



HITACHI

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MFN 08-086, Supplement 10

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Subject: Response to Portion of NRC Request for Additional Information
Letter No. 126 Related to ESBWR Design Certification Application,
RAI Numbers 14.3-268, 14.3-302, 14.3-308, 14.3-328, 14.3-329,
14.3-330, 14.3-331, 14.3-332, 14.3-333, 14.3-375 and 14.3-376

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) sent by NRC letter dated December 20, 2007 (Reference 1). RAI Numbers 14.3-268, 14.3-302, 14.3-308, 14.3-328, 14.3-329, 14.3-330, 14.3-331, 14.3-332, 14.3-333, 14.3-375 and 14.3-376 are addressed in Enclosure 1.

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

Sincerely,

James C. Kinsey
Vice President, ESBWR Licensing

DO68
NRC

Reference:

1. MFN 07-718, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 126 Related To ESBWR Design Certification Application*, dated December 20, 2007

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application, DCD Tier 1, RAI Numbers 14.3-268, 14.3-302, 14.3-308, 14.3-328, 14.3-329, 14.3-330, 14.3-331, 14.3-332, 14.3-333, 14.3-375 and 14.3-376

cc:	AE Cabbage	USNRC (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	DH Hinds	GEH/Wilmington (with enclosure)
	eDRF	0000-0081-7094 NRC RAI 14.3-268
		0000-0081-0594 NRC RAI 14.3-302
		0000-0081-0595 NRC RAI 14.3-308
		0000-0081-7095 NRC RAI 14.3-328
		0000-0081-7096 NRC RAI 14.3-329
		0000-0081-7097 NRC RAI 14.3-330
		0000-0081-7098 NRC RAI 14.3-331
		0000-0081-7099 NRC RAI 14.3-332
		0000-0081-7100 NRC RAI 14.3-333
		0000-0081-7102 NRC RAI 14.3-375
		0000-0081-7104 NRC RAI 14.3-376

Enclosure 1

MFN 08-086, Supplement 10

***Response to Portion of NRC Request for**

Additional Information Letter No. 126

Related to ESBWR Design Certification Application

DCD Tier 1

RAI Numbers 14.3-268, 14.3-302, 14.3-308, 14.3-328, 14.3-329, 14.3-330, 14.3-331, 14.3-332, 14.3-333, 14.3-375, 14.3-376

***Pending DCD change(s) associated with this RAI response are shaded in gray. Other change(s) shown in the enclosed DCD markup(s) may not be reflective of the final format and content of DCD Revision 5 when submitted (i.e., those markups may include changes that are not fully developed and approved for inclusion in the DCD).**

NRC RAI 14.3-268

NRC Summary:

ITAAC for Main Control Room Panels

NRC Full Text:

1. Table 2.7.1-1 3a. Column 2 (Inspections, Tests, Analyses) specifies "checking for voltage in all divisions". Column 3 (Acceptance Criteria) refers to "test signal". Please clarify and confirm what is being checked for in Column 2 and what is being used for acceptance.

GEH Response

The intent of Table 2.7.1-1, ITAAC #3 is to ensure that proper electrical independence and separation exists within the MCR Panels. Electrical independence will be shown by providing a test signal in only one safety-related division at a time, then documenting that the test signal exists only in the division under test. Physical separation will be shown by inspection of the as-built system and report(s) documenting results of the inspection.

The ITA for ITAAC #3a will be revised to clarify that the test checks for only the presence of a test signal. The AC will remain as currently stated, that reports will document that a test signal exists only in the division under test.

DCD Impact

DCD Tier 1, Table 2.7.1-1, ITAAC #3 will be revised as shown in the attached markup.

Table 2.7.1-1

ITAAC For Main Control Room Panels

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3a) Independence is provided between safety-related divisions.	Tests will be performed on the as-built safety-related MCR Panels by providing a test signal in only one safety-related division at a time and checking for voltage <u>a test signal</u> in all divisions.	Test report(s) document that a test signal exists only in the as-built safety-related division under test in the MCR Panels.
b) Separation or electrical isolation is provided between safety-related divisions, and between safety-related divisions and nonsafety-related equipment.	Inspection of the as-built safety-related MRC Panels will be performed.	Inspection report(s) document that, for the as-built safety-related MCR Panels, physical separation or electrical isolation exists between safety -related divisions. Physical separation or electrical isolation exists between safety-related divisions and nonsafety-related equipment.
4. Human factors engineering principles are incorporated into the MCR Panel design	See Tier 1 Section 3.3.	See Tier 1 Section 3.3.

