed on the as-built SSLC/ESF of the LD&IS functions.	Report(s) exist and conclude that the SSLC/ESF performs the LD&IS function trip outputs when a coincident trip of at least two divisions occurs.
11. LD&IS logic is de-energized to initiate the isolation function (i.e., fail-safe).	Test(s) will be performed on the as-built SSLC/ESF of the LD&IS functions by de-energizing the SSLC/ESF by division.	Report(s) exist and conclude that the SSLC/ESF de-energizes the LD&IS trip outputs when a coincident de-energization of at least two divisions occurs.
12. 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).	Test(s) will be performed on the as-built DW floor drain high conductivity waste (HCW) sump instrumentation.	Report(s) exist and conclude that the DW floor drain high conductivity waste (HCW) sump instrumentation detects leakage step-changes (increases) of 3.8 liters/min (1.0 gpm) within one hour and sump flow rates in excess of 19 liters/min (5 gpm).

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 equipment qualification of SSLC/ESF components ~~described~~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~~defined in Table 2.2.13-2.

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

(4) (Deleted)

(5) (Deleted)

(6) (Deleted)

(7) (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.

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 2.2.13-4

ITAAC For The Safety System Logic and Control/~~ESF~~ System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The SSLC/ESF functional arrangement is ~~described~~ defined in Table 2.2.13-1.	Inspections ~~and/or tests~~ will be conducted in the as-built configuration as ~~described~~ defined in Table 2.2.13-1.	~~Inspection and/or test r~~Report(s) exist~~(s)~~ and conclude~~(s)~~ that ~~document~~ the system conforms to the functional arrangement as ~~described~~ defined in Table 2.2.13-1.
2. The SSLC/ESF provides automatic trip initiators and associated interfacing systems are ~~described~~ defined in Table 2.2.13-2.	Test(s) ~~and type test(s)~~ will be performed on the as-built system using simulated signals.	~~Test and type test r~~Report(s) exist and conclude~~document~~ the system is capable of performing the functions ~~described~~ defined in Table 2.2.13-2.
3. The SSLC/ESF provides controls, interlocks, and bypasses in the main control room (MCR) ~~are~~ as ~~described~~ defined in Table 2.2.13-3.	Test(s) ~~and type test(s)~~ will be performed on the as-built system using simulated signals.	~~Test and type test r~~Report(s) exist and conclude~~document~~ that the system controls, ~~and~~ interlocks and bypasses exist, can be retrieved in the main control room, ~~or~~ and are performed in response to simulated signals and manual actions as ~~described~~ defined 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).	~~See Subsection 2.2.15.~~	~~See Subsection 2.2.15.~~
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)	~~See Section 3.3.~~	~~See Section 3.3.~~

2.2.14 Diverse Instrumentation and Controls Systems

Design Description

The Ddiverse Iinstrumentation and Ccontrol Ssystems (DICS) comprise the Anticipated Transients Without Scram Standby Liquid Control (ATWS/SLC) system and the 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)

Table 2.2.14-4

ITAAC For The Diverse Instrumentation and Controls

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
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.	Inspection(s), test(s), and/or type test(s) will be conducted on the as-built system configuration described defined in Tables 2.2.14-1 and 2.2.14-2.	Inspection(s), test(s), and/or type test(s) Rreport(s) exist and conclude document(s) that the system's conformance to the functional arrangement described defined in Tables 2.2.14-1 and 2.2.14-2.
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.	a. Tests will be performed conducted on the DICS ATWS/SLC and DPS safety-related and nonsafety-related components will be conducted on the as-built system configuration using simulated signals.	a. Test rReport(s) exist and conclude confirm that the DICS ATWS/SLC and DPS are is capable of performing the functions described defined in Table 2.2.14-2.
	b. For safety-related DCIS components, see Subsection 2.2.15. (Deleted)	b. For safety-related DCIS components, see Subsection 2.2.15.
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.	a. Test(s) and type test(s) will be performed on the DICS ATWS/SLC and DPS safety-related and nonsafety-related logic using simulated signals and actuators for process controls, interlocks, and bypasses, and controls described as defined in Table 2.2.14-3.	a. Test rReport(s) exist and conclude(s) that the DICS ATWS/SLC and DPS logic process controls, interlocks and bypasses exist, can be retrieved in the main control room, and are performed in response to simulated signals and manual actio ns as defined , and issue control signals described in Table 2.2.14-3.
	b. For safety-related DCIS components, see Subsection 2.2.15. (Deleted)	b. For safety-related DCIS components, see Subsection 2.2.15.

