HITACHI

**GE Hitachi Nuclear Energy**

James C. Kinsey
Vice President, ESBWR Licensing

PO Box 780 M/C A-55
Wilmington, NC 28402-0780
USA

T 910 675 5057
F 910 362 5057

MFN 08-358

Docket No. 52-010

April 17, 2008

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. 105 Related to ESBWR Design Certification Application - Containment Systems - RAI Number 6.2-131 S01**

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) response to the subject NRC RAI originally transmitted via the Reference 1 letter and supplemented by an NRC request for clarification in Reference 2. DCD Markups related to this response are provided in Enclosure 2.

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

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

D068
NRO

References:

1. MFN 06-393, Letter from U.S. Nuclear Regulatory Commission to David H. Hinds, *Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application*, October 11, 2006
2. MFN 07-460, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application*, August 16, 2007

Enclosures:

1. MFN 08-358 - Response to Portion of NRC Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application - Containment Systems - RAI Number 6.2-131 S01
2. MFN 08-358 - Response to Portion of NRC Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application - Containment Systems - RAI Number 6.2-131 S01 - DCD Markups

cc:

| | |
|---|---|
| AE Cubbage | USNRC (with enclosures) |
| DH Hinds | GEH/Wilmington (with enclosures) |
| GB Stramback | GEH/San Jose (with enclosures) |
| RE Brown | GEH/Wilmington (with enclosures) |
| eDRF | 0000-0083-0421 |

# Enclosure 1

# MFN 08-358

# Response to Portion of NRC Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application

## Containment Systems

## RAI Number 6.2-131 S01

**NRC RAI 6.2-131 S01:**

*The responses to parts A and B of the original RAI 6.2-131 are acceptable. However, the staff has a further request for part C.*

*Part C requested a discussion of reducing the containment setpoint pressure that initiates containment isolation for nonessential penetrations to be minimum compatible with normal operating conditions. In the response to this RAI, GEH proposed a change to DCD Tier 2, Appendix 1A to include the following: The alarm and initiation setpoints of the LD&IS are set to the minimum compatible with normal operating conditions to initiate containment isolation for containment penetrations containing process lines that are not required for emergency operation. The values for these setpoints are determined analytically or are based on actual measurements made during startup and preoperational tests.*

*If setpoints are to be determined analytically, provide the actual numerical value of the containment setpoint pressure that initiates containment isolation for nonessential penetrations and justify that it is the minimum compatible with normal operation conditions. If the setpoints are to be based on actual measurements during startup and preoperational tests then revise the DCD to provide more details regarding how an[d] when this setpoint will be determined.*

**GEH Response:**

The response to RAI 6.2-131, Part C (MFN 07-283, dated June 29, 2007), stated that the ESBWR is compliant with NUREG-0737. As currently stated in DCD Tier 2, Appendix 1A, Table 1A-1, Item II.E.4.2, the alarm and initiation setpoints for a high drywell pressure condition is reduced to the minimum values compatible with normal operating conditions for containment penetrations containing process lines that are not required for emergency operation. However, the primary concern is to ensure the high drywell pressure setpoint is set conservative to the analytical limit used in the safety analyses. In order to clarify the basis of the high drywell pressure initiation signal, DCD Tier 2, Appendix 1A, Table 1A-1, Item II.E.4.2, will be revised to state that the high drywell pressure setpoint is based on the analytical limit used in the safety analyses, and the reference to startup and preoperational test measurements will be deleted.

The value for the high drywell pressure setpoint is the same for both the Reactor Protection System (RPS) scram signal and the containment isolation signal. The analytical limit for the high drywell pressure signal is contained in DCD Tier 2, Table 6.2-2 and is shown as 13.8 kPaG (2 psig). This value is an upper analytical limit and is the basis for a setpoint calculation that will be performed to determine the actual instrument setting. This setpoint calculation will be based on the GEH ABWR/ESBWR Setpoint Methodology (NEDE-33304P). A setpoint based on this analytical limit is compatible with the maximum normal operating drywell pressure of 8.96 kPaG (1.3 psig) identified in DCD Tier 2, Chapter 16, Technical Specification Limiting Condition for Operation (LCO) 3.6.1.4. The analytical limit is sufficiently low to ensure the performance of the necessary safety actions, and at the same time high enough not to cause spurious reactor trips.

The alarm and initiation setpoints of the Leak Detection and Isolation System (LD&IS) are set as low as compatible with normal operation. The actual setpoint will be based on instrument sensitivity and tolerance relating to actual installed instrument type, instrument range, setpoint drift, post event function time, environmental and process conditions, and will ensure that the analytical limit is met. LD&IS parameters used to initiate these signals are discussed in DCD Tier 2, Subsection 5.2.5 and DCD Tier 2, Subsection 7.3.3.

**DCD Impact:**

DCD Tier 2, Appendix 1A, Table 1A-1 will be revised as shown in the attached markup.

