



GE Energy

James C. Kinsey
Project Manager, ESBWR Licensing

PO Box 780 M/C J-70
Wilmington, NC 28402-0780
USA

T 910 675 5057
F 910 362 5057
jim.kinsey@ge.com

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Supplement 1

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Subject: **Response to Portion of NRC Request for Additional Information
Letter No. 50 Related to ESBWR Design Certification Application –
Initial Test Program – RAI Number 14.2-8 S01**

Enclosure 1 contains GE's response to the subject NRC RAI transmitted by e-mail on November 27, 2006. GE's original response is contained in the Reference 1 letter.

If you have any questions or require additional information regarding the information provided here, please contact me.

Sincerely,

A handwritten signature in cursive script that reads "Kathy Sedney for".

James C. Kinsey
Project Manager, ESBWR Licensing

D068

Reference:

1. MFN 06-413, Letter from David Hinds to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 50 Related to ESBWR Design Certification Application – Initial Test Program – RAI Numbers 14.2-6 and 14.2-8*, October 30, 2006

Enclosure:

1. MFN 06-413, Supplement 1 – Response to Portion of NRC Request for Additional Information Letter No. 50 Related to ESBWR Design Certification Application – Initial Test Program – RAI Number 14.2-8 S01

cc: AE Cabbage USNRC (with enclosures)
DH Hinds GE (with enclosures)
RE Brown GE (w/o enclosures)
eDRF 0000-0059-3300/1

Enclosure 1

MFN 06-413 Supplement 1

Response to Portion of NRC Request for

Additional Information Letter No. 50

Related to ESBWR Design Certification Application

Initial Test Program – RAI Number 14.2-8 S01

NRC RAI 14.2-8

Section 1.c of RG 1.68 states that the initial test program should include the testing of the reactor protection system and engineered safety feature actuation (RPS/ESF) systems in its pre-operational phase. The pre-operational test description should include the testing of the response time of each of the protection channels, including sensors. The pre-operational test description of the SSLC does not include testing for channel response time or sensor calibration/testing. Consistent with the above RG, specify whether the channel response time and sensor calibration and testing will be performed during the SSLC pre-operational test.

If these tests will be performed, provide the appropriate test descriptions in the DCD Tier 2, Section 14.2.8.1.6. Otherwise, provide adequate justification for not performing the test.

GE Response

Original Response

The operability of the SSLC functional logic shall be demonstrated during a series of overlapping preoperational tests. The SSLC preoperational tests are described in DCD/Tier 2, 26A6642BN Rev 1, Section 14.2.8.1.6. After these tests are conducted the testing of the response time and calibration/testing of each of the safety-related channels, including sensors is performed as part of the tests of following safety-related systems.

Preoperational tests of the RPS/ESF response times are performed as part of the tests described in DCD/Tier 2, Section 7.9.1.4; these tests flow down from DCD/Tier 1, Table 2.2.10-1, Item 4. Specifically, DCD/Tier 2, Section 7.9.1.4, states:

“Because the E-DCIS functions are closely interfaced with the SSLC functions, the integrated hardware and software functions of the E-DCIS and SSLC including network parameters and data status are checked and tested. Some of the key diagnostics include the CPU status check, parity checks, watchdog timer status, voltage level in controllers, data path integrity and data validation checks, and data cycling time and system signal response time.”

E-DCIS channel response times are tested in accordance with DCD/Tier 2, Section 14.2.8.1.7:

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

The RPS channel response times are tested in accordance with DCD/Tier 2, Section 14.2.8.1.9:

“Acceptability of instrument channel response times, as measured from each applicable process variable (except for neutron sensors and suppression pool temperature sensors) to the deenergization of the scram pilot valve solenoids.”

