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Supplement 6

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Subject: **Response to Portion of NRC Request for Additional Information  
Letter No. 63 Related to ESBWR Design Certification Application -  
Technical Specifications - RAI Numbers 16.2-49 S01 and 16.2-63 S02**

Enclosure 1 contains the subject supplemental RAI responses resulting from March 27, 2007 and June 15, 2007 e-mails from the NRC. GE's original responses were provided in the Reference 1 letter.

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

Sincerely,



James C. Kinsey  
Project Manager, ESBWR Licensing

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NRO

References:

1. MFN 06-431, Letter from David Hinds to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 63 Related to ESBWR Design Certification Application – Technical Specifications – RAI Numbers 16.0-2 through 16.0-7, 16.2-10, 16.2-12 through 16.2-22, 16.2-25, 16.2-31 through 16.2-40, 16.2-43, 16.2-44, 16.2-46 through 16.2-49, 16.2-51, 16.2-53, 16.2-55 through 16.2-72, and 16.2-78 through 16.2-80*, November 13, 2006
2. MFN 06-431, Supplement 2, Letter from James C. Kinsey to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 63 Related to ESBWR Design Certification Application – Technical Specifications – RAI Numbers 16.2-22 S01, 16.2-62 S01, and 16.2-63 S01*, May 14, 2007

Enclosures:

1. MFN 06-431, Supplement 6 – Response to Portion of NRC Request for Additional Information Letter No. 63 Related to ESBWR Design Certification Application – Technical Specifications – RAI Numbers 16.2-49 S01 and 16.2-63 S02

cc: AE Cabbage USNRC (with enclosures)  
DH Hinds GEH (with enclosures)  
RE Brown GEH (w/o enclosures)  
eDRFs 0072-9371 and 0070-1675

**Enclosure 1**

**MFN 06-431, Supplement 6**

**Response to Portion of NRC Request for**

**Additional Information Letter No. 63**

**Related to ESBWR Design Certification Application**

**- Technical Specifications -**

**RAI Numbers 16.2-49 S01 and 16.2-63 S02**

**NRC RAI 16.2-49**

*DCD, Tier 2, Rev. 1, Page 6.2-9 mentions butterfly and solenoid valves for the vacuum breakers. Why are the butterfly valves and their solenoid valves not required to be tested by a surveillance requirement as part of TS 3.6.1.6?*

**GE Response**

The response to RAI 16.0-1 provided in GE letter MFN 06-263, dated August 8, 2006, provided a commitment, on page 2 of Enclosure 1, to include drywell to wetwell vacuum breaker proximity switch and downstream isolation valve testing in the TS; stating "...the Drywell (DW) to Wetwell (WW) vacuum breaker line isolation valves, and the associated actuation instrumentation for the DW to WW vacuum breaker line isolation valves including the proximity switches on the DW to WW vacuum breaker valves, have been determined to meet 10 CFR 50.36(c)(2)(ii) Criterion 3 and will therefore result in a revision to Technical Specifications to include a new SR to ensure periodic verification of the appropriate containment or ECCS related Technical Specification function." Because GE has previously committed to including these components in the Design Control Document (DCD) Tier 2, Chapter 16 TS, no additional changes will be made to DCD Tier 2, Chapter 16 as a result of this RAI.

**DCD Impact**

DCD Tier 2, Chapter 16 will be revised as described above in a future revision.

**NRC RAI 16.2-49, Supplement 1**

*Comment on response to RAI 16.2-49 from MFN 06-431:*

*State what the exact DCD changes are related to the resolution to this question. It is not clear that Surveillance Requirement (SR) 3.6.1.1.3 and SRs 3.6.1.6.4 and 5 are sufficient. Why place the instrumentation function for the vacuum breaker isolation in TS 3.6.1.6 instead of TS Section 3.3?*

**GEH Response**

Leak rate testing required by (Technical Specification (TS) 3.6.1.1, 'Containment Systems,' Surveillance Requirement (SR) 3.6.1.1.3 is included in TS 3.6.1.1, because excess leakage via this leakage path could affect the pressure suppression capabilities of the containment. This is modeled after a similar Surveillance in NUREG 1433, Revision 3.1, 'Standard Technical Specifications General Electric Plants, BWR\4,' SR 3.6.1.1.2.

