GE Hitachi Nuclear Energy

Richard E. Kingston
Vice President, ESBWR Licensing

PO Box 780 M/C A-65
Wilmington, NC 28402-0780
USA

T 910 819 6192
F 910 362 6192
rick.kingston@ge.com

HITACHI

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Subject: **Transmittal of ESBWR DCD Markups to Tier 1 Related to NRC ITAAC Prioritization Protocal Comments**

Enclosure 1 contains additional supplemental markups of DCD Tier 1 in response to the NRC suggestion for GEH to review Tier 1 for similar comments to those stemming from the NRC's ITAAC prioritization review. These additional changes are summarized below.

Affected Section	Description of Change
Table 2.1.2-3, 2b3	Changed table referenced by ITA and AC to be consistent with table referenced in Design Commitment.
Section 2.2.15, 8b	Deleted first bullet to align with the as-built Design Commitment and ITAAC of Table 2.2.15-2 Item 8b.
Section 2.2.15, 11b7	Clarified 3rd and 5th bullets of Design Description.
Section 2.2.15, 23a, 23b, 24a, 24b	Clarified and made design description titles consistent for Electrical and Non-electrical Power Source Requirements.
Table 2.2.15-2, 11b7	Clarified 3rd and 5th bullets in Design Commitment and ITAAC.
Table 2.2.15-2, 23a, 23b, 24a, 24b	Clarified Design Commitment title for Electrical and Non-electrical Power Source Requirements and aligned them with the Design Description.

DO68
NRO

Affected Section	Description of Change
Table 2.6.1-2	Changed ITAAC table references to be consistent with the table referenced in the Design Commitment.
Section 2.11.6, 1st Para.	Changed "AOO" to "Abnormal Events" to match the wording in Design Description Items 4, 5, and 7.
Table 2.11.6-1, 7	Changed "AOO" in Design Commitment and ITA to "Abnormal Event" to match Design Description Item 7.
Table 2.13.3-3, 1	Changed table referenced by Design Commitment to be consistent with table referenced in Design Description and AC.
Table 2.13.5-2, 1	Added a reference to Table 2.13.5-1 to AC in order to be consistent with Design Commitment.
Table 2.15.4-2, 2b3	Changed ITAAC table references to be consistent with the table referenced in the Design Commitment.

If you have any questions about the information provided, please contact me.

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

Enclosure:

1. Transmittal of ESBWR DCD Markups to Tier 1 Related to NRC ITAAC Prioritization Protocol Comments - DCD Markups

cc:	AE Cubbage	USNRC (with enclosures)
	JG Head	GEH/Wilmington (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	LF Dougherty	GEH/Wilmington (with enclosures)
	eDRF Section	0000-0123-8679 Rev 2

Enclosure 1

MFN 10-280 Supplement 2

Transmittal of ESBWR DCD Markups to Tier 1 Related to NRC ITAAC Prioritization Protocal Comments

DCD Markups

Table 2.1.2-3

ITAAC For The Nuclear Boiler System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
2b2. The as-built piping identified in Table 2.1.2-1 as ASME Code Section III shall be reconciled with the piping design requirements.	A reconciliation analysis of the piping identified in Table 2.1.2-1 as ASME Code Section III using as-designed and as-built information and ASME Code Design Reports (NCA-3550) will be performed	ASME Code Design Report(s) (NCA-3550) (certified, when required by ASME Code) exist and conclude that design reconciliation has been completed, in accordance with ASME Code, for as-built reconciliation of the piping identified in Table 2.1.2-1 as ASME Code Section III. The report documents the results of the reconciliation analysis.
2b3. The piping identified in Table 2.1.2-1 as ASME Code Section III is fabricated, installed, and inspected in accordance with ASME Code Section III requirements.	Inspections of the piping identified in Table 2.41.2-1 as ASME Code Section III will be conducted.	ASME Code Data Report(s) (certified, when required by ASME Code) and inspection reports (including N-5 Data Reports where applicable) exist and ~~conclude that the piping identified in~~ Table 2.41.2-1 as ASME Code Section III ~~is fabricated, installed, and inspected in~~ accordance with ASME Code Section III requirements.
3a. Pressure boundary welds in components identified in Table 2.1.2-1 as ASME Code Section III meet ASME Code Section III non-destructive examination requirements.	Inspection of the as-built pressure boundary welds in components identified in Table 2.1.2-1 as ASME Code Section III will be performed in accordance with ASME Code Section III.	ASME Code report(s) exist and conclude that ASME Code Section III requirements are met for non-destructive examination of pressure boundary welds in components identified in Table 2.1.2-1 as ASME Code Section III.

