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Subject: **Revised Response to Portion of NRC Request for Additional Information Letter No. 258 - Related To ESBWR Design Certification Application - RAI Numbers 14.2-70 Supplement 1 and 14.2-73 Supplement 1**

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 the Reference 1 NRC letter. GEH response to RAI Numbers 14.2-70 Supplement 1 and 14.2-73 Supplement 1 is addressed in Enclosures 1 and 2. The original response was submitted in the Reference 4 GEH letter. Subsequent discussion with NRC staff resulted in a revision. Therefore, this revised response supersedes the Reference 4 GEH response.

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

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

References:

1. MFN 08-746, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 258 Related To ESBWR Design Certification Application*, dated September 25, 2008.
2. MFN 07-473, Letter from James C. Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 95 – Related to ESBWR Design Certification Application – RAI Numbers 14.2-64 through 14.2-66, 14.2-68 through 14.2-73, 14.2-76, 14.2-80*, dated September 11, 2007.
3. MFN 08-188, Letter from James C. Kinsey to U.S. Nuclear Regulatory Commission, *Response to January 16, 2008 Telephone Call with NRC Staff Regarding ESBWR DCD Section 14.2 RAIs*, dated March 1, 2008.
4. MFN 09-016, Letter from Richard E. Kingston to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 258 - Related To ESBWR Design Certification Application – RAI Numbers 14.2-70 Supplement 1 and 14.2-73 Supplement 1*, dated January 9, 2009.

Enclosures:

1. MFN 09-016 Revision 1 – Revised Response to Portion of NRC Request for Additional Information Letter No. 258 - Related To ESBWR Design Certification Application – RAI Numbers 14.2-70 S01 and 14.2-73 S01
2. MFN 09-016 Revision 1 – Revised Response to Portion of NRC Request for Additional Information Letter No. 258 - Related To ESBWR Design Certification Application – RAI Numbers 14.2-70 S01 and 14.2-73 S01 – DCD Markups

cc:	AE Cubbage	USNRC (with enclosure)
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	eDRF	0000-0095-4855/R1

Enclosure 1

MFN 09-016 Revision 1

Revised Response to Portion of NRC Request for Additional Information Letter No. 258 Related to ESBWR Design Certification Application RAI Numbers 14.2-70 S01 and 14.2-73 S01

NRC RAI 14.2-70 S01

Describe the SSLC major functions that will be tested.

The staff determined that, regardless of I&C hardware/software that will be used, the DC applicant should describe the safety system logic control (SSLC) major functions that will be tested in DCD Tier 2 Section 14.2.8.1.6.

In accordance with RG 1.68 and SRP 14.2, the DC applicant should include testing of the channel response time or sensor calibration and testing for the (SSLC) system channels and sensors in the SSLC preoperational test description.

GEH Response

GEH concurs that further explanation is required. MFN 08-188 ("Response to January 16, 2008 Telephone Call with NRC Staff Regarding ESBWR DCD Section 14.2 RAIs" dated March 1, 2008) documented NRC discussions related to RAI 14.2-70 and stated that DCD Tier 2 Subsection 14.2.8.1.6 was a generic test plan and does not contain specific tests that will be conducted but revised Subsection 14.2.8.1.6 to include, under "General Test Methods and Acceptance Criteria", the following:

- Verify proper operation of instrumentation and controls in appropriate design combinations of logic and instrument channel trip; and
- Verify bypass logic and bypass indications.

This addition to Subsection 14.2.8.1.6 was implemented in DCD Tier 2 Revision 5.

The Safety System Logic and Control Engineered Safety Feature (SSLC/ESF) must satisfy Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) and software management planned testing as part of implementation and installation. This means that testing that might otherwise be considered SSLC/ESF preoperational testing is already completed during the implementation and installation phases of the SSLC/ESF construction. Therefore, the only SSLC/ESF preoperational activities remaining involve the clearing of any SSLC/ESF system diagnostic alarms and any other site-specific testing determined to be necessary. Other systems' preoperational testing require a functional SSLC/ESF and upon their completion further indicate a fully functional SSLC/ESF.

Detail sufficient to conclude that adequate SSLC/ESF testing has been performed prior to preoperational and startup testing is, therefore, part of the SSLC/ESF ITAAC and software management planned testing documentation. The "General Test Methods and Acceptance Criteria" does not cover details of the SAT because they are part of the Software Quality Assurance Program (SQAP) documentation. The NRC will have access to the detailed test/acceptance records as part of the design implementation process. Subsection 14.2.8.1.6 will be revised to include this detail.

DCD Tier 2 Subsection 7.2.1.4.2 is an example of the specific types of SSLC/ESF tests performed during operation that verify proper operation of instrumentation and controls

in appropriate design combinations of logic and instrument channel trips, including channel response time or sensor calibration and testing. These types of tests are performed prior to operation in the preoperational test phase also.

DCD Impact

DCD Tier 2, Subsection 14.2.8.1.6 will be revised as noted in the Enclosure 2 markup.