2.2.16 HP CRD Isolation Bypass Function Independent Control Platform

Design Description

The HP CRD Isolation Bypass Function Independent Control Platform (ICP) automatically bypasses the CRD hydraulic subsystem high pressure makeup water injection isolation function by using isolation bypass valves.

HP CRD Isolation Bypass Function ICP 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 HP CRD Isolation Bypass Function ICP components defined in Table 2.2.16-1 are addressed in Section 3.8.

Conformance with IEEE Std. 603 requirements by the safety-related control system structures, systems, and components defined in Table 2.2.16-1 is addressed in Subsection 2.2.15.

HP CRD Isolation Bypass Function ICP software is developed in accordance with the software development program described in Section 3.2 as part of the HP CRD Iolation Bypass Function software project.

Functional Arrangement

(1) HP CRD Isolation Bypass Function ICP functional arrangement is defined in Table 2.2.16-1.

Functional Requirements

(2) HP CRD Isolation Bypass Function ICP provides automatic functions, initiators, and associated interfacing systems as defined in Table 2.2.16-2.

(3) HP CRD Isolation Bypass Function ICP provides controls, interlocks, and bypasses as defined in Table 2.2.16-3.

(4) Divisional HP CRD Isolation Bypass Function ICP safety-related power supplies power the HP CRD Isolation Bypass Function ICP divisional loads.

(5) PIP power supplies power their respective HP CRD isolation bypass valves.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.2.16-4 defines the inspections, tests, and/or analyses, together with associated acceptance criteria for the HP CRD Isolation Bypass Function ICP.

Table 2.2.16-4

ITAAC For The HP CRD Isolation Bypass Function ICP

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. HP CRD Isolation Bypass Function ICP functional arrangement is defined in Table 2.2.16-1.	Inspection(s) will be performed on the as-built configuration as defined in Table 2.2.16-1.	Report(s) exist and conclude that the system conforms to the functional arrangement as defined in Table 2.2.16-1.
2. HP CRD Isolation Bypass Function ICP provides automatic functions, initiators, and associated interfacing systems as defined in Table 2.2.16-2.	Test(s) will be performed on the as-built HP CRD Isolation Bypass Function ICP using simulated signals and actuators for the automatic functions defined in Table 2.2.16-2.	Report(s) exist and conclude that the HP CRD Isolation Bypass Function ICP performs the automatic functions defined in Table 2.2.16-2.
3. HP CRD Isolation Bypass Function ICP provides controls, interlocks, and bypasses as defined in Table 2.2.16-3.	Test(s) will be performed on the as-built HP CRD Isolation Bypass Function ICP using simulated signals and actuators for the controls, interlocks, and bypasses defined in Table 2.2.16-3.	Report(s) exist and conclude that the system controls, interlocks and bypasses exist, can be retrieved in the main control room, and are performed in response to simulated signals.
4. Divisional HP CRD Isolation Bypass Function ICP safety-related power supplies power the HP CRD Isolation Bypass Function ICP divisional loads.	Test(s) will be performed on each as-built HP CRD Isolation Bypass Function ICP division 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 at the terminals of the respective divisional HP CRD Isolation Bypass Function loads.
5. PIP power supplies power their respective HP CRD isolation bypass valves.	Test(s) will be performed on the power supply to each as-built HP CRD isolation bypass valve by injecting a test signal.	Report(s) exist and conclude that the test signal exists only at the respective PIP power supply.