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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 103 Related to ESBWR Design Certification Application - Control Room Habitability - RAI Number 9.4-33**

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) response to the subject NRC RAI transmitted via the Reference 1 letter.

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

Reference:

1. MFN 07-414, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 103 Related to ESBWR Design Certification Application*, July 23, 2007

Enclosure:

1. MFN 08-064 - Response to Portion of NRC Request for Additional Information Letter No. 103 Related to ESBWR Design Certification Application - Control Room Habitability - RAI Number 9.4-33

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	0000-0074-1617

Enclosure 1

MFN 08-064

Response to Portion of NRC Request for Additional Information Letter No. 103 Related to ESBWR Design Certification Application

Control Room Habitability

RAI Number 9.4-33

NRC RAI 9.4-33:

In DCD Tier 2, Revision 3, Section 9.4.1 it is stated that after the first two hours up to 72 hours, the temperature is controlled by the absorption of heat by the control room habitability area (CRHA) heat sink which is essentially the building walls, floors, ceilings and other structural components. The staff understands that a recirculation AHU would not be operating and that movement of air in the control room would be by natural convection with a small contribution of the EFU outside air flow being delivered to the space above the false ceiling.

Provide additional information on how the temperature in the control room changes with time during the 72-hour period following accident initiation. The information should be based on a detailed thermal heat transfer study that considers the temperature of outside air entering the control room, the heat loads in the control room, the rate of heat transfer from the heat producing equipment to control room air, the rate of heat transfer from the control room air to building structures and components that make up the heat sink, the impact of other barriers to heat transfer such as carpets, vinyl layers, false ceilings and floors, and the impact of heat sources on exterior CRHA surfaces, outside air conditioners and other environmental factors on the building heat sink.

The staff is concerned that although there is some potential to remove the heat through the heat sink, the rate of heat removal would be much slower than the heat released to the room and the temperatures might exceed limits for personnel and equipment operation.

GEH Response:

The analysis for Control Room Habitability Area (CRHA) heatup after an accident condition assumes a simultaneous loss of all onsite and offsite AC power, with no credit taken for nonsafety-related diesel generators or the nonsafety-related battery systems. The normal CRHA ventilation cooling system and the supplemental recirculation air-handling unit (AHU) and chilled water pump are assumed to be lost after the event initiation. The analysis is based on peak ambient temperature (summer) conditions, and assumes operation of the emergency filter unit (EFU), which induces outside air into the CRHA, adding to the internal heat loads.

The safety-related electrical and electronic heat loads are evaluated since the nonsafety-related heat loads isolate upon loss of the Control Room Habitability Area HVAC Subsystem (CRHAVS). This is conservative since the CRHAVS accommodates both the safety-related and nonsafety-related heat loads.

The computer code used to analyze these conditions is CONTAIN 2.0, which was developed by the USNRC. The analysis models the walls and ceiling as heat sinks, the concrete characteristics and initial temperatures are assumed to be at maximum normal operating conditions. The heat generated in the CRHA is absorbed by the walls and ceiling. It is assumed that the concrete floor of the Main Control Room (MCR) is thermally insulated and that there are no heat differences inside the MCR. Appropriately conservative heat transfer coefficients are utilized to account for the impact of barriers such as carpets, vinyl layers, false ceilings and floors. There is no solar heat transmission considered through the external wall surfaces because the CRHA and safety-related Distributed Control and Information System (Q-DCIS) room walls are situated below grade.

A maximum internal heat load of 7375 W is modeled in the CRHA heatup analysis, which includes 375 W of heat