NRC RAI 14.2-73 S01

Describe the major function of the LD&IS controls, interlocks, and bypasses

In DCD Tier 2, Section 14.2.8.1.8, the DC applicant should describe the major functions of the leak detection and isolation system (LD&IS) and reactor protection system (RPS) controls, interlocks and bypasses that are verified in the LD&IS and RPS ITAAC. This includes the major LD&IS and RPS control, interlock and bypass functions described in Tier 1 Tables 2.2.7-3, 2.2.7-4, 2.2.12-4 and 2.2.12-5.

GEH Response

GEH understands your statements and provides the following explanation. MFN 08-188 ("Response to January 16, 2008 Telephone Call with NRC Staff Regarding ESBWR DCD Section 14.2 RAIs" dated March 1, 2008) documented NRC discussions related to RAI 14.2-73 and stated that DCD Tier 2 Revision 4 (and 5) Subsection 14.2.8.1.8 lists the LD&IS preoperational functional logic tests that address your concerns. Similarly Subsection 14.2.8.1.9 documents the RPS preoperational tests. These overlapping tests are also addressed in DCD Tier 1 Table 2.2.12-5 as part of LD&IS ITAAC # 4 and DCD Tier 1 Table 2.2.7-4 as part of the RPS Controls, Interlocks (System Interfaces), and Bypasses ITAAC # 3.

The LD&IS Logic must satisfy Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) and software management planned testing as part of implementation and installation of the Reactor Protection System (RPS) and Safety System Logic and Control Engineered Safety Feature (SSLC/ESF) equipment. This means that testing that might otherwise be considered RPS and SSLC/ESF preoperational testing is already completed during the implementation and installation phases of the RPS and SSLC/ESF construction. Therefore, the only RPS and SSLC/ESF preoperational activities remaining involve the clearing of any RPS and SSLC/ESF system diagnostic alarms and any other site-specific testing determined to be necessary. Other systems' preoperational testing turnover packages require a functional RPS and SSLC/ESF and upon their completion further indicate a fully functional LD&IS logic arrangement.

Detail sufficient to conclude that adequate LD&IS logic testing has been performed prior to preoperational and startup testing is, therefore, part of the RPS and SSLC/ESF ITAAC and software management planned testing documentation. The "General Test Methods and Acceptance Criteria" does not cover details of the SAT because they are part of the Software Quality Assurance Program (SQAP) documentation. The NRC will have access to the detailed test/acceptance records as part of the design implementation process. Subsection 14.2.8.1.8 will be revised to include this detail

DCD Tier 2 Subsections 7.2.1.4.2 and 7.3.5.4 are examples of the specific types of tests performed during operation that verify proper operation of instrumentation and controls in appropriate design combinations of logic and instrument channel trips, including channel response time or sensor calibration and testing. These types of tests are performed prior to operation in the preoperational test phase also.

DCD Impact

DCD Tier 2, Subsection 14.2.8.1.8 will be revised as noted in the Enclosure 2 markup.

Enclosure 2

MFN 09-016 Revision 1

Revised Response to Portion of NRC Request for Additional Information Letter No. 258 Related to ESBWR Design Certification Application RAI Numbers 14.2-70 S01 and 14.2-73 S01 DCD Markups

14.2.8.1.5 Rod Control and Information System Preoperational Test

Purpose

The objective of this test is to verify that the RC&IS functions are as designed.

Prerequisites

The construction tests have been successfully completed and the SCG has reviewed the test procedure and approved the initiation of testing. All electrical connections for rod position indication and RC&IS have been completed. All RC&IS cabinet power is available and system power supplies calibrated.

General Test Methods and Acceptance Criteria

Performance shall be observed and recorded during a series of tests to demonstrate the following:

- Proper operation of rod blocks and associated alarms and annunciators in appropriate design combinations of logic and instrument channel trip, including all positions of the reactor mode switch;
- Proper system response to control rod run-in logic, including that associated with Alternate Rod Insertion (ARI), SCRRI and normal post-scram follow;
- Proper functioning of instrumentation used to monitor Fine Motion Control Rod Drive (FMCRD) subsystem status such as rod position indication instrumentation and that used to monitor rod/drive separation status;
- Proper functioning of instrumentation used to monitor status signals from hydraulic control units (HCUs) and failure indication of any one position detector for an individual FMCRD;
- Proper operation of RC&IS software including verification of gang and group assignments and Automated Thermal Limit Monitors (ATLM), Rod Worth Minimizer (RWM) and automatic rod selection and movement functions; and
- Proper communication with Plant Automation System (PAS).

14.2.8.1.6 Safety System Logic and Control Eningeered Safety Feature Preoperational Test

Purpose

The objective of this test is to verify proper operation of the Safety System Logic and Control Engineered Safety Feature (SSLC/ESF) and the safety-related (Q-DCIS) and nonsafety-related (N-DCIS) plant Distributed Control and Information System (DCIS) indicated in Subsection 14.2.8.1.7. Proper functioning of the DCIS includes those functions utilized for the preoperational testing of the aggregate plant systems.

