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Subject: **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**

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 July 23, 2007, Reference 1, GEH response to RAI Number 9.4-43, is addressed in Enclosure 1.

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

Sincerely,

James C. Kinsey
Vice President, ESBWR Licensing

D068
NRO

Reference:

1. 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. 103 Related to ESBWR Design Certification Application – Heating, Ventilation, and Air Conditioning – RAI Number 9.4-43

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

Enclosure 1

MFN 07-593, 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

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 hydrogen gas build up and maintains hydrogen concentration below 2%. Hydrogen monitors are provided in the main control room for each room to ensure the battery rooms are properly scavenged.

The safety-related 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 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 not required following an accident.

During an accident when batteries are discharging, battery room heatup is mitigated by a passive heat sink. Floors, ceilings, and walls absorb the heat load of the battery rooms, and the room temperature is maintained below the qualification temperature of batteries. Exhaust fans are not required during battery discharge.

Recirculation fans are not required because the heat load is low and thermal gradients are minimal.

DCD Impact

DCD Tier 2, Revision 5, Section 9.4.6 will be changed, in response to this RAI, as shown on the attached markup.

The chilled water system provides cooling water for the CLAVS AHUs. The instrument air system provides instrument air for the pneumatic actuators. Electric unit heaters provide supplementary heating. The CLAVS AHU supplies air to the battery rooms. A minimum exhaust air is continuously extracted from battery rooms in order to keep hydrogen concentration below 2%. This extracted air is exhausted from the battery rooms by the battery room exhaust fans which discharge directly to the plant vent stack. Battery room temperature is maintained within a range to maximize output and equipment life. Battery room hydrogen indication and alarm functions are provided.

The CLAVS AHUs and return/exhaust fans are located in the Fuel Building HVAC Equipment Area. The CLAVS smoke exhaust fans are located in the Reactor Building. The electric unit heaters are located in or near the areas they serve.

System Operation

The RBVS operates during normal power plant operation, plant startup, and plant shutdown. It is not required to operate during a Station Blackout.

CONAVS

During normal operation, the CONAVS operates with one AHU and one exhaust fan in service. The exhaust fan starts first to establish negative pressure in the areas served. Then the AHU supply fan starts. Failure of an operating exhaust fan automatically energizes the standby exhaust fan. Simultaneously, the CONAVS AHU supply fan is de-energized due to a loss in room negative pressure. The AHU supply fan is re-energized upon reestablishment of room negative pressure.

Before and during personnel entry into the containment area, the CONAVS is used to de-inert the containment. The CONAVS AHU supply fan provides purge supply air to containment while the containment purge exhaust fan exhausts air from containment. On detection of high radiation in the exhaust air by PRMS, supply and exhaust dampers to containment are automatically closed. During inerting operation, the CONAVS exhausts air from containment while the Containment Inerting System supplies nitrogen to the containment.

REPAVS

During normal operation, the REPAVS operates with one AHU and one exhaust fan in service. The exhaust fan starts first to establish negative pressure in the areas served. Then the AHU supply fan starts. Failure of an operating exhaust fan automatically energizes the standby exhaust fan. Simultaneously, the REPAVS AHU supply fan is de-energized due to a loss in room negative pressure. The AHU supply fan is re-energized upon reestablishment of room negative pressure.

CLAVS

During normal operation, the CLAVS operates with one AHU and one return/exhaust fan in service. When outside air conditions are suitable, the CLAVS incorporates an economizer cycle to reduce operating hours for mechanical cooling equipment. Failure of an operating AHU supply fan automatically energizes the standby AHU supply fan and de-energizes the failed fan. Simultaneously, the return/exhaust fan is de-energized due to a loss in room pressurization. The return/exhaust fan is re-energized upon reestablishment of room positive pressure.

- Differential pressures between the ventilated spaces and the outside are transmitted to a pressure controller. The controller adjusts the CLAVS AHU supply fan's variable inlet vanes or fan speed that modulates airflow to maintain the ventilated spaces at a positive pressure.
- A temperature controller modulates the CLAVS outside, return and exhaust air dampers when outside air temperatures are below design supply air temperatures. Damper modulation provides a mixture of outside and return air at or below design supply air temperatures to the ventilated spaces.
- The CONAVS supply fan auto starts after the exhaust fan starts and a negative pressure has been established in the ventilated spaces;
- Differential pressures between the ventilated spaces and the outside are transmitted to a pressure controller. The pressure controller adjusts the CONAVS exhaust fan's variable inlet vanes or fan speed that modulates exhaust airflow to maintain a negative pressure.
- When a recirculating AHU is started, the fan runs continuously. A room thermostat automatically modulates the chilled water supplied to the cooling coil to maintain the room temperature.
- Local thermostats automatically start the unit heaters in rooms served by CLAVS and CONAVS; and
- The RBVS component operating status and system parameters are monitored and indicated in the MCR and locally where required;

Indications and alarms include the following:

- Indicators for system operating parameters, including flow rates, damper position, filter pressure drop, building pressure with respect to atmospheric, ~~and~~ temperatures, battery room hydrogen concentration; and
- Alarms for high or low conditions, including airflow rates, temperatures, filter pressure drop, building differential pressure, ~~and~~ smoke detection, and high battery room hydrogen concentration.

This instrumentation conforms to GDC 13. Refer to Subsection 3.1.2 for a general discussion of GDC 13.

9.4.6.6 COL Information

None

9.4.6.7 References

The applicable HVAC codes and standards are shown in Table 9.4-17.

9.4.7 Electrical Building HVAC System

The Electrical Building HVAC System (EBVS) consists of the following subsystems:

- Electric and Electronic Rooms (EER) HVAC Subsystem (EERVS)