NRC RAI 14.3-302

NRC Summary:

DC, ITA, and AC consistency

NRC Full Text:

In ITAAC Table 2.1.2-3, ITAAC #8, the staff requests that the applicant specify in the ITA the signals that are provided in the DC and AC to test MSIV closure. In addition, the staff requests that the applicant specify:

1) that the closure signals are provided to the MSIV motor operators

2) whether the entire actuation circuit is tested or just the MSIV. If the entire actuation circuit is being verified by this ITAAC, the DC, ITA, and AC should be revised to reflect that scope of testing and verification.

GEH Response

ITAAC Table 2.1.2-3, Item 8, will be rewritten in simpler form so that DC, ITA and AC are consistent, and a comparable change will be made to the design description, bullet 8. The only purpose of this ITAAC is to demonstrate the nuclear boiler system (NBS) isolation valve functional capability to close on command. Only a single test stroke is required. The list of automatic isolation signals in this ITAAC item is not required for demonstrating the valve mechanical response function, so the DC, ITA and AC of the item are revised. It is noted, however, that the NBS design includes also isolation requirements for valves in the main steam drains subsystem piping and in the feedwater piping. The isolation capabilities of the main steam line drains line isolation valves are addressed under ITAAC 2.1.2-3, Item 10. The ESBWR includes new isolation function for the feedwater lines, and this will be added to Table 2.1.2-3, Item 8.

The MSIVs are not motor-operated valves, however, the command is transmitted to each valve's actuator control pilot(s). A close command signal will be input to each valve's control pilot(s) as part of ITAAC Item 8 of Table 2.1.2-3.

Alarms and displays are part of the control room human factors engineering, which is covered under Tier 1, Section 3.3 "Human Factors Engineering."

Individual instrumentation sensors, signal processing and logic control function ITAACs that involve NBS instruments which provide input signals for isolation are covered under Tier 1, Subsection 2.2.12 "Leak Detection and Isolation System." Therefore, the entire actuation circuit

is not tested under ITAAC 2.1.2-3, Item 8, rather the test of the sensors to the close signal transmitted to the valves is performed by the ITAAC per Table 2.2.12-4, Item 2.

DCD Impact

DCD Tier 1, Section 2.1.2, Item 8 and Table 2.1.2-3, Item 8, will be revised as noted in the attached markup.

- (8) ~~Instrumentation and Control~~ Isolation Capability
- a. ~~The MSIVs close upon command~~
 - b. ~~The FWIVs close upon command~~
 - ~~a.c. Control Room alarms, displays, and/or controls provided for the NBS System are defined in Table 2.1.2-2.~~
 - b. ~~The MSIVs close upon any of the following conditions:~~
 - ~~Main Condenser Vacuum Low (Run mode)~~
 - ~~Turbine Area Ambient Temperature High~~
 - ~~MSL Tunnel Ambient Temperature High~~
 - ~~MSL Flow Rate High~~
 - ~~Turbine Inlet Pressure Low~~
 - ~~Reactor Water Level Low~~
- (9) ~~Repositional~~ Repositionable valves (not including the DPVs (squib-actuated valves) or safety/relief valves) designated in Table 2.1.2-2 as having an active safety-related function open, close, or both open and also close under ~~design~~ differential pressure, fluid flow, and temperature conditions.
- (10) ~~The Each~~ pneumatically operated valve(s) in the Main Steam Line Drain Lines shown in Figure 2.1.2-2 closes (opens) (remains the same) if either electric power to the valve actuating solenoid is lost, or pneumatic pressure to the valve(s) is lost.
- (11) Check valves designated in Table 2.1.2-1 as having an active safety-related function open, close, or both open and also close under ~~design~~ system pressure, fluid flow, and temperature conditions.
- (12) The throat diameter of each MSL flow restrictor is sized for design choke flow requirements.
- (13) Each MSL flow restrictor has taps for two instrument connections to be used for monitoring the flow through ~~each its associated~~ MSL.
- (14) The combined steamline volume from the RPV to the main steam turbine stop valves and steam bypass valves is sufficient to meet the assumptions for AOOs and infrequent events.
- (15) The MSIVs are capable of fast closing under design differential pressure, fluid flow and temperature conditions.
- (16) When all four inboard or outboard MSIVs are stroked from a full-open to full-closed position by their actuators ~~closed by normal means~~, the combined leakage through the MSIVs for all four MSLs will be less than or equal to the design bases assumption value.
- (17) The opening pressure for the SRVs mechanical lift mode satisfies the overpressure protection analysis.

