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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 93 – Related to ESBWR Design Certification Application – RAI Number 14.2-63**

Enclosure 1 contains GHNEA'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

NRO

Reference:

1. MFN 07-106, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 93 Related to the ESBWR Design Certification Application*, January 31, 2007

Enclosures:

1. MFN 07-378 – Response to Portion of NRC Request for Additional Information Letter No. 93 – Related to ESBWR Design Certification Application –RAI Number 14.2-63
2. MFN 07-378 – Response to Portion of NRC Request for Additional Information Letter No. 93 – Related to ESBWR Design Certification Application –RAI Number 14.2-63 – DCD Tier 2 Markup Pages

cc:

AE Cubbage	USNRC (with enclosures)
DH Hinds	GHNEA Wilmington (with enclosures)
BE Brown	GHNEA Wilmington (with enclosures)
eDRF	0000-0069-6260/R1

Enclosure 1

MFN 07-378

Response to Portion of NRC Request for

Additional Information Letter No. 93

Related to ESBWR Design Certification Application

RAI Number 14.2-63

NRC RAI 14.2-63

DCD, Tier 2, Revision 2, Section 14.2.8.1.32 states that an objective of the pressure suppression containment bypass leakage tests is to verify that the suppression pool bypass leakage rate is within limits for high pressure and low pressure tests. Please provide the values of the high and low pressures and their significance.

GE Response

A review of this RAI and Subsection 14.2.8.32 led, by reference, back to DCD Chapter 6 Subsection 6.2.1.1.5 (Bypass Leakage and Surveillance). Subsection 6.2.1.1.5.4.1 (High-Pressure Leak Test) was deleted in Revision 3 of the DCD Tier2. Chapter 14 will be revised to eliminate the description of high and low pressure tests. In addition, subsections under 6.2.1.1.5 will be revised to be in line with the changes made in Chapter 14.

The testing for bypass leakage in Chapters 6 and 14 will consist of local leak rate testing at a single pressure plus visual inspections. Therefore the request to provide values of the high and low pressure testing and their significance is no longer relevant.

DCD Impact

DCD Tier 2, Subsections 6.2.1.1.5.4, 6.2.1.1.5.4.1, 6.2.1.1.5.4.2, and 14.2.8.1.32, will be revised as noted in the attached markup.

Enclosure 2

MFN 07-378

Response to Portion of NRC Request for

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DCD Tier 2 Markup Pages

6.2.1.1.5.2 Suppression Pool Bypass During Severe Accidents

See Chapter 19 for discussion on Suppression Pool Bypass During Severe Accidents.

6.2.1.1.5.3 Justification for Deviation From SRP Acceptance Criteria

6.2.1.1.5.3.1 Actuation of PCCS

The provision of automatic PCCS design meet the intent of the SRP (Appendix A to SRP Section 6.2.1.1.C) for automatic actuation of sprays, without the use of a containment spray system. The SRP states that the wetwell spray should be automatically actuated 10 minutes following a LOCA signal and an indication of pressurization of the wetwell to quench steam bypassing the suppression pool. However, in determining maximum allowable steam bypass leakage area for ESBWR design, analyses take credit for PCCS operation immediately following LOCA initiation.

The PCCS is considered adequate to provide mitigation for consequences due to steam bypass leakage during a LOCA event. There is no technical merit in changing ESBWR design to provide wetwell sprays.

6.2.1.1.5.3.2 Vacuum Valve Operability Tests

Section B.3.b of Appendix A to SRP Section 6.2.1.1.C specifies that all vacuum valves should be operability tested at monthly intervals to assure free movement of the valves. Operability tests are conducted at plants of earlier BWR designs using an air actuated cylinder attached to the valve disk. The air actuated cylinders have been found to be one of the root causes of vacuum breakers failing to close. Free movement of the vacuum breakers in the ESBWR design has been enhanced by eliminating this potential actuator failure mode, improving the valve hinge design and selecting materials which are resistant to wear and galling. Therefore, this requirement for monthly testing is deemed unnecessary for the ESBWR. However, the vacuum breakers will be tested for free movement and leakage during each outage.