The ESF comprises the Gravity Driven Cooling System (GDSCS), the Automatic Depressurization System (ADS), the Passive Containment Cooling System (PCCS), the Isolation Condenser System (ICS), Standby Liquid Control System (SLCS) and the Leak Detection and Isolation System (LD&IS). Channel response time is not applicable to the PCCS because the PCCS does not rely on instrumentation to function. ESF channel response times for the ICS, GDSCS, and ADS are tested in accordance with DCD/Tier 2, Sections 14.2.8.1.63 (ICS), 65

(GDCS), and Section 14.2.8.1.1 (ADS). To clarify that channel response times are tested, the following bulleted item will be added to Sections 14.2.8.1.63 and 65, and 14.2.8.1.1:

“Acceptability of instrument channel response times, as measured from each applicable process variable input signal to the applicable process actuator confirmation signal”

ESF channel response times for the LD&IS are tested in accordance with DCD/Tier 2, Section 14.2.8.1.8. To clarify that channel response times are tested, the following bulleted item will be added to Section 14.2.8.1.8:

“Acceptability of instrument channel response times, as measured from each applicable process variable input signal to the applicable process actuator confirmation signal”

ESF channel response times for the SLCS are tested in accordance with DCD/Tier 2, Section 14.2.8.1.3. To clarify that channel response times are tested, the following bulleted item will be added to Section 14.2.8.1.3:

“Acceptability of instrument channel response times, as measured from each applicable process variable input signal to the applicable process actuator confirmation signal”

Sensors are calibrated as part of the system to which they are associated. RPS sensors are calibrated in accordance with DCD/Tier 2, Section 14.2.8.1.9:

“Calibration of primary sensors”

ICS, GDCS sensors are calibrated in accordance with DCD/Tier 2, Section 14.2.8.1.63 and 65:

“Proper operation of instrumentation and equipment in all combinations of logic and instrument channel trip”

LD&IS sensors are calibrated in accordance with DCD/Tier 2, Section 14.2.8.1.8. To clarify that the instrumentation and controls are properly installed and calibrated, the following bulleted item will be added to Section 14.2.8.1.8:

“Proper installation and calibration of all instrumentation and controls;”

SLCS sensors are calibrated in accordance with DCD/Tier 2, Section 14.2.8.1.3:

“Proper operation of instrumentation and equipment in all combinations of logic and instrument channel trip”

DCD changes will be made in response to RAI 14.2-8 as indicated.

NRC RAI 14.2-8 S01

RAI 14.2-8: In its response to RAI 14.2-8, the applicant stated that sensors are calibrated as part of the system to which they are associated. Additionally, the applicant stated that, for the ICS, GDCS, and SLCS, the phrase "proper operation of instrumentation and equipment in all combinations of logic and instrument channel trip" in Sections 14.2.8.1.63, 14.2.8.1.65, and 14.2.8.1.3 of the DCD, respectively, covers the above testing. The staff disagrees with the applicant's response. The staff believes the phrase above may or may not include the calibration of sensors. The DCD should be revised to explicitly include the calibration of sensors.

GE Response

The ESBWR initial test program requires that the calibration of all instrumentation be initially performed during the construction tests as described in DCD Tier 2, Revision 2, Subsection 14.2.1.1, "Construction Test Objectives:"

"Construction tests are performed to demonstrate that components and systems are correctly installed and operational. These tests include, but are not limited to, flushing and cleaning, hydrostatic testing, initial calibration of instrumentation..."

For consistency with DCD Tier 2, Subsection 14.2.8.1.9, the following bulleted item was added to Subsections 14.2.8.1.3, 14.2.8.1.63, and 14.2.8.1.65:

- Proper calibration of instrumentation

DCD Impact

DCD Tier 2, Subsections 14.2.8.1.3, 14.2.8.1.63, and 14.2.8.1.65 have been changed as shown in the attached DCD markup.

injecting demineralized water. Required interfacing systems shall be available, as needed, to support the specified testing and the appropriate system configurations.

General Test Methods and Acceptance Criteria

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

- Proper calibration of instrumentation
- Proper operation of instrumentation and equipment in the required combinations of logic and instrument channel trip;
- Proper functioning of instrumentation and alarms used to monitor system operation and availability;
- Proper operation of system valves, including timing, under expected operating conditions;
- Proper operation of the nitrogen pressurization system;
- Proper system flow paths and discharge (with demineralized water substituted for the neutron absorber mixture);
- Proper operation of interlocks and equipment protective devices in valve controls; and
- Proper operation of the squib type injection valves.

Note: Proper volume and concentration of the neutron absorber solution (refer to Subsection 9.3.5) will be surveilled prior to entry in the Technical Specification mode in which the SLC system is required to be operable.