In response to NRC RAI 16.2-49, DCD Chapter 16, Revision 2 incorporated TS 3.6.1.6, 'Wetwell-to-Drywell Vacuum Breakers,' SR 3.6.1.6.4 and SR 3.6.1.6.5. In addition, the TS 3.6.1.6 Limiting Condition for Operation (LCO), Conditions and Required Actions were revised to refer to the 'vacuum breaker flow path' and the 'vacuum breaker flow path isolation function.'

SR 3.6.1.6.3 requires verification of the opening setpoint of each vacuum breaker. As described in DCD Section 6.2.1.1.2, the vacuum breaker is a process-actuated valve. This SR is consistent

with similar requirements in NUREG-1434, Revision 3.1, 'Standard Technical Specifications General Electric Plants, BWR6,' SR 3.6.5.6.3.

The channel calibration required by SR 3.6.1.6.4 provides assurance that the instrumentation related to the vacuum breaker flow path isolation function is properly adjusted. The system functional test required by SR 3.6.1.6.5 provides assurance that the entire vacuum breaker flow path and isolation function operates correctly. The combination of channel calibration and system functional test encompasses the necessary testing for all required instrumentation sensors, system logic, and valve stroking.

The instrumentation requirements provided in Chapter 16, Section 3.3, are generally those associated with the major instrumentation platforms. System level instrumentation and controls are generally presented within the system Specification. In this case, TS 3.6.1.6 incorporates the requirements related to the upstream isolation valves and their automatic closure. A precedence example for this presentation approach can be found in ESBWR TS 3.7.4, 'Main Turbine Bypass System,' in SR 3.7.4.2. An additional example is shown in NUREG-1434, TS 3.6.1.9, 'Main Steam Isolation Valve (MSIV) Leakage Control System (LCS),' in SR 3.6.1.9.3. Both of these examples show that system level TS can provide for complete surveillance testing for instrumentation, as well as the actuated components

**DCD Impact**

No additional changes will be made to DCD Chapter 16 and Chapter 16B.

**NRC RAI 16.2-63**

*Provide the justification for having no proposed ESBWR TS LCO 3.8 surveillance requirements to:*

- a. *Verify correct breaker alignment and indicated power availability for each Isolation Power Center Bus.*
- b. *Verify automatic and manual transfer of AC power sources from the normal PIP bus to the alternate PIP bus.*

**GE Response**

In response to NRC RAI 16.0-1, GE completed a systematic and comprehensive evaluation of Revision 1 of the ESBWR Design Control Document (DCD) to determine the ESBWR process variables, design features, operating restrictions, and structures, systems, or components (SSCs) that meet one or more of the four criteria in 10 CFR 50.36(c)(2)(ii). This evaluation was used to verify that Revision 1 of DCD Chapter 16, TS, includes the LCOs required to maintain the validity of the safety analysis and risk analysis described in Revision 1 of the ESBWR DCD. The evaluation determined that the offsite circuits did not meet the criteria for inclusion in the TS because the ESBWR does not credit offsite or onsite AC backup power source for the first 72 hours following a design basis accident. The Criterion 3 matrix specifies that the batteries support all safety-related DC power and safety-related vital AC power (via inverters). The results of this evaluation were provided in GE letter MFN 06-263, dated August 8, 2006.

Because the offsite circuits did not meet the criteria for inclusion in the TS, the TS do not include requirements for periodic verification of either: a) correct breaker alignment and indicated power availability for each Isolation Power Center bus; or, b) automatic and manual transfer of AC power sources from the normal PIP bus to the alternate PIP bus.

**DCD Impact**

No changes will be made to DCD Tier 2, Chapter 16 as a result of this RAI.