Prerequisites

Because the SSLC/ESF must be functional for utilization in the preoperational testing of other systems, SSLC/ESF testing is completed during the implementation and installation phases of construction. The SSLC/ESF implementation and installation testing includes adhering to the commitments of the software development process (see Subsection 14.3.3.2). The commitments of the software plans include such testing as Factory Acceptance Tests (FAT) and Site

Acceptance Tests (SAT). That which is not tested during the FAT, that which could change in transit, or that which is otherwise determined to need testing at the site is tested during the SAT.

SSLC/ESF ~~The~~ construction tests have been successfully completed and the SCG has reviewed the test procedures and approved the initiation of testing. The required alternating current (AC) and direct current (DC) electrical power sources shall be operational and the appropriate interfacing systems shall be available as required to support the specified testing.

General Test Methods and Acceptance Criteria

The testing consists of the following:

- Verify the self-test portion of the SSLC/ESF, including the proper reporting of detected failures;
- Verify the non-interaction of the SSLC/ESF self-test system to confirm that the self-test system does not cause a false indication;
- Verify the correct activation of the inputs to the SSLC/ESF such as pushbutton switches, control operating switches, key-operated switches and analog inputs;
- Verify the local indication devices on the SSLC/ESF properly indicate the correct status;
- Verify the proper interface with diverse protection system;
- Verify proper operation of instrumentation and controls in appropriate design combinations of logic and instrument channel trip; and
- Verify bypass logic and bypass indications.

14.2.8.1.7 DCIS System Preoperational Test

Purpose

The objective of this testing is to verify proper functioning of both the safety-related (Q-DCIS) and nonsafety-related (N-DCIS) plant Distributed Control and Information System (DCIS)~~, including both safety-related (Q-DCIS) and nonsafety-related (N-DCIS) subsystems~~. Proper functioning of the DCIS includes those functions utilized for the preoperational testing of the aggregate plant systems.

Prerequisites

Since the DCIS must be functional for utilization in the preoperational testing of other systems, DCIS testing is completed during the implementation and installation phases of construction. The DCIS implementation and installation testing includes adhering to the commitments of the software plans (see Subsection 14.3.3.2). The commitments of the software plans include such testing as Factory Acceptance Tests and Site Acceptance Tests. That which is not tested during the Factory Acceptance Tests, that which could change in transit, or that which is otherwise determined to need testing at the site is tested during the Site Acceptance Test.

DCIS ~~C~~construction tests have been successfully completed and the SCG has both reviewed the test procedures and approved the initiation of testing. The required AC and DC electrical power sources shall be operational and the appropriate interfacing systems shall be available as required

to support the specified testing. ~~Interfacing systems shall be tested and operational. Fiber optic cables have been connected.~~

General Test Methods and Acceptance Criteria

The testing consists of the following:

- Verify that all DCIS diagnostic alarms have been resolved, cleared, and documented as such or have been documented for later resolution during individual/specific system preoperational testing.

~~Verify the ability to communicate to each nonsafety-related and each safety-related subsystem. Confirm proper addressing of the nonsafety-related and safety-related multiplexing networks. Confirm that multiple devices do not answer to or transmit the same address;~~

~~Verify the ability to transmit and receive data from interfacing systems within specified response times and data rate requirements;~~

~~Verify the ability to receive error messages from interfacing systems;~~

~~Verify the synchronization of time signals;~~

~~Verify the multiplexing system failure recovery capabilities;~~

~~Verify the ability of the communications software to identify and locate a problem on the network; and~~

~~Proper Performance Monitoring and Control subsystem function and interfaces to Technical Support Center (TSC).~~

14.2.8.1.8 Leak Detection and Isolation System Preoperational Test

Purpose

The objective of this test is to verify proper response and operation of the Leak Detection and Isolation System (LD&IS) logic, the safety-related (Q-DCIS), and nonsafety-related (N-DCIS) plant Distributed Control and Information System (DCIS) indicated in Subsection 14.2.8.1.7. Proper functioning of the DCIS includes those functions utilized for the preoperational testing of the aggregate plant systems.

Prerequisites

Since the RPS and SSLC/ESF must be functional for utilization in the preoperational testing of other systems, LD&IS testing is completed during the implementation and installation phases of construction. The RPS and SSLC/ESF implementation and installation testing includes adhering to the commitments of the software plans (see Subsection 14.3.3.2). The commitments of the software plans include such testing as Factory Acceptance Tests (FAT) and Site Acceptance Tests (SAT). That which is not tested during the FAT, that which could change in transit, or that which is otherwise determined to need testing at the site is tested during the SAT.

~~The~~ SSLC/ESF construction tests have been successfully completed and the SCG has reviewed the test procedures and approved the initiation of testing. The required AC and DC electrical power sources shall be operational and the appropriate interfacing systems shall be available as required to support the specified testing.