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MFN 06-265 Supplement 1

Docket No. 52-010

June 21, 2007

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. 26 - Isolation Condenser System - RAI Numbers 5.4-22 S02 and 5.4-51 S01**

Enclosure 1 contains GHNEA's response to the subject NRC RAIs originally transmitted via the Reference 1 letter and supplemented by NRC requests for clarification.

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

Sincerely,

Kathy Sedney for

James C. Kinsey
Project Manager, ESBWR Licensing

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NRO

Reference:

1. MFN 06-141, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 26 Related to ESBWR Design Certification Application*, May 3, 2006

Enclosure:

1. MFN 06-265 Supplement 1 - Response to Portion of NRC Request for Additional Information Letter No. 26 - Related to ESBWR Design Certification Application - Isolation Condenser System - RAI Numbers 5.4-22 S02 and 5.4-51 S01

cc:	AE Cubbage	USNRC (with enclosures)
	BE Brown	GHNEA/Wilmington (with enclosures)
	GB Stramback	GHNEA/San Jose (with enclosures)
	eDRF	0000-0067-9757 for RAI 5.4-22 S02
		0000-0067-6583 for RAI 5.4-51 S01

Enclosure 1

MFN 06-265 Supplement 1

Response to Portion of NRC Request for

Additional Information Letter No. 26

Related to ESBWR Design Certification Application

Isolation Condenser System

RAI Numbers 5.4-22 S02 and 5.4-51 S01

NRC RAI 5.4-22:

The staff finds the system operation parameters given in Table 5.4-1 is not complete. Provide a diagram showing the ICS design and operating parameters: pressures, temperatures and flow rates. The diagram should be similar to a GE standard Process Flow Diagram (PFD) for the ICS.

GHNEA Response:

A simplified Isolation Condenser System (ICS) process flow diagram (PFD) is provided in the attached figure. DCD Tier 2 Subsection 5.4.6 will be revised in the next update to incorporate this figure.

NRC RAI 5.4-22 S01:

The following are in reference to GE's response to RAI 5.4-22 (MFN 06-265). (A) Please include the isolation condenser system (ICS) design parameters in the process diagram. (B) In the standby mode, temperature in the condensate return line (node 3) appears to be high. Please explain this high temperature.

GHNEA Response:

(A) The ICS Process Flow Diagram design parameters provided in RAI 5.4-22 (MFN 06-265) will be included in the next revision of DCD.

(B) Node 3 has a condensate temperature of 99.7°C at the IC lower headers. To add margin in the pool water volume, the conservative assumption was made to set the IC pool water to its saturation temperature. Therefore, the IC pool temperature affects node 3.

NRC RAI 5.4-22 S02:

Please discuss the means that will be in place to ensure that the isolation condenser system drain line is full during normal operation to ensure that the water volume assumed in the safety analysis is available for injection on a Loss of Coolant Accident signal.

GHNEA Response:

A temperature element is provided in each condensate return line, downstream of isolation valve F004 and at the bottom and top of the condensate line at the reactor pressure vessel (RPV) connection. Each temperature element is recorded in the main control room. Therefore, the temperature measurements can provide information that the condensate line is filled with condensate.

During normal plant operation, each isolation condenser (IC) train is in "ready standby." This means the isolation valves on the condensate return line are in an open position, condensate level in the IC extending above upper headers and the condensate return valve-pair both closed.

Normal operation includes steady-state operation at a given power level up to rated power. With a minimum water volume of 13.88 m^3 per train assumed during a loss-of-coolant accident (LOCA), the condensate line would take less than 3 minutes to fill during the steady-state heat removal mode following initial IC operation during a LOCA. The steady-state heat removal mode is selected at a point in the IC operation in which quasi steady-state mass flow conditions are observed.