**Table 2.1.2-3
ITAAC For The Nuclear Boiler System**

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>8. <u>Instrumentation and Control Isolation Capability</u></p> <p>a) <u>The MSIVs close upon command</u></p> <p>b) <u>The FWIVs close upon command</u></p> <p>c) <u>Control Room alarms, displays, and/or controls provided for the NBS System are defined in Table 2.1.2-2.</u></p>	<p><u>Valve closure tests will be performed on the as-built MSIVs using a manual closure command to simulate an isolation signal. Inspections will be performed on the as-built Control Room alarms, displays, and/or controls for the NBS System.</u></p> <p><u>Valve closure tests will be performed on the as-built FWIVs using a manual closure command to simulate an isolation signal.</u></p> <p><u>Inspections, tests or analyses are performed as described in Section 3.3 and Table 3.3-1.</u></p>	<p><u>Report(s) document that MSIVs close upon command. Report(s) document that alarms, displays, and/or controls exist or can be retrieved in the Control Room as defined in Table 2.1.2-2.</u></p> <p><u>Report(s) document that the FWIVs close upon command</u></p> <p><u>Reports are as described by the acceptance criteria in Table 3.3-1.</u></p>

**Table 2.1.2-3
ITAAC For The Nuclear Boiler System**

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>b) The MSIVs close upon any of the following conditions:</p> <ul style="list-style-type: none"> Main Condenser Vacuum Low (Run mode) Turbine Area Ambient Temperature High MSL Tunnel Ambient Temperature High MSL Flow Rate High Turbine Inlet Pressure Low Reactor Water Level Low 	<p>Valve closure tests will be performed on the as-built MSIVs using simulated signals.</p>	<p>Report(s) document that the MSIVs close upon generation of any of the following simulated signals:</p> <ul style="list-style-type: none"> Main Condenser Vacuum Low (Run mode) Turbine Area Ambient Temperature High MSL Tunnel Ambient Temperature High MSL Flow Rate High Turbine Inlet Pressure Low Reactor Water Level Low
<p>9. Repositional <u>Repositionable</u> valves (not including DPVs (squib-activated valves) or safety/relief valves) designated in Table 2.1.2-2 as having an active safety-related function to open, close, or both open and also close under design differential pressure, fluid flow, and temperature conditions.</p>	<p>Tests of installed valves will be performed for opening, closing, or both opening and also closing under system preoperational differential pressure, fluid flow, and temperature conditions.</p>	<p>Report(s) document that, upon receipt of the actuating signal, each valve opens, closes, or both opens and also closes, depending upon the valve's safety function.</p>

NRC RAI 14.3-308

NRC Summary:

MSL flow restrictor instrument taps

NRC Full Text:

In ITAAC Table 2.1.2-3, for clarity in ITAAC #13, the staff requests that the applicant specify the general locations of the instrument taps (i.e., they can't be on the same side of the MSL if they're going to measure flow via delta P)

GEH Response

Each ESBWR main steam nozzle has two instrument taps that are positioned at an equal distance downstream of the throat of the integral steam nozzle venturi as the low-pressure side of the differential pressure flow measuring instruments. The two pressure sensing taps are located on opposite sides of the nozzle in the horizontal plane across the center of the steam line. The high-pressure side instrument taps are directly sensing the vessel steam dome pressure. This arrangement provides redundancy for the differential pressure –to – flow measurement function of the feedwater control system. The ITAAC Table 2.1.2-3, Item 13, is correctly written.

DCD Impact

No DCD changes will be made in response to this RAI.

NRC RAI 14.3-328

NRC Summary:

Physical separation

NRC Full Text:

In Table 2.13.1-2, the AC for ITAAC #3a does not provide clear criteria to evaluate whether the physical separation of the electrical components has been met. The staff requests that the applicant clearly specify the acceptance criteria (e.g., compliance with a specific IEEE standard) for physical separation of electrical components.

GEH Response

Physical separation of electrical components will be in accordance with Regulatory Guide 1.75. This commitment is consistent with DCD Tier 2 Chapter 8 and Table 1.9-21 of Chapter 1.

Tier 1 Table 2.13.1-2, ITAAC #3b for physical separation, the Acceptance Criteria will be revised to state that reports will document the physical separation of electrical components as required by Regulatory Guide 1.75.

DCD Impact

DCD Tier 1, Table 2.13.1-2 will be revised as shown in the attached markup.