5a. Criterion 4.7, Range of transient and steady-state conditions: The software project's design bases list the range of transient and steady-state conditions of motive and control power and the environment (e.g., voltage, frequency, radiation, temperature, humidity, pressure, and vibration) during normal, abnormal, and accident circumstances throughout which the safety-related system is to perform.

5b. Criterion 4.7, Range of transient and steady-state conditions: The as-built software project's design bases reconcile any changes to the list of the range of transient and steady-state conditions of motive and control power and the environment (e.g., voltage, frequency, radiation, temperature, humidity, pressure, and vibration) during normal, abnormal, and accident circumstances throughout which the safety-related system is to perform.

6a. Criterion 4.8, Identification of conditions having the potential for causing functional degradation of safety-related system's performance: The software project's design bases list the conditions having the potential to cause functional degradation of safety-related system performance.

6b. Criterion 4.8, Identification of conditions having the potential for causing functional degradation of safety-related system's performance: The as-built software project's design bases reconcile any changes to the list of the conditions having the potential to cause functional degradation of safety-related system performance.

7a. Criterion 4.9, Identification of the methods used to determine reliability of the safety system design: The software project's design bases list the methods and any qualitative and quantitative reliability goals used to assess the reliability of the safety-related system design.

7b. Criterion 4.9, Identification of the methods used to determine reliability of the safety system design: The as-built software project's design bases reconcile any changes to the list: of the methods and any qualitative and quantitative reliability goals used to assess the reliability of the safety-related system design.

8a. Criterion 4.10, The critical points in time or the plant conditions, after the onset of a design basis event: The software project's design bases ensures that;

- A plant process control timing budget (end-to-end sense, command, and execute loop including the associated DCIS digital components response times) exists; and
- The plant process control timing budget completes its protective action in less than the specified maximum time allowable.

8b. Criterion 4.10, The critical points in time or the plant conditions, after the onset of a design basis event: The as-built software project ensures that;

- The plant process control timing budget completes its protective action in less than the specified maximum time allowable.

~~8a~~9a. Criterion 5.1, Single-failure criterion: The software project's design bases show compliance with the single-failure criterion.

- Data communications use dedicated communication interface modules and shared reflective memory (scramnet) to communicate between the RMU, digital trip module, trip logic unit, and nonsafety-related components;
- Data links use dedicated nonsafety-related communication interface modules (safety-related components) at the receiving end; and
- Data links use optical fibers.

11b7.Criteria 5.6, Independence and 6.3, Interactions Between the Sense and Command Features and Other Systems: The as-built SSLC/ESF software project's intra-divisional input/output data communications have the following features;

- Sensor inputs at the RMUs are measured with triple redundancy;
- Sensor inputs and outputs sent to and from the RMUs are on a dedicated triply redundant communication backplane bus to triply redundant controller application processors;
- Sensor inputs from the RMUs are sent via data links using triply redundant optical fibers;
- Actuator outputs from the RMUs are determined using commands from the triply redundant controller application processors; and
- Actuator commands are sent via data links using triply redundant optical fibers.

11.b8.Criteria 5.6, Independence and 6.3, Interactions Between the Sense and Command Features and Other Systems: The as-built SSLC/ESF software project's intra-divisional VDU data communications have the following features;

- Data inputs/outputs are to and from the SSLC/ESF platform
- Data inputs are only from RTIF-NMS platform;
- Data inputs/outputs to and from the safety-related VDUs are via dual, redundant networks;
- Data links have dedicated communication interface modules;
- Data links use optical fibers;
- Message authentication resides in the receiving division only; and
- Message authentication includes transmitter and receiver identification, sequence number, hash functions, and cyclic redundancy checks.

11b9. Criteria 5.6, Independence and 6.3, Interactions Between the Sense and Command Features and Other Systems: The as-built SSLC/ESF software project's inter-divisional data communications within safety-related systems have the following features;

- Data links supporting two-out-of-four voting logic are via dual, redundant networks;
- Data links have dedicated communication interface modules;
- Data links use optical fibers;

2~~0~~1b1. Criteria 6.7, 7.5, and 8.3, Maintenance Bypasses: The as-built software project~~s~~ ensures that ~~they~~it ~~are~~is capable of performing ~~their~~its safety-related functions, when one division is in maintenance bypass.

2~~0~~1b2. Criteria 6.7, 7.5, and 8.3, Maintenance Bypasses: The as-built software project~~s~~ ensures that it~~they~~ is~~are~~ capable of performing ~~their~~its safety-related functions, when one power supply division is in maintenance bypass.

