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

MFN 06-504

Docket No. 52-010

December 15, 2006

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: **Response to Portion of NRC Request for Additional Information Letter No. 70 Related to ESBWR Design Certification Application – Initial Plant Test Program For Final Safety Analysis Reports – RAI Numbers 14.2-41, 14.2-50, 14.2-51, and 14.2-56**

Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via the Reference 1 letter.

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

Sincerely,

Kathy Sedney for

James C. Kinsey
Project Manager, ESBWR Licensing

D068

Reference:

1. MFN 06-382, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 70 Related to ESBWR Design Certification Application,* October 10, 2006

Enclosure:

1. MFN 06-504 – Response to Portion of NRC Request for Additional Information Letter No. 70 Related to ESBWR Design Certification Application – Initial Plant Test Program For Final Safety Analysis Reports – RAI Numbers 14.2-41, 14.2-50, 14.2-51, and 14.2-56

cc: AE Cubbage USNRC (with enclosures)
GB Stramback GE/San Jose (with enclosures)
eDRFs 0000-0061-9834 RAI 14.2-41
0000-0062-2368 RAIs 14.2-50, 14.2-51
0000-0060-9914 RAI 14.2-56

Enclosure 1

MFN 06-504

Response to Portion of NRC Request for

Additional Information Letter No. 70

Related to ESBWR Design Certification Application

Initial Plant Test Program For Final Safety Analysis Reports

RAI Numbers 14.2-41, 14.2-50, 14.2-51, and 14.2-56

NRC RAI 14.2-41

DCD Tier 2, Revision 1, Section 14.2.8.1.65, GDCS testing: please provide information on test set up conditions (e.g., vessel and dry well pressures) and what limiting conditions will be considered in the tests. In addition, will GDCS testing be performed with check valves and squib valves installed?

GE Response

Testing of GDCS is described in DCD Tier 1, Table 2.4.2-1, "ITAAC For The Gravity Driven Cooling System." An open reactor vessel test will be conducted. Therefore testing conditions will be at atmospheric conditions in both the drywell and vessel. Testing will be conducted with check valves and squib valves installed. Previously activated squib valves will be used. Mechanical testing of squib valves will be conducted by manufacturer; see DCD Tier 2 Revision 2, Subsection 6.3.4.1.

DCD Impact

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

NRC RAI 14.2-50

Question Summary: Confirm if the ESBWR pre-operational testing includes verification of pump NPSH and verification of proper system operation while powered from primary and alternate power sources.

Full Text: DCD Tier2, revision 1, Section 14.2.8.1.50: The ABWR DCD included the following acceptance criteria for the CIRC pre-operational testing:

1. Verifying acceptable pump NPSH under the most limiting design flow conditions.

2. Verifying proper system operation while powered from primary and alternate sources, including transfers, and in degraded modes for which the system is expected to remain operational.

Confirm if the ESBWR pre-operational testing includes similar acceptance criteria.

GE Response

DCD Tier 2, Revision 2, Subsection 14.2.8.1.50 states:

"Because of insufficient heat loads during the preoperational test phase, condenser and cooling water source performance evaluation are performed during the startup phase with the turbine-generator on line.

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

- Proper operation of pumps and motors in all design operating modes;
- Proper system flow paths and flow rates, including pump capacity and discharge head;"

1. While it could be concluded that these statements would require testing the Circulating Water Pumps for acceptable NPSH under the most limiting design flow conditions, it does not make that specific statement. Therefore, the statement will be added to the DCD.

2. As stated in Subsection 10.4.5.1.1, "The Circulating Water System does not perform, ensure, or support any safety related functions, and thus, has no safety design basis." Therefore, the CIRC does not have a backup power supply or redundant power source specific to the system. The CIRC Pumps power source along with other plant equipment comes from the Unit Auxiliary Transformer (UAT). The Reserve Auxiliary Transformer (RAT) backs up the UAT. However, this is the AC Power Distribution System and any required testing of these power sources or testing of the switching from one to the other will be performed with the AC Power Distribution System Testing. Therefore, no change to the DCD will be made concerning testing of the primary and alternate power sources.

DCD Impact:

DCD Tier 2, Subsection 14.2.8.1.50 will be revised, as shown in the attached markup, to add a statement that requires verification of acceptable pump NPSH under the most limiting design flow conditions.