Table 2.13.1-2
ITAAC For The Onsite AC Power System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>3a. Independence is provided between safety-related divisions.</p> <p>b. Separation is provided between safety-related divisions, and between safety-related divisions and nonsafety-related equipment.</p>	<p>Tests will be performed on the as-built safety-related 480 VAC Isolation Power Centers by providing a test signal in only one safety-related division at a time.</p> <p>Inspection of the as-built safety-related 480 VAC Isolation Power Centers will be performed.</p>	<p>Test report(s) document that a test signal exists only in the as-built safety-related division under test in the 480 VAC Isolation Power Center.</p> <p>Inspection report(s) document that, for the as-built safety-related 480 VAC Isolation Power Centers, physical separation and electrical isolation (as required by <u>Regulatory Guide 1.75</u>) exists between safety-related divisions. Physical separation and electrical isolation as (required by <u>Regulatory Guide 1.75</u>) exists between safety-related divisions and nonsafety-related equipment.</p>
<p>4. Each safety-related Isolation Power Center supplies power to safety-related loads of their respective division.</p>	<p>Tests will be performed using a test signal to confirm that an electrical path exists from the as-built safety-related Isolation Power Center to its divisional safety-related loads. Each test may be a single test or a series of over-lapping tests.</p>	<p>Test report(s) demonstrate that a test signal originating from the as-built divisional Isolation Power Center exists at the terminals of its divisional safety-related load.</p>

NRC RAI 14.3-329

NRC Summary:

Minimum set

NRC Full Text:

In Table 2.13.1-2, ITAAC #7, the definition of minimum set has not been clearly specified in the DC, ITA, and AC. The staff requests the applicant provide a definition for "minimum set" and specify the "applicable codes and standards" in the AC.

GEH Response

The ITAAC in question will be revised to change the language concerning "minimum set" to be consistent with the similar ITAACs in Section 2.2. In general, the revised ITAAC will correctly refer to Section 3.3, Human Factors Engineering, for the definition and specification of minimum inventory.

DCD Tier 1, Revision 5, will revise the DC to read, "The Onsite AC Power System minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3."

DCD Tier 1, Revision 5, will revise the ITA to read, "See Section 3.3."

DCD Tier 1, Revision 5, will revise the AC to read, "See Section 3.3."

DCD Impact

DCD Tier 1, Section 2.13.1, Item 7 and Table 2.13.1-2, Item 7 will be revised as shown in the attached markup.

2.13 ELECTRICAL SYSTEMS

2.13.1 Onsite AC Power System

Design Description

The purpose of the Onsite AC Power System is to provide power to the power generation (PG) nonsafety-related loads and the plant's investment protection (PIP) nonsafety-related loads. The PIP buses supply power to the four (4) safety-related, 480VAC, Isolation Power Center buses. The nonsafety-related PIP buses have a Regulatory Treatment of Non-Safety Systems (RTNSS) function to supply power to RTNSS credited loads.

- (1) The functional arrangement of Onsite AC Power System is as shown on Figure 2.13.1-1 and the component locations are shown in Table 2.13.1-1.
- (2) The safety-related 480 VAC Isolation Power Center equipment identified in Table 2.13.1-1 conforms to Seismic Category I requirements and is housed in Seismic Category I structures.
- (3)
 - a. Independence is provided between safety-related divisions.
 - b. Separation is provided between safety-related divisions, and between safety-related divisions and nonsafety-related equipment.
- (4) c. Each safety-related Isolation Power Center supplies power to safety-related loads in its respective division.
- (5) Isolation Power Centers and their associated loads are protected against undervoltage, degraded voltage and under-frequency conditions.
- (6) The Onsite AC Power System provides the following nonsafety-related functions:
 - a. The Onsite AC Power System provides the capability for distributing nonsafety-related AC power from onsite sources to nonsafety-related RTNSS loads.
 - b. The Onsite AC Power System provides a PIP bus undervoltage signal to trip the PIP bus normal and alternate preferred power supply breakers, and start the standby diesel generator.
 - c. The standby power supply breaker closes when the standby diesel generator is ready to load.
- (7) The minimum set of displays, alarms and controls, based on the applicable codes and standards, including HFE evaluations and emergency procedure guidelines, is available in the main control room. The onsite AC Power System minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3
- (8) Equipment qualification of safety-related 480 VAC Isolation Power Center equipment is addressed in DCD Tier 1 Section 3.8.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.13.1-2 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria for the Electrical Power Distribution System.

Table 2.13.1-2

ITAAC For The Onsite AC Power System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>7. The minimum set of displays, alarms and controls, based on the applicable codes and standards, including HFE evaluations and emergency procedure guidelines, is available in the main control room. The Onsite AC Power System minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3.</p>	<p>Inspection of the as-built main control room will verify that the minimum set of displays, alarms and controls for the Onsite AC Power System is available. See Section 3.3.</p>	<p>Inspection report(s) document that the minimum set of displays, alarms and controls for the Onsite AC Power System, as defined by the applicable codes and standards, including HFE evaluations and emergency operating procedures, exist in the as-built main control room. See Section 3.3.</p>
<p>8. Equipment qualification of safety-related 480 VAC Isolation Power Center equipment is addressed in DCD Tier 1 Section 3.8.</p>	<p>See Tier 1 Section 3.8.</p>	<p>See Tier 1 Section 3.8.</p>

NRC RAI 14.3-330

NRC Summary:

Minimum set

NRC Full Text:

In Table 2.13.3-3, ITAAC #10, the definition of minimum set has not been clearly specified in the DC, ITA, and AC. The staff requests the applicant provide a definition for "minimum set" and specify the "applicable codes and standards" in the AC.