2~~1~~2a. Criterion 6.8, Setpoint: The software project's setpoints for safety-related functions are determined by a defined setpoint methodology.

2~~1~~2b. Criterion 6.8, Setpoint: Any changes to the setpoints have been reconciled for the as-built software project.

2~~2~~3a. Criterion 8.1, Electrical Power Source Requirements: The software project's design bases ensures that electrical components receive power from their respective, divisional, safety-related power supplies.

2~~2~~3b. Criterion 8.1, Electrical Power Source Requirements: The as-built software project's as-built electrical components receive power from their respective, divisional, safety-related power supplies.

2~~3~~4a. Criterion 8.2, Non-electrical Power Source~~s~~ Requirements: The software project's design bases ensures that actuators receive non-electric power from safety-related sources.

2~~3~~4b. Criterion 8.2, Non-electrical Power Source~~s~~ Requirements: The as-built software project's actuators receive non-electric power from safety-related sources.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.2.15-2 defines the inspections, tests, and analyses, together with acceptance criteria for the software projects.

Subsections 2.1.2, 2.2.2, 2.2.4, 2.2.5, 2.2.7, 2.2.10, 2.2.12, 2.2.13, 2.2.14, 2.2.16, 2.3.1, 2.4.1, 2.4.2, 2.15.1, and 2.15.7, 2.16.2.2, 2.16.2.3 define the inspections, tests, and analyses, together with associated acceptance criteria for the sensors, actuators, functional arrangement, functional performance, controls, interlocks, and bypasses associated with the software projects.

Table 2.2.15-2

ITAAC For IEEE Std. 603 Compliance Confirmation

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11b7. Criteria 5.6, Independence and 6.3, Interactions Between the Sense and Command Features and Other Systems: The as-built SSLC/ESF software project's intra-divisional input/output data communications have the following features; • Sensor inputs at the RMUs are measured with triple redundancy; • Sensor inputs and outputs sent to and from the RMUs are on a dedicated triply redundant communication backplane bus to triply redundant controller application processors; • Sensor inputs from the RMUs are sent via data links using triply redundant optical fibers; • Actuator outputs from the RMUs are determined using commands from the triply redundant controller application processors; and • Actuator commands are sent via data links using triply redundant optical fibers.	Inspection of the as-built software project will verify that the intra-divisional input/output data communications design have the following features; • Sensor inputs at the RMUs are measured with triple redundancy; • Sensor inputs and outputs sent to and from the RMUs are on a dedicated triply redundant communication backplane bus to triply redundant controller application processors; • Sensor inputs from the RMUs are sent via data links using triply redundant optical fibers • Actuator outputs from the RMUs are determined using commands from the triply redundant controller application processors; and • Actuator commands are sent via data links using triply redundant optical fibers.	The intra-divisional input/output data communications have the following features; • Sensor inputs at the RMUs are measured with triple redundancy; • Sensor inputs and outputs sent to and from the RMUs are on a dedicated triply redundant communication backplane bus to triply redundant controller application processors; • Sensor inputs from the RMUs are sent via data links using triply redundant optical fibers • Actuator outputs from the RMUs are determined using commands from the triply redundant controller application processors; and • Actuator commands are sent via data links using triply redundant optical fibers.

Table 2.2.15-2

ITAAC For IEEE Std. 603 Compliance Confirmation

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
212b. Criterion 6.8, Setpoint: Any changes to the setpoints have been reconciled for the as-built software projects.	Inspection of the installation phase summary BRR setpoint analyses for the as-built software projects will be performed to verify that the setpoints for safety-related functions are defined, determined and implemented based on a defined setpoint methodology and to ensure that changes have been reconciled.	The installation phase summary BRR setpoints for safety-related functions for the as-built software projects were are defined, determined and implemented using a defined setpoint methodology and changes have been reconciled.
223a. Criterion 8.1, Electrical Power sSource rRequirements: The software project's design bases ensures that electrical components receive power from their respective, divisional, safety-related power supplies.	Inspection of the software project's design phase summary BRR will be performed to ensure that the software project's electrical components receive power from their respective, divisional, safety-related power supplies. {{Design Acceptance Criteria}}	The software project's design phase summary BRR reference design documents that show that the software project's electrical components receive power from their respective, divisional, safety-related power supplies. {{Design Acceptance Criteria}}
232b. Criterion 8.1, Electrical Power sSource rRequirements: The as-built software project's as-built electrical components receive power from their respective, divisional, safety-related power supplies.	Tests will be performed on the as-builtto show that the as-built software project's as-built electrical components by providing test signals in only one safety-related division at a time to verify that the components receive power from their respective, divisional, safety-related power supplies. The test signal will be injected in only one safety related division at a time.	The as-built software project' installation phase summary BRR confirm that the Tests show that as-built software project's as-built electrical components received test signals from a safety-related source in the same division, which verifies that the components receive power from their respective, divisional, safety-related power supplies.