14.2.8.1.4 Control Rod Drive System Preoperational Test

Purpose

To verify that the Control Rod Drive (CRD) System, including the CRD hydraulic and fine motion control rod subsystems, functions as designed.

Prerequisites

The construction tests have been successfully completed and the SCG has reviewed the test procedure and approved the initiation of testing. The control blades and temporary guides in the RPV shall be installed and the FMCRDs are ready to be stroked and scrambled. Reactor component cooling water, instrument air, and other required interfacing systems shall be available, as needed, to support the specified testing and the corresponding system configurations.

Additionally, the Rod Control and Information System (RC&IS) shall be functional when needed, with the applicable portion of its specified preoperational testing complete.

General Test Methods and Acceptance Criteria

The CRD pumps take suction from the condensate system (preferred source) or the condensate storage tank (backup). This test must include testing both sources and the transfer between

- Proper functioning of instrumentation and alarms used to monitor system operation and status;
- Acceptable system and component flow paths and flow rates, including pump capacities and tank volumes;
- Proper operation of system pumps, valves, and motors under expected operating conditions;
- Proper operation of phase separators;
- Proper operation of concentrating and packaging functions, including verification of the absence of free liquids in packaged waste;
- Proper operation of filter and demineralizer units and their associated support facilities; and
- Proper functioning of drains and sumps, including those dedicated for handling of specific agents such as detergents.

14.2.8.1.63 Isolation Condenser System Preoperational Test

Purpose

To verify that the operation of the Isolation Condenser (IC) system loops, including valves, logic and instrumentation is as specified.

Prerequisites

The construction tests have been successfully completed and the SCG has reviewed the test procedure and approved the initiation of testing. High-pressure nitrogen must be available to operate the spring-loaded condensate return valves, and nitrogen operated pneumatic rotary motor isolation valves. Electrical power is also required to operate valves and controls.

General Test Methods and Acceptance Criteria

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

- Proper calibration of instrumentation
- Proper operation of instrumentation and equipment in all combinations of logic and instrument channel trip;
- Proper functioning of instrumentation and alarms used to monitor system operation and availability;
- Proper operation of system valves, including timing;
- Verification that the steam flow paths from the IC/PCCS pools to the atmosphere are unobstructed;
- Verification that IC steam and condensate-return piping flow passages are unobstructed;
- Verification that IC system valves are in their operational readiness positions as required by design, and the IC pool is filled to normal level;

- Proper operation of IC/PCCS pool level control;
- Verification that the IC Pool subcompartment valves are locked open; and
- Proper isolation of IC containment isolation valves upon receipt of simulated isolation signals.

14.2.8.1.64 Passive Containment Cooling System Preoperational Test

Purpose

To verify the operation of Passive Containment Cooling Systems (PCCS) is as specified.

Prerequisites

The construction tests have been successfully completed and the integrated containment leak rate test has been completed successfully. Makeup Water System is available to support the proper level control of IC/PCCS pool. The SCG has reviewed the test procedure and approved this visual inspection.

General Test Methods and Acceptance Criteria Performance shall be observed and recorded during a series of individual component and integrated system tests to demonstrate the following:

- Verification that PCCS steam supply, drain and vent piping is unobstructed;
- Verification that PCCS condenser air flow versus differential pressure is within acceptable test limits;
- Verification that PCCS pool subcompartment valves are locked open;
- Proper operation of IC/PCCS pool level control; and
- Verification of the system interface with Fuel and Auxiliary Pools Cooling System for IC/PCCS pool cooling.

14.2.8.1.65 Gravity-Driven Cooling System Preoperational Test

Purpose

To verify that the operation of the four divisions of the Gravity-Driven Cooling System (GDCCS), including valves, logic and instrumentation, is as specified.

Prerequisites

The construction tests have been successfully completed and the SCG has reviewed the test procedure and approved the initiation of testing. The reactor vessel shall be ready to accept GDCCS flow. The required electrical power shall be available for squib type valve power supply. Instrument calibration and instrument loop checks have been completed.

General Test Method and Acceptance Criteria

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

- Proper calibration of instrumentation