GEH Response

The ITAAC in question will be revised to change the language concerning "minimum set" to be consistent with the similar ITAACs in Section 2.2. In general, the revised ITAAC will correctly refer to Section 3.3, Human Factors Engineering, for the definition and specification of minimum inventory.

DCD Tier 1, Revision 5, will revise the DC to read, "The Direct Current Power Supply minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3."

DCD Tier 1, Revision 5, will revise the ITA to read, "See Section 3.3."

DCD Tier 1, Revision 5, will revise the AC to read, "See Section 3.3."

DCD Impact

DCD Tier 1, Section 2.13.3, Item 10 and Table 2.13.3-3, Item 10 will be revised as shown in the attached markup.

2.13.3 Direct Current Power Supply

Design Description

Completely independent safety-related and nonsafety-related DC power systems are provided.

Nonsafety-related DC power systems are not part of the plant safety design basis, and are independent and separated from the safety-related DC power supplies.

The 250 V Safety-Related DC systems provide four divisions of power to operate safety-related loads for at least 72 hours following a design basis accident. The 250V Safety-Related DC systems are also adequately sized for the station blackout loads.

- (1) The functional arrangement of the 250V Safety-Related DC systems is as shown on Figure 2.13.3-1 and the component locations are shown in Table 2.13.3-1.
- (2) The functional arrangement of the 125 V and 250 V Nonsafety-Related DC systems is as shown on Figure 2.13.3-2.
- (3) Two 72-hour batteries in each division are sized to supply their design loads, at the end of installed life, for a minimum of 72 hours without recharging.
- ~~(3)~~(4) The 250V Safety-Related DC systems identified in Table 2.13.3-1 conform to Seismic Category I requirements and are housed in Seismic Category I structures.
- ~~(4)~~(5) The 250 V Safety-Related DC systems provide four independent and redundant safety-related divisions.
- ~~(5)~~(6) Separation is provided between safety-related divisions, and between safety-related divisions and nonsafety-related equipment.
- ~~(6)~~The two 250 VDC safety-related batteries in each division are each capable of supplying power to their safety-related loads for at least 72 hours following a design basis accident.
- (7) Each battery charger associated with each 250 VDC safety-related battery has sufficient capacity to meet the largest combined demands of the various continuous steady-state loads plus the charging capacity to restore the battery from the design minimum charge state to the fully charged state within the time stated in the design basis, consistent with the requirement given in IEEE 308.
- (8) The 250 V Safety-Related DC battery and battery charger circuit breakers, and DC distribution panels and their circuit breakers and fuses, are sized to supply their load requirements.
- (9) The output diodes for the battery chargers are designed to prevent their AC source from becoming a load on the 250 VDC safety-related batteries because of power feedback from loss of when the AC power source is de-energized or has degraded voltage.
- (10) The minimum set of displays, alarms and controls, based on the applicable codes and standards, including HFE evaluations and emergency procedure guidelines, is available in the main control room. [r595]-[r596] The Direct Current Power Supply minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3.

- (11) Equipment qualification of the 250 V Safety-Related DC systems is addressed in DCD Tier 1 Section 3.8.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.13.3-3 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria for the Direct Current Power Supply.

**Table 2.13.3-3
ITAAC For The Direct Current Power Supply**

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>9. The battery chargers are designed to prevent their AC source from becoming a load on the 250 VDC safety-related batteries <u>when the because of power feedback from loss of AC power source is de-energized or has degraded voltage</u></p>	<p>Testing of <u>the output diodes for each 250 VDC safety-related battery charger</u> will be performed to demonstrate that there is no power feedback from a loss of AC input power.</p>	<p>Test report(s) document that <u>the output diodes for the 250 VDC safety-related battery chargers</u> prevents the AC input source from becoming a load on the 250 VDC safety-related batteries during a loss of AC power condition.</p>
<p>10. <u>The Direct Current Power Supply minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3. The minimum set of displays, alarms and controls, based on the applicable codes and standards, including HFE evaluations and emergency procedure guidelines, is available in the main control room.</u></p>	<p><u>Inspection of the as-built main control room will verify that the minimum set of displays, alarms and controls for the 250 V Safety-Related DC systems are available. See Section 3.3.</u></p>	<p><u>Inspection report(s) document that the minimum set of displays, alarms and controls for the 250 V Safety-Related DC systems, as defined by the applicable codes and standards, including HFE evaluations and emergency operating procedures, exist in the as-built main control room. See Section 3.3.</u></p>
<p>11. Equipment qualification of the 250 V Safety-Related DC System is addressed in DCD Tier 1 Section 3.8.</p>	<p>See Tier 1 Section 3.8.</p>	<p>See Tier 1 Section 3.8.</p>