**NRC RAI 16.2-63, Supplement 1**

*Include SRs to verify breaker alignment and indicated power availability for each Isolation Power Center bus.*

**GE Response**

Incorrect breaker alignment or power availability from the nonsafety-related Plant Investment Protection (PIP) bus that supplies the four Isolation Power Center (IPC) buses will result in inadequate power to the associated battery chargers and a failure to meet Surveillance Requirement (SR) 3.8.1.1. As such, SR 3.8.1.1 verifies appropriate breaker alignment and power availability for each IPC bus.

**DCD Impact**

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

**NRC RAI 16.2-63, Supplement 2**

*Comment on response to RAI 16.2-63 supplement 1 (MFN-06-431, supplement 2):*

*In RAI 16.2-63, the staff requested the applicant to establish surveillance requirements to verify (a) isolation power center (IPC) bus breaker alignment and power availability, and (b) automatic and manual transfer of AC power sources from the normal Plant Investment Protection (PIP) bus to the alternate PIP bus. In its response letter (MFN 06-431, supplement 2, dated May 14, 2007), the applicant stated that incorrect breaker alignment or power availability from the non-safety-related PIP buses supplying power to the four IPC buses will result in failure to meet Surveillance requirement (SR) 3.8.1.1. SR 3.8.1.1 verifies that each required battery terminal voltage is greater than or equal to minimum established temperature-compensated float voltage every 31 days. This is an indirect method of verifying IPC breaker alignment and power availability for a Class 1E distribution system. Operational problems may not be noted until the effected batter(ies) have significantly discharged. It would be prudent in accordance with the Applicability Statement to verify breaker alignments and power availability prior to entering Modes 1, 2, 3, and 4 and every 7 days thereafter as recommended by NUREG 1434 for Class 1E distribution systems.*

*As stated above, RAI 16.2-63 request that SRs be established to verify automatic and manual IPC bus transfer capabilities. This recommendation is closely related to RAI 16.2-61 which request that surveillance requirements for the IPC degraded and under voltage protection relays be included in the technical specifications (TS) to ensure IPC fast bus transfer capability. IPC fast bus transfer capability is needed to reduce routine challenges to the safety related 250 VDC and 120 VAC vital buses.*

*In summary, the staff considers the IPC buses an essential part of the Class 1E distribution system, and should therefore be included in TS 3.8.6, Distribution Systems - Operating, and TS 3.8.7, Distribution Systems - Shutdown.*

**GEH Response**

Each of the two safety-related 250 VDC Electrical Power Distribution buses in each division is powered from an associated DC source consisting of a battery and a battery charger that is powered from an Isolation Power Center (IPC) bus. The output of each 250 VDC Electrical Power Distribution bus is the safety-related and uninterruptible source of power to an associated DC to AC inverter. DCD Tier 2, Chapter 16, Technical Specification (TS) Surveillance Requirement (SR) 3.8.1.1 requires verifying battery terminal voltage greater than or equal to the minimum established limit while on float charge; i.e., the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery and maintain the battery in a fully charged state while supplying the continuous steady state loads of the associated DC subsystem. Since the battery chargers are powered from IPC buses, this SR inherently requires adequate power availability (and therefore appropriate breaker alignment) for the IPC buses.

As an SR, TS SR 3.0.4 requires that "Entry into a MODE or other specified condition in the Applicability of an LCO shall only be made when the LCO's Surveillances have been met"; which ensures appropriate breaker alignments and power availability prior to entering Modes 1, 2, 3, and 4. Since all abnormal conditions of important system parameters (e.g., charger failure and low bus voltage) are alarmed in the main control room and/or locally (as described in DCD

Tier 2, 8.3.2.2.1), the 31-day periodic verification frequency is deemed adequate to ensure IPC bus power availability and appropriate breaker alignment.

The nonsafety-related Plant Investment Protection (PIP) power supplying the IPC bus, and the PIP bus transfer capability provided to reduce routine challenges to supplying battery charger power, do not meet the 10CFR 50.36 criteria for inclusion in TS (refer to original response to RAI 16.2-63 above). DCD Tier 2, Chapter 8, continues to require these features as part of the ESBWR design, which provides appropriate assurance of minimizing challenges to the power supply to the safety-related electrical system.

**DCD Impact**

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