Table 2.2.15-2

ITAAC For IEEE Std. 603 Compliance Confirmation

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
243a. Criterion 8.2, Non-electrical Power Sources Requirements: The software project's design bases ensure that actuators receive non-electric power from safety-related sources.	Inspection of the software project's design phase summary BRR will be performed to ensure that safety-related systems and components that require non-electric power receive it from safety-related sources. {{Design Acceptance Criteria}}	The software project's design phase summary BRR show that safety-related systems and components that require non-electric power receive it from safety-related sources. {{Design Acceptance Criteria}}
234b. Criterion 8.2, Non-electrical Power Sources Requirements: The as-built software project's actuators receive non-electric power from safety-related sources.	Inspection of the as-built software project's installation phase summary BRR will be performed to confirm that tTests will be have been performed on the as-built software project's as-built mechanical installation of the as-built software project's actuators to show that non-electric power is received from safety-related sources.	The as-built software project' installation phase summary BRR confirm that the Tests show that as-built software project's actuators receive non-electric power from safety-related sources.

Table 2.6.1-2

ITAAC For The Reactor Water Cleanup/Shutdown Cooling System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8b2. The as-built piping identified in Table 2.6.1-1 as ASME Code Section III shall be reconciled with the piping design requirements.	A reconciliation analysis of the piping identified in Table 2.6.1-1 as ASME Code Section III using as-designed and as-built information and ASME Code Design Reports (NCA-3550) will be performed.	ASME Code Design Report(s) (NCA-3550) (certified, when required by ASME Code) exist and conclude that design reconciliation has been completed, in accordance with ASME Code, for as-built reconciliation of the piping identified in Table 2.6.1-1 as ASME Code Section III. The report documents the results of the reconciliation analysis.
8b3. The piping identified in Table 2.6.1-1 as ASME Code Section III is fabricated, installed, and inspected in accordance with ASME Code Section III requirements.	Inspections of the piping identified in Table 2.~~4~~6.~~2~~1-1 as ASME Code Section III will be conducted.	ASME Code Data Report(s) (certified, when required by ASME Code) and inspection reports (including N-5 Data Reports where applicable) exist and ~~conclude that the piping~~ identified in Table 2.~~4~~6.~~2~~1-1 as ASME Code Section III is fabricated, installed, and inspected in accordance with ASME Code Section III requirements.
9a. Pressure boundary welds in components identified in Table 2.6.1-1 as ASME Code Section III meet ASME Code Section III non-destructive examination requirements.	Inspection of the as-built pressure boundary welds in components identified in Table 2.6.1-1 as ASME Code Section III will be performed in accordance with ASME Code Section III.	ASME Code report(s) exist and conclude that ASME Code Section III requirements are met for non-destructive examination of pressure boundary welds in components identified in Table 2.6.1-1 as ASME Code Section III.

2.11.6 Turbine Bypass System

Design Description

The Turbine Bypass System (TBS) consists of hydraulically operated Turbine Bypass Valves (TBVs) that are connected to the main steam header via Turbine Main Stream System (TMSS) piping. The TBS also includes the piping down stream of the TBVs to the main condenser. The TBS passes steam to the main condenser in conjunction with the TMSS under the control of the Steam Bypass and Pressure Control (SB&PC) system. The TBS is classified as nonsafety-related. The TBS is used to mitigate A~~OOs~~bnormal Events. The TBS is located in the Turbine Building.

(1) The TBS functional arrangement is as described in Subsection 2.11.6.

(2) The TBVs are controlled by the SB&PC System.

(3) The TBS steam pressure retaining and structural components are analyzed to demonstrate structural integrity under SSE loading conditions.

(4) The TBS accommodates steam flow to mitigate Abnormal Events.

(5) The TBS maintains sufficient capacity to mitigate Abnormal Events with a single active failure.

(6) The TBS design limits the capacity of individual TBVs.

(7) The TBS design allows the TBVs to open rapidly to support Abnormal Event mitigation.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.11.6-1 provides a definition of the inspections, tests, and analyses, together with associated acceptance criteria for the TBS.