NRC RAI 14.3-331

NRC Summary:

Minimum set

NRC Full Text:

In Table 2.13.4-2, ITAAC #3, the definition of minimum set has not been clearly specified in the DC, ITA, and AC. The staff requests the applicant provide a definition for "minimum set" and specify the "applicable codes and standards" in the AC.

GEH Response

The ITAAC in question will be revised to change the language concerning "minimum set" to be consistent with the similar ITAACs in Section 2.2. In general, the revised ITAAC will correctly refer to Section 3.3, Human Factors Engineering, for the definition and specification of minimum inventory.

DCD Tier 1, Revision 5, will revise the DC to read, "The Standby Onsite Power Supply minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3."

DCD Tier 1, Revision 5, will revise the ITA to read, "See Section 3.3."

DCD Tier 1, Revision 5, will revise the AC to read, "See Section 3.3."

DCD Impact

DCD Tier 1, Section 2.13.4, Item 3 and Table 2.13.4-2, Item 3 will be revised as shown in the attached markup.

2.13.4 Standby On Site Power Supply

Design Description

Two independent nonsafety-related standby AC diesel generators, including their support systems, provide separate sources of on-site power for the nonsafety-related Plant Investment Protection (PIP) load groups when the normal and alternate preferred 6.9kV power supplies are not available. The nonsafety-related standby diesel generators have a Regulatory Treatment of Non-Safety Systems (RTNSS) function to provide power to the PIP buses that supply RTNSS credited loads.

- (1) The functional arrangement of Standby On Site Power System is as described in the Design Description of this Section 2.13.4 and the component locations are shown in Table 2.13.4-1.
- (2) The Standby On Site Power Supply System provides the following nonsafety-related functions:
 - a. Upon receipt of an undervoltage signal from the On Site AC Power System, the standby diesel generator starts, achieves rated speed and voltage, and produces a ready to load signal.
 - b. Each standby diesel generator is sized to accommodate its expected loads.
 - c. Each standby diesel generator fuel oil storage tank contains adequate fuel oil capacity for 7 days of standby diesel generator operation.
 - d. Each of the standby diesel generator fuel oil transfer pumps (two pumps per engine) start automatically and transfer fuel oil from the fuel oil storage tank to the standby diesel generator day tank at a rate greater than or equal to the usage rate of the standby diesel generator.
 - e. Each of the standby diesel generator starting air receivers (two receivers per engine) is capable of three engine start attempts.
 - f. The jacket cooling water system controls the flow of water to maintain required water temperature.
 - g. Instrumentation is provided to monitor lube oil temperature, pressure and sump level, ensuring proper operation of the system.
 - h. Each DG is provided with a separate intake and exhaust system.
- (3) The minimum set of displays, alarms and controls, based on the applicable codes and standards, including HFE evaluations emergency procedure guidelines, is available in the main control room. [607] The Standby Onsite Power Supply minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.13.4-2 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria for the Standby On Site Power Supply System.

**Table 2.13.4-2
ITAAC For The Standby On Site Power Supply**

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>3. The Standby Onsite Power Supply minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3. The minimum set of displays, alarms and controls, based on the applicable codes and standard, including HFE evaluations and emergency procedure guidelines, is available in the main control room.</p>	<p>Inspection of the as-built main control room will verify that the minimum set of displays, alarms and controls for the Standby Onsite Power Supply system is available. See Section 3.3.</p>	<p>Inspection report(s) document that the minimum set of displays, alarms and controls for the Standby Onsite Power Supply system, as defined by the applicable codes and standards, including HFE evaluations and emergency operating procedure guidelines, exists in the as-built main control room. See Section 3.3.</p>

NRC RAI 14.3-332

NRC Summary:

Minimum set

NRC Full Text:

In Table 2.13.5-2, ITAAC #7, the definition of minimum set has not been clearly specified in the DC, ITA, and AC. The staff requests the applicant provide a definition for "minimum set" and specify the "applicable codes and standards" in the AC.