NRC RAI 14.2-51

DCD Tier 2, Revision 1, Section 14.2.8.1.53: The ABWR DCD includes the following acceptance criteria for the main turbine control system pre-operational testing:

1. Verifying proper operation of trip devices for main stop and control valves and CIVs.

Confirm if the ESBWR pre-operational testing includes similar acceptance criteria.

GE Response:

Tier 2 Subsection 14.2.8.1.53 describes the general test methods and acceptance criteria for the turbine control system, including proper operation of the main stop and control valves, and combined intermediate valves (CIVs) in response to simulated signals related to turbine speed, load, and pressure. The turbine main stop, control, and CIVs are equipped with Fast Acting Solenoid Valves (i.e. trip devices) to facilitate fast closure in response to an overspeed signal but there is no specific discussion of overspeed or trip devices in this subsection.

Tier 1, Table 2.11.4-1, ITAAC For The Turbine-Generator System, includes testing of the control logic of the as-built overspeed protection system with simulated overspeed signals to verify the valves that supply steam to the turbine close upon receipt of an overspeed signal. This testing verifies proper operation of the trip devices (Fast Acting Solenoid Valves, Emergency Trip Fluid System (ETS), Speed control/Overspeed trip/Backup Overspeed trip) that are required to prevent a turbine overspeed.

DCD Impact:

Tier 2, Subsection 14.2.8.1.53 will be revised to specifically address verifying proper operation of turbine valve overspeed trip devices as described in the Tier 1 ITAAC for this system as shown in the attached markup.

NRC RAI 14.2-56

DCD Tier 2, Revision 1, Section 14.2.8.1.36: Describe how you will ensure the effectiveness of the programming of the required microprocessor based protective device characteristics.

GE Response:

Protective relaying/electronics are non-safety related electrical systems. Development of microprocessor based systems for these functions will follow the ISO 9001 criteria for quality assurance. This process, together with the electrical engineering of the distribution grid, is based on industry practices and is the responsibility of the COL Holder.

The activities discussed above will ensure the effectiveness of the programming of the required microprocessor based protective device characteristics.

DCD Impact:

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

General Test Methods and Acceptance Criteria

Because of insufficient heat loads during the preoperational test phase, condenser and cooling water source performance evaluation are performed during the startup phase with the turbine generator on line.

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

- 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, under expected operating conditions;
- Proper operation of pumps and motors in all design operating modes;
- Proper system flow paths and flow rates, including pump capacity and discharge head;
- Verifying acceptable pump NPSH under the most limiting design flow conditions.
- Proper pump motor start sequence and margin to actuation of protective devices;
- Proper operation of interlocks and equipment protective devices in pump and valve controls;
- Proper operation of permissive, prohibit, and bypass functions;
- Proper operation of freeze protection methods and devices, if applicable; and
- Acceptability of pump/motor vibration levels and system piping movements during both transient and steady state operation.

This test demonstrates main turbine control system functions properly through the following testing:

- Proper operation of the hydraulic control subsystem, including hydraulic fluid pumps and accumulators, and power supplies;
- Proper operation of the main stop and control valves, CIVs in response to simulated signals related to turbine speed, load, and pressure;
- Proper operation of the trip devices for the main stop and control valves, CIVs in response to simulated overspeed signals;
- Proper operation of the main stop and control valves, CIVs upon loss of the control system electrical power or hydraulic system pressure;
- Capability of manual operation of the turbine valves, including position indications and stroke rate adjustments;
- Proper interface with steam bypass and pressure control system; and
- Verification that various component alarms used to monitor system operation.

14.2.8.1.54 Main Turbine Bypass System Preoperational Test

Purpose

To verify the proper operation of the Main Turbine Bypass System (MTBS) to the extent that it can be done without steam.

Prerequisite

The construction tests have been successfully completed and the SCG has reviewed the test procedure and approved the initiation of testing. The Turbine Instruction Manual (TIM) is available to identify the necessary supporting systems and to define the test steps.

General Test Methods and Acceptance Criteria

Performance shall be observed and recorded during a series of component and system tests. This test shall demonstrate that the turbine bypass system operates properly through the following testing:

- Proper functioning of instrumentation and system controls in all combinations of logic and instrument channel trip;
- Capability of manual bypass operation, including stroke rate adjustments and position indications;
- Proper operation of the bypass valve closure in response to loss of condenser vacuum, control system electrical signal or hydraulic power;
- Proper bypass valve response following a simulated turbine and generator trip initiation signal, including the fast opening timing to avoid the reactor trip; and
- Proper interface with the steam bypass and pressure control system.