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
jim.kinsey@ge.com

MFN 08-407

Docket No. 52-010

April 24, 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. 158 Related to ESBWR Design Certification Application - Auxiliary Systems - RAI Number 9.4-43 S01**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by NRC letter dated February 29, 2008, Reference 1. GEH response to RAI Number 9.4-43 S01 is addressed in Enclosure 1. The original response was transmitted via Reference 2 in response to Reference 3.

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 08-209, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 158 Related To ESBWR Design Certification Application*, dated February 29, 2008.
2. MFN 070593, Supplement 2, Response to Portion of NRC Request for Additional Information Letter No. 103 Related to ESBWR Design Certification Application – Heating, Ventilation, and Air Conditioning – RAI Number 9.4-43, dated December 2, 2007
3. MFN 07-414, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, Senior Vice President, Regulatory Affairs. *Request For Additional Information Letter No. 103 Related To ESBWR Design Certification Application* dated July 23, 2007

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 158 Related.to ESBWR Design Certification Application - Auxiliary Systems - RAI Number 9.4-43 S01

cc:	AE Cubbage	USNRC (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	DH Hinds	GEH/Wilmington (with enclosure)
	eDRF	0000-0075-7393, Revision 1

Enclosure 1

MFN 08-407

Response to Portion of NRC Request for

Additional Information Letter No. 158

Related to ESBWR Design Certification Application

Auxiliary Systems

RAI Number 9.4-43 S01

For historical purposes, the original text of RAIs 9.4-43 with the GEH response is included. The DCD mark-up provided with the original response is not included.

NRC RAI 9.4-43

DCD, Tier 2, Revision 3, Table 9.4-9 shows two battery room exhaust fans. How many battery rooms are exhausted by these fans? Are there both safety-related and non-safety-related battery rooms exhausted by these fans. Are there monitors in each of the battery rooms that indicate that the rooms are being properly exhausted and that there is no build up of hydrogen? Is the operation of these fans required to keep the battery rooms cool during periods of battery discharge? Are there recirculation fans in each of the rooms to prevent thermal gradients?

GEH Response

The battery room exhaust subsystem consists of two 100% exhaust fans taking suction from safety-related battery rooms (rooms 1210, 1220, 1230 and 1240). Battery room exhaust fans provide their function only for the safety-related battery rooms because the nonsafety-related battery rooms are located outside the Reactor Building. During normal operation the exhaust air flow rate provided by the battery room exhaust fans precludes the hydrogen gas build up and maintains the hydrogen concentration below 2%. Hydrogen monitors are provided in each room to ensure the battery rooms are properly scavenged.

The batteries are used to mitigate the consequences of an accident and as such provide power to safety-related loads during and following an accident. Since the batteries do not generate hydrogen while discharging there is no build-up of hydrogen gas in the battery rooms during an accident. Therefore the battery room exhaust subsystem is only required during normal operation.

During an accident when batteries are discharging, battery rooms are cooled by the passive heat sink. Floors, ceilings, and walls reject the heat load of the battery rooms, and the room temperature is maintained below the qualification temperature of batteries. Therefore, exhaust fans are not required during battery discharge.

Recirculation fans are not required because the heat load is relatively low and excessive thermal gradients are precluded.

DCD Impact

DCD Tier 2 Section 9.4.6 will be changed, in response to this RAI, as shown on the attached markup.

NRC RAI 9.4-43 S01

In your response to RAI 9.4-43, it was stated that there was no hydrogen build up post accident because the batteries do not generate hydrogen while discharging. However, safety-related batteries either would or could be charged by the station diesels post-accident and hydrogen would be generated under these circumstances. Please address hydrogen monitoring and exhaust of the battery rooms while charging the batteries post -accident. If the battery room exhaust is used post-accident, has it been considered as part of the potential leak path from the reactor building and included in building leakage testing. It was also stated in your response to RAI 9.4-43 that passive cooling for the battery rooms is used. Please provide an analysis that shows the adequacy of passive cooling considering potential heat loads from other rooms, summer and winter design conditions, and the battery heat loads. Please identify the surveillance requirements which will assure the initial conditions of the passive heat load sink are being maintained including the frequency of the surveillance.