6.2.1.1.5.4 Bypass Leakage Tests and Surveillance

There is a provision for leakage tests and surveillance to provide assurance that suppression pool bypass leakage is not substantially increased over the plant life. This includes a pre-operational and periodic local leak rate testing of vacuum breakers and, ~~high-pressure leak test,~~ a periodic visual inspection of drywell to wetwell penetrations., ~~and periodic local leak testing of vacuum breakers.~~

6.2.1.1.5.4.1 ~~High-Pressure Leak Test~~Deleted

~~Deleted.~~

6.2.1.1.5.4.2 Local Leak Rate Testing of Drywell to Wetwell

A pre-operational and post-operational visual inspection of drywell to wetwell penetrations and local leak rate testing of vacuum breakers is performed to detect leakage from the drywell to wetwell. This test is performed at each refueling outage. A low-pressure test is not conducted since the vacuum breakers are the only credible source for bypass leakage; other existing

penetrations are pipe connections that are welded and cannot physically leak. The acceptance criteria are specified in Subsection 6.2.1.1.5.4.3.

6.2.1.1.5.4.3 Acceptance Criteria for Leakage Tests

NUREG-0800, 6.2.1.1.c Draft 1996, Appendix A, Steam Bypass, specifies acceptance criteria for drywell/wetwell steam bypass testing for Mark I, II and III containments. It states that alternative criteria can be proposed for review by the NRC staff. For ESBWR an alternate criteria is proposed, to:

- Provide a drywell/wetwell interface, sufficiently leak tight, to assure the containment performs the intended function of containment of radioactivity.
- Provide flexibility for the licensee in conducting tests;
- Account for degradation in performance between tests; and
- Account the uncertainties in test measurement.

The criteria specified for Mark II and III containments is a fraction of the analytical leakage capability. The fraction is judged small enough to cover degradation in performance between tests and uncertainties in test measurement. For ESBWR, an alternate acceptance criteria will be applied. The ability of the containment to tolerate degraded (increased) leakage up to ultimate strength has been determined to be more than a factor of 5 above the design capability (see Subsection 6.2.1.1.5.1). This adequately bounds potential degradation between test intervals. The uncertainty in the test measurement will be quantified and applied to the acceptance criteria. The acceptance criteria will be the leakage analytically required to keep the containment below design pressure, 2 cm^2 (2.16E-03 ft^2), ($A/\sqrt{K}$). The uncertainties associated with the specific test procedure and equipment applied will be determined by the licensee and added to the measured leakage prior to comparison against the acceptance criteria.

6.2.1.1.5.4.4 Surveillance Test

A visual inspection will be conducted to detect possible leak paths at each refueling outage. Each vacuum relief valve and associated piping will be checked to determine that it is clear of foreign matter. Also, at this time each vacuum breaker will be tested for free disk movement.

6.2.1.1.5.5 Vacuum Relief Valve Instrumentation and Tests

6.2.1.1.5.5.1 Position Indicators and Alarms

Redundant position indicators are placed on all vacuum breakers with redundant indication and an alarm in the control room. The vacuum breaker position indicator system is designed to provide the plant operators with continuous surveillance of the vacuum breaker position. The vacuum relief valve position indicator system has adequate sensitivity to detect a total valve opening, for all valves, that is less than the design bypass capability, discussed in Subsection 6.2.1.1.5.4.

6.2.1.1.5.5.2 Vacuum Valves Operability Tests

The vacuum relief valves will be tested for free movement during each refueling outage.

Pools, reactor cavity, dryer/separator pool, spent fuel pool and suppression pool are filled with water to the normal operating level. Pressurizing and test equipment is checked out and ready for the test. Individual leak rate tests, Type B and C of 10 CFR 50, Appendix J, have been completed. A general inspection of the accessible interior and exterior surfaces of the primary containment structures and components is performed and corrective actions are taken if evidence of structural deterioration exists. Containment isolation valves are functionally tested and aligned in accordance with Containment Leakage Rate Testing Program.