DCD Impact:

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

NRC RAI 5.4-51:

Because of the functional limitations of the passive plant designs, the Commission, in an SRM issued June 30, 1994, approved the position in SECY-94-084, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-safety systems in Passive Plant Designs." This position accepts 420°F or below, rather than the cold shutdown specified in RG 1.139, as the safe stable condition that the passive systems must be capable of achieving and maintaining following non-LOCA events. Describe in detail the use of ICS in combination with other systems to keep the plant in Safe Shutdown Condition (less than 420°F) for 72 hours in both normal shutdown mode as well as post accident conditions. Describe the use of ICS in combination with other systems during and post LOCA conditions.

GHNEA Response:

(A) Describe in detail the use of ICS in combination with other systems to keep the plant in Safe Shutdown Condition (less than 420°F) for 72 hours in both normal shutdown mode as well as post accident condition.

Normal Shutdown Mode:

DCD Tier 2 states in two sections, see below, the operation of the ICS in combination to other systems during normal shutdown.

DCD Tier 2 Section 5.1 states, "During normal shutdown and reactor servicing, the RWCU/SDC System removes residual and decay heat. The RWCU/SDC System in conjunction with the Isolation Condenser System (ICS) allows decay heat to be removed whenever the main heat sink (main condenser) is not available (e.g., hot standby). The ICS provides cooling of the reactor if the RCPB becomes isolated following a scram during power operations. The ICS automatically removes residual and decay heat to limit reactor pressure when reactor isolation occurs. Over a longer duration, the ICS provides a way to remove excess heat from the reactor with minimal loss of coolant inventory, if the normal heat removal path is unavailable."

DCD Tier 2 Subsection 5.4.6.3 Safety Evaluation states, "The Isolation Condenser System is used to transfer decay and residual heat from the reactor after it is shutdown and isolated. This function can also be performed by the RWCU/SDC system or other Engineered Safety Features (ESF) of ADS, PCCS, and GDCS which back up the ICS."

Post Accident Condition:

The ICS is designed to remove post-reactor isolation decay heat with 3 out of 4 IC heat exchangers operating and to reduce Nuclear Steam Supply System (NSSS) temperature to safe shutdown conditions of 204°C (400°F) in 36 hours (and NSSS pressure below containment design conditions of 0.31 MPaG in 72 hours) with occasional venting to the suppression pool of radiolytically generated noncondensable gases beginning four hours after isolation.

(B) Describe the use of ICS in combination with other systems during and post LOCA conditions

An ICS function is to avoid unnecessary use of other ESFs for residual heat removal and in the event of a Loss of Coolant Accident (LOCA) and the ICS provides additional liquid inventory upon opening of the condensate return valves to initiate the system. The ICS also provides

reactor with initial depressurization of the reactor before ADS in event of loss of feed water, such that the ADS can take place from a lower water level.

No DCD change is required.

NRC RAI 5.4-51 S01:

In GE's response to RAI 5.4-51 (MFN 06-265), GE indicated that "No DCD change is required." It will be necessary for staff to use the information provided in GE response to RAI 5.4-51 to reach a reasonable assurance finding in the safety evaluation report. Therefore, the following information that was provided in the RAI response should be included in the DCD, Tier 2:

In GE's response to part (A):

The ICS is designed to remove post-reactor isolation decay heat with 3 out of 4 IC heat exchangers operating and to reduce Nuclear Steam Supply System (NSSS) temperature to safe shutdown conditions of 204°C (400°F) in 36 hours (and NSSS pressure below containment design conditions of 0.31 MPaG in 72 hours) with occasional venting to the suppression pool of radiolytically generated noncondensable gases beginning four hours after isolation.

In GE's response to part (B):

An ICS function is to avoid unnecessary use of other ESFs for residual heat removal and in the event of a Loss of Coolant Accident (LOCA) and the ICS provides additional liquid inventory upon opening of the condensate return valves to initiate the system. The ICS also provides reactor with initial depressurization of the reactor before ADS in event of loss of feed water, such that the ADS can take place from a lower water level.

GHNEA Response:

DCD Tier 2, Revision 3, Subsection 5.4.6.1.1, includes incorporation of the information discussed in both Part A and Part B of the NRC request.

DCD Impact:

DCD Tier 2, Revision 3, contains the information requested. No other DCD changes will be made in response to this RAI.