GEH Response

The ITAAC in question will be revised to change the language concerning "minimum set" to be consistent with the similar ITAACs in Section 2.2. In general, the revised ITAAC will correctly refer to Section 3.3, Human Factors Engineering, for the definition and specification of minimum inventory.

DCD Tier 1, Revision 5, will revise the DC to read, "The Uninterruptible AC Power Supply minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3."

DCD Tier 1, Revision 5, will revise the ITA to read, "See Section 3.3."

DCD Tier 1, Revision 5, will revise the AC to read, "See Section 3.3."

DCD Impact

DCD Tier 1, Section 2.13.5, Item 7 and Table 2.13.5-2, Item 7 will be revised as shown in the attached markup.

2.13.5 Uninterruptible AC Power Supply

Design Description

The Uninterruptible AC Power Supply (UPS) is divided into two subsystems, the safety-related UPS and the nonsafety-related UPS.

The nonsafety-related UPS system and the nonsafety-related Technical Support Center UPS system are not part of the plant safety design basis, and are independent and separated from the safety-related UPS system.

The safety-related UPS system provides four divisions of 120 VAC power to safety-related loads during normal, upset and accident conditions.

- (1) The functional arrangement of the safety-related UPS system is as shown on Figure 2.13.5-1 and the component locations are shown in Table 2.13.5-1.
- (2) The functional arrangement of the nonsafety-related UPS system is as shown on Figure 2.13.5-2, and as described in Section 2.13.5.
- (3) The safety-related UPS system equipment identified in Table 2.13.5-1 conforms to Seismic Category I requirements and is housed in Seismic Category I structures.
- (4) The safety-related UPS system provides four independent and redundant safety-related divisions.
- (5) Separation is provided between safety-related divisions, and between safety-related divisions and nonsafety-related equipment.
- (6) Each safety-related UPS inverter is capable of supplying its ac load.
- (7) The minimum set of displays, alarms and controls, based on the applicable codes and standards, including HFE evaluations and emergency procedure guidelines, is available in the main control room. [614] The Uninterruptible AC Power Supply minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3.
- (8) Equipment qualification of the safety-related UPS system is addressed in DCD Tier 1 Section 3.8.
- (9) The output diodes for the safety-related AC power rectifiers are designed to prevent their AC source from becoming a load on the 250 VDC safety-related batteries when the AC power source is de-energized or has degraded voltage.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.13.5-2 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria for the Uninterruptible AC Power Supply.

Table 2.13.5-2

ITAAC For The Uninterruptible AC Power Supply

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
<p>5. Separation is provided between safety-related divisions, and between safety-related divisions and nonsafety-related equipment.</p>	<p>Inspection of the as-built safety-related UPS system will be performed.</p>	<p>Inspection report(s) document that, in the as-built safety-related UPS system, physical separation or electrical isolation exists between safety-related divisions. Physical separation or electrical isolation exists between safety-related divisions and nonsafety-related equipment.</p>
<p>6. Each safety-related UPS inverter is capable of supplying its ac load.</p>	<p>Testing of each as-built safety-related UPS inverter will be performed by applying a combination of simulated and/or real loads. The inverter input voltage at the inverter input terminals will be no more than 210 VDC during the test.</p>	<p>Test report(s) demonstrate that the as-built safety-related UPS inverter supplies its rated voltage at its rated frequency.</p>
<p>7. The Uninterruptible AC Power Supply minimum inventory of alarms, displays, controls, and status indications in the main control room are addressed in Section 3.3. The minimum set of displays, alarms and controls, based on the applicable codes and standards, including HFE evaluations and emergency procedure guidelines, is available in the main control room.</p>	<p>Inspection of the as-built main control room will verify that the minimum set of displays, alarms and controls for the safety-related UPS system are available. See Section 3.3.</p>	<p>Inspection report(s) document that the minimum set of displays, alarms and controls for the safety-related UPS system, as defined by the applicable codes and standards, including HFE evaluations and emergency operating procedures, exist in the as-built main control room. See Section 3.3.</p>
<p>8. Equipment qualification of the safety-related UPS system is addressed in DCD Tier 1 Section 3.8.</p>	<p>See Tier 1 Section 3.8.</p>	<p>See Tier 1 Section 3.8.</p>

NRC RAI 14.3-333

NRC Summary:

MCR Emergency Lighting

NRC Full Text:

In Table 2.13.8-1, for clarity, the staff requests that the ITA for ITAAC #2 include inspection of as-built lighting system.

GEH Response

Table 2.13.8-1, ITAAC #2, will be revised as requested.

DCD Tier 1, Revision 5, will revise the ITA to read, "Analysis of the Control Room Emergency Lighting System mountings and inspection of the as-built system will be performed."