General Test Methods and Acceptance Criteria

Description of the preoperational containment integrated leakage rate tests and acceptance criteria are provided in Section 6.2.

During the Type A test, the drywell to suppression pool gas space differential pressure test will be performed as required by the Technical Specifications.

14.2.8.1.31 Containment Structural Integrity Test

Purpose

The objective of this test is to verify that the design and construction of the primary containment is capable of withstanding specified internal pressure loads as described in Section 3.8.

Prerequisites

The containment construction is complete to the extent necessary to perform this test. Construction turnover of the system is completed. The SCG has reviewed the test procedures and approved the initiation of testing. Reactor vessel, GDCS Pools, IC/PCCS Pools, reactor cavity, dryer/separator pool, spent fuel pool and suppression pool are filled with water to the normal operation level. The instruments and controls within the scope of this test are calibrated. The structural integrity measurement and pressurizing equipment is available for use to support the test. Equipments incapable of withstanding the test pressure are removed from containment or otherwise protected.

General Test Methods and Acceptance Criteria

The internal pressure in the containment will be increased from atmospheric pressure to the test pressure in equally spaced pressure increments. The drywell and containment are depressurized in the same increments. During the test, the radial and vertical displacements of the drywell and containment structure are measured, and crack patterns and crack widths of the containment exterior surface at prescribed locations are observed. Pertinent system performance data are recorded and compared with the predicted response. During the analysis, verify that system performance test data satisfy the requirements as specified in Section 3.8.

14.2.8.1.32 Pressure Suppression Containment Bypass Leakage Tests

Purpose

The objectives of this preoperational test is ~~are~~ to ~~:~~

~~□ Verify that the suppression pool bypass leakage rate is within limits for high pressure and low pressure tests, and~~

~~O~~obtain the baseline data for use during subsequent leak rate tests conducted during refueling outages.

Prerequisites

~~After attaining test pressure, the Suppression pool gas space pressure is stabilized for one hour prior to collecting data.~~ The SCG has reviewed the test procedures and approved the initiation of testing. ~~Suppression pool gas space closures are in place and the containment ventilation system is operable to support this test.~~ Pressurizing and test equipment is checked out and ready for the test. ~~The wetwell is filled with water to normal operating level.~~

General Test Methods and Acceptance Criteria

The suppression pool bypass leakage rate test will be calculated from data taken in a series of local leak rate tests performed on the drywell to suppression pool vacuum breaker assemblies. Each assembly is tested to determine the leak rate, the total leak rate is the sum of the individually measured values.~~at both high and low test pressure conditions to detect potential leakage in the drywell to the suppression pool gas space as described in the following:~~

~~With the drywell being pressurized at the specified test pressures, adjust the suppression pool gas space pressure to establish the prescribed test differential pressure. Allow pressure to stabilize for one hour prior to collecting data used to determine the leak rate.~~ Verify this calculated value of ~~at the measured~~ drywell to suppression pool gas space bypass leakage rate is within design limit as specified in Section 6.2.1.1.5.

14.2.8.1.33 Containment Isolation Valve Functional and Closure Timing Tests

Purpose

The objective of this test is to verify proper function of the containment isolation valves, including the required closure timing are met.

Prerequisites

Permanently installed equipment and instrumentation shall have been functionally tested and calibrated.

General Test Methods and Acceptance Criteria

The Containment Isolation System is discussed in Section 6.2 with characteristics of and requirements for individual valves listed in Tables 6.2-16 through 6.2-42. Preoperational functional and closure timing tests of valves performing containment isolation functions will be done as part of the testing of the systems to which such valves belong (see Tables 6.2-16 through 6.2-42 for system affiliation of individual valves). Overall containment isolation initiation logic is a function of the LD&IS that is described in Subsection 14.2.8.1.

14.2.8.1.34 Wetwell-to-Drywell Vacuum Breaker System Preoperational Test

Purpose

The objective of this test is to verify proper functioning of the wetwell-to-drywell vacuum breakers. The leakage rate test of the vacuum breakers are performed in conjunction with suppression pool bypass described in Subsection 14.2.8.1.