# Enclosure 2

# MFN 08-358

# Response to Portion of NRC Request for Additional Information Letter No. 105 Related to ESBWR Design Certification Application

## Containment Systems

## RAI Number 6.2-131 S01

## DCD Markups

**Table 1A-1**

**TMI Action Plan Items**

| Regulation | TMI Item | Description | ESBWR Resolution | Associated Tier 2 Location(s) |
|---|---|---|---|---|
| 10 CFR 50. 34(f)(2)(xii) | II.E.1.2 | Provide automatic and manual auxiliary feedwater (AFW) system initiation and provide auxiliary feedwater system flow indication in the control room. (Applicable to PWRs only) | Applicable to PWRs only. The ESBWR does not have an auxiliary feedwater system. | N/A |
| 10 CFR 50. 34(f)(2)(xiii) | II.E.3.1 | Provide pressurizer heater power supply and associated motive and control power .... (Applicable to PWRs only) | Applicable to PWRs only. The ESBWR does not have comparable systems. | N/A |
| 10 CFR 50. 34(f)(2)(xiv) | II.E.4.2 | Provide containment isolation systems that:<br>(A) Ensure all non-essential systems are isolated automatically by the containment isolation system,<br>(B) For each non-essential penetration (except instrument lines) have two isolation barriers in series,<br>(C) Do not result in reopening of the containment isolation valves on resetting of the isolation signal,<br>(D) Utilize a containment set point pressure for initiating containment isolation as low as is compatible with normal operations, and<br>(E) Include automatic closing on a high radiation signal for all systems | The ESBWR Containment Isolation System meets the NRC requirements, including the post-TMI requirements. In general, this means that two barriers are provided.<br>Redundancy and physical separation are required in the electrical and mechanical design of the containment isolation system to ensure that no single failure in the system prevents it from performing its intended functions. Electrical redundancy is provided for each set of isolation valves, eliminating dependency on one power source to attain isolation. Electrical cables for isolation valves in the same line are routed separately. Cables are selected and based on the specific environment to which they may be subjected (e.g., magnetic fields, high radiation, high | 10 CFR 50. 34(f)(2)(xiv) |

**Table 1A-1**

**TMI Action Plan Items**

| Regulation | TMI Item | Description | ESBWR Resolution | Associated Tier 2 Location(s) |
|---|---|---|---|---|
| | | that provide a path to the environs. | temperature and high humidity).<br><br>Classification of structures, systems and components for the ESBWR design is addressed in Section 3.2 and identified in Table 3.2-1. The basis for classification is also presented in Section 3.2.<br><br>The containment isolation system, in general, closes fluid penetrations for support systems that are not safety-related.<br><br>The design of the control systems for automatic containment isolation valves ensures that resetting the isolation signal does not result in the automatic reopening of containment isolation valves.<br><br>Actuation of the containment isolation system is automatically initiated by the Leak Detection and Isolation System (LD&IS) at specific limits defined for reactor plant operation. The LD&IS (described in Subsections 5.2.5 and 7.3.3) is designed to detect, monitor and alarm leakage inside and outside the containment, and automatically initiates the appropriate protective action to isolate the source of the leak. Various plant variables are monitored, including pressure, and these are used in the logic to isolate the | |

**Table 1A-1**

**TMI Action Plan Items**

| Regulation | TMI Item | Description | ESBWR Resolution | Associated Tier 2 Location(s) |
|---|---|---|---|---|
| | | | containment. The drywell pressure is monitored by four divisional channels, using pressure transmitters to sense the drywell atmospheric pressure from four separate locations. A pressure rise above the nominal level indicates a possible leak or loss of reactor coolant within the drywell. A high pressure indication is alarmed in the main control room, and initiates reactor scram and with the exception of the MSIVs, closure of the containment isolation valves. The alarm and initiation setpoints of the LD&IS are set to the minimum compatible with normal operating conditions to initiate containment isolation for containment penetrations containing process lines that are not required for emergency operation. ~~The values for these setpoints are determined analytically or are based on actual measurements made during startup and preoperational tests.~~ The value for this setpoint is based on the analytical limit used in safety analyses.<br><br>All ESBWR containment purge valves meet the criteria provided in BTP CSB 6-4. The main purge valves are fail-closed and are verified to be closed at a frequency interval of 31 days as defined in the plant technical specifications. All purge and vent valves are | |

**Table 1A-1**

**TMI Action Plan Items**

| Regulation | TMI Item | Description | ESBWR Resolution | Associated Tier 2 Location(s) |
|---|---|---|---|---|
| | | | pneumatically operated, fail closed and receive containment isolation signals. Bleed valves and makeup valves can be remote manually opened in the presence of an isolation signal, by utilizing override control if continued inerting is necessary.<br><br>In the ESBWR design, redundant primary containment isolation valves (purge and vent) close automatically upon receipt of an isolation signal from the Leak Detection and Isolation System (LD&IS). The LD&IS is a four-divisional system designed to detect and monitor leakage from the reactor coolant pressure boundary, and, in certain cases, isolates the source of the leak by initiating closure of the appropriate containment isolation valves. Various plant variables are monitored, including radiation level, and these are used in the logic to initiate alarms and the required control signals for containment isolation. High radiation levels detected in the reactor building HVAC air exhaust or in the refueling area air exhaust automatically isolates the containment purge and vent isolation valves. | |