DCD Tier 1, Revision 5, will revise the AC to read, "Analysis and inspection report(s) exist and document that the Control Room Emergency Lighting System mountings meet Seismic Category I requirements."

DCD Impact

DCD Tier 1, Table 2.13.8-1, ITAAC #2 will be revised as shown in the attached markup.

Table 2.13.8-1

ITAAC For The Lighting Power Supply

Design Commitments	Inspections, Tests, Analyses	Acceptance Criteria
<p>1. The functional arrangement of Control Room Emergency Lighting System is as described in the Design Description of this Section 2.13.8.</p>	<p>Inspections of the as-built system will be conducted.</p>	<p>Inspection report(s) document that the as-built Control Room Emergency Lighting System conforms with the functional arrangement as described in the Design Description of this Section 2.13.8.</p>
<p>2. The Control Room Emergency Lighting System meets Seismic Category I requirements for mountings.</p>	<p>Analysis of the Control Room Emergency Lighting System mountings <u>and inspection of the as-built system</u> will be performed.</p>	<p>Analysis <u>and inspection</u> report(s) exist and document that the Control Room Emergency Lighting System mountings meet Seismic Category I requirements..</p>
<p>3. The Control Room Emergency Lighting System is electrically independent and physically separated. Cables are routed in the respective divisional raceways.</p>	<p>Inspection of the as-built Control Room Emergency Lighting System will be performed.</p>	<p>Inspection report(s) document that the as-built Control Room Emergency Lighting System equipment and cables are electrically independent and physically separated between safety divisions and between safety-related divisions and nonsafety-related equipment.</p>
<p>4. The Control Room Emergency Lighting system provides illumination levels in the main control room equal to or greater than those recommended by the IESNA for at least 72 hours following a design basis accident and a loss of all AC power sources.</p>	<p>Testing of the as-built Control Room Emergency Lighting System in the main control room will be performed.</p>	<p>Test report(s) demonstrate that the as-built Control Room Emergency Lighting System provides the illumination required by the IESNA at the main control room control stations for at least 72 hours.</p>

NRC RAI 14.3-375

NRC Summary:

DC power supply functional arrangement

NRC Full Text:

For ITAAC Table 2.13.3-3 Item 1, the staff requests that the applicant modify the AC to be consistent with the DC either by adding conformance to Table 2.13.3-1 in the AC or revising Table 2.1.13-1 to Section 2.13.3 in the DC (staff prefers the former).

GEH Response

For ITAAC Table 2.13.3-3 Item 1, GEH will modify the Acceptance Criteria to be consistent with the Design Commitment by adding conformance to Table 2.13.3-1 in the Acceptance Criteria.

DCD Impact

DCD Tier 1, Table 2.13.3-3, Item 1 will be revised as noted in the attached markup.

Table 2.13.3-3

ITAAC For The Direct Current Power Supply

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The functional arrangement of the 250V Safety-Related DC systems is as shown on Figure 2.13.3-1 and the component locations are shown in Table 2.13.3-1.	Inspections of the as-built 250 V Safety-Related DC systems will be performed.	Inspection report(s) document that the as-built 250 V Safety-Related DC systems conform with the functional arrangement as shown in Figure 2.13.3-1 and as described in section 2.13.3 <u>and component locations are as shown in Table 2.13.3-1.</u>
2. The functional arrangement of the 125 V and 250V Nonsafety-Related DC systems is as shown on Figure 2.13.3-2 and as described in section 2.13.3.	Inspections of the as-built 125 V and 250 V Nonsafety-Related DC systems will be performed.	Inspection report(s) document that the as-built 125 V and 250 V Nonsafety-Related DC systems conform with the functional arrangement as shown in Figure 2.13.3-2 and as described in section 2.13.3

NRC RAI 14.3-376

NRC Summary:

DC power supply capacity

NRC Full Text:

For ITAAC Table 2.13.3-3 Item 6, the staff requests that the applicant modify the AC to be consistent with the DC by specifically including in the test report a confirmation that the two safety-related 250 VDC batteries in each division are capable of supplying safety-related loads for 72 hours following a design basis accident.

GEH Response

The GEH response to RAI 8.3-52 S03 committed to restore Revision 4 ITAAC Table 2.13.3-3 Item 6 to the Revision 3 wording and numbering of Item 3. This commitment was to maintain continuity with previous RAI responses and the Staff's drafted SER.

The restored ITAAC Item 3 includes a statement that reports confirm that the two batteries in each division are capable of supplying their loads for 72 hours without recharging.

The RAI 8.3-52 S03 response is provided in MFN 07-165, Supplement 2, dated December 11, 2007.

DCD Impact

No DCD Tier 1 change will be made in response to this RAI.