GEH Response

The Reactor Building Ventilation System (RBVS), which contains the Reactor Building Clean Area HVAC Subsystem (CLAVS), is operated from the Main Control Room (MCR). The divisional battery rooms hydrogen indication and high hydrogen concentration alarms are provided in the MCR. These indications and alarms, also provided locally allow the MCR to monitor the hydrogen concentration of the divisional battery rooms.

The divisional battery rooms are exhausted by CLAVS to the Reactor Building (RB) / Fuel Building (FB) exhaust stack. The stack has radiation monitoring on them to monitor the operational post accident release of radionuclides. A minimum of exhaust air is continuously extracted from the divisional battery rooms, in order to keep hydrogen concentration below 2%. CLAVS does not run without power; therefore, there are no exhaust fans running during a loss of power.

Charging the batteries requires power and generates hydrogen. If power is available for charging the batteries then power is available for CLAVS and battery exhaust fan operation. Therefore the exhaust fans will keep the battery room concentration of hydrogen below 2%. The batteries will not be recharged without first having CLAVS exhaust fans running. The batteries do not generate hydrogen while discharging; there is therefore no build-up of hydrogen gas in the battery rooms during a loss of power.

The normal flow path through the divisional battery rooms has four (4) safety-related building isolation dampers [(2) redundant dampers for each CLAVS supply and exhaust duct], (See RAI 9.4-42, MFN 07-592, dated November 23, 2007). These dampers close on loss of power and are not opened unless AC power is available. This is either preferred power or diesel power, not batteries. Therefore the exhaust pathway from the battery rooms is not used during the first 72 hours post accident when AC power is not available.

The safety-related isolation dampers on the CLAVS supply and exhaust ducts are part of the reactor building isolation and testing program. DCD Tier 2, Revision 5, Subsection 9.4.6.4 states that "Periodic surveillance testing of safety-related building isolation dampers is carried out per IEEE-338."

Analysis of Passive Cooling: The divisional battery rooms are below grade. There are doors at each exit and there are no adjoining rooms with heat loads. The walls, floor and ceiling are concrete. The summer and winter air temperatures are corrected by heating or cooling the incoming air via CLAVS to maintain the battery rooms at a nominal temperature of 20°C to 22°C (68°F to 72°F) per DCD Tier 2, Revision 4, Table 9.4-8. Therefore, at the beginning of a loss of power event the battery room is assumed to be at 25°C (77°F). A high temperature alarm coincides with this limit.

As stated in the Response to RAI 16.2-123 (MFN 07-601 dated November 10, 2007), battery room temperature during design basis events was analyzed and the results are described in the responses to RAI 8.3-47, (MFN 07-309, dated June 13, 2007), including Supplement 1, (MFN 07-405, dated July 24, 2007) and RAI 8.5-14, Supplement 1 (MFN 07-405 dated July 24, 2007). These responses documented the conclusion that battery room temperature would not exceed 43.5°C (110°F), which is less than the maximum allowable equipment qualification temperature of 50°C (122°F). The peak battery room temperature during the design basis events without the battery room ventilation system will not prevent the batteries from performing their safety-related design function.

As explained in the response to RAI 8.3-47 (MFN 07-309 dated June 13, 2007), including Supplement 1 (MFN 07-405 dated July 24, 2007), battery room temperature was evaluated for the battery room with the most unfavorable conditions following a High Energy Line Break (HELB), assuming a 10% margin for the heat load and simultaneous loss of off-site and on-site AC, with no credit for the non-safety diesel generators. Additionally, the initial temperature for the battery rooms was analyzed at 30°C (86°F), which is 8°C (14°F) higher than the expected normal operating temperature. This analysis concluded that battery room temperature remains within acceptable limits during this event. Other Technical Specification requirements for monitoring battery and battery room temperature, including high and low temperature limits, are addressed in the response to RAI 16.2-122 (MFN 07-601 dated November 10, 2007). Based on these considerations, GEH determined that limits for battery room high temperature does not meet the requirements of 10 CFR 50.36(d) for inclusion in Technical Specifications and no Surveillance Requirement is required.

DCD Impact

There is no change to DCD Tier 2, Revision 5 being added for this RAI.