Table 2.11.6-1

ITAAC For The Turbine Bypass System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. The TBS design allows the TBVs to open rapidly to support A~~OO~~bnormal Event mitigation.	Testing or analyses of the TBS will be performed to confirm that the as-built TBS design allows the TBVs to open rapidly to support A~~OO~~bnormal Event mitigation.	The TBS can achieve a flow greater than or equal to 80% of total bypass capacity in a time period less than or equal to 0.17 seconds after initiation of TBV fast opening function for AOO mitigation.

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 250 V safety-related DC systems is as ~~described in Subsection 2.13.3~~ Design Description and Table 2.13.3-1 and as shown on Figure 2.13.3-1.	Inspections of the as-built 250 V safety-related DC systems will be performed.	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 Subsection 2.13.3 and component locations are as shown in Table 2.13.3-1.
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 Subsection 2.13.3.	Inspections of the as-built 125 V and 250 V nonsafety-related DC systems will be performed.	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 Subsection 2.13.3
3. Two 250V safety-related batteries in each division are together sized to supply their design loads, at the end of installed life, for a minimum of 72 hours without recharging.	i. Analyses for the as-built safety-related batteries to determine battery capacities will be performed based on the design duty cycle for each battery. ii. Tests of each as-built safety-related battery will be conducted by simulating loads which envelope the analyzed battery design duty cycle.	i. The as-built batteries in each division together have the capacity, as determined by the vendor performance specification, to supply their rated constant current for a minimum of 72 hours without recharging. ii. The capacity of each as-built safety-related battery equals or exceeds the analyzed battery design duty cycle capacity.

Table 2.13.5-2

ITAAC For The Uninterruptible AC Power Supply

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The functional arrangement of the safety-related UPS system is as described in Subsection 2.13.5 and Table 2.13.5-1 and is as shown on Figure 2.13.5-1.	Inspections of the as-built safety-related UPS system will be performed.	The as-built safety-related UPS system conforms with the functional arrangement as described in Subsection 2.13.5 and Table 2.13.5-1 and as shown in Figure 2.13.5-1.
2. The functional arrangement of the nonsafety-related UPS system is as described in Subsection 2.13.5 and as shown on Figure 2.13.5-2.	Inspections of the as-built nonsafety-related UPS system will be performed.	The as-built nonsafety-related UPS system conforms with the functional arrangement as described in Subsection 2.13.5 and as shown in Figure 2.13.5-2.
3. The UPS system equipment identified as Seismic Category I in Table 2.13.5-1 can withstand Seismic Category I loads without loss of safety function.	i. Inspections will be performed to verify that the UPS system equipment identified as Seismic Category I in Table 2.13.5-1 is located in a Seismic Category I structure.	i. The Seismic Category I equipment identified in Table 2.13.5-1 is located in a Seismic Category I structure.
	ii. Type tests, analyses, or a combination of type tests and analyses of the UPS system safety-related Seismic Category I equipment will be performed using analytical assumptions, or under conditions which bound the Seismic Category I design requirements.	ii. The as-built UPS system can withstand Seismic Category I loads without loss of safety function.

Table 2.15.4-2

ITAAC For The Passive Containment Cooling System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
2b2. The as-built piping identified in Table 2.15.4-1 as ASME Code Section III shall be reconciled with the piping design requirements.	A reconciliation analysis of the piping identified in Table 2.15.4-1 as ASME Code Section III using as-designed and as-built information and ASME Code Design Reports (NCA-3550) will be performed.	ASME Code Design Report(s) (NCA-3550) (certified, when required by ASME Code) exist and conclude that design reconciliation has been completed, in accordance with ASME Code, for as-built reconciliation of the piping identified in Table 2.15.4-1 as ASME Code Section III. The report documents the results of the reconciliation analysis.
2b3. The piping identified in Table 2.15.4-1 as ASME Code Section III is fabricated, installed, and inspected in accordance with ASME Code Section III requirements.	Inspections of the piping identified in Table 2.415.24-1 as ASME Code Section III will be conducted.	ASME Code Data Report(s) (certified, when required by ASME Code) and inspection reports (including N-5 Data Reports where applicable) exist and conclude that the piping identified in Table 2.415.24-1 as ASME Code Section III is fabricated, installed, and inspected in accordance with ASME Code Section III requirements.
3a. Pressure boundary welds in components identified in Table 2.15.4-1 as ASME Code Section III meet ASME Code Section III non-destructive examination requirements.	Inspection of the as-built pressure boundary welds in components identified in Table 2.15.4-1 as ASME Code Section III will be performed in accordance with ASME Code Section III.	ASME Code report(s) exist and conclude that ASME Code Section III requirements are met for non-destructive examination of pressure boundary welds in components identified in Table 2.15.4-1 as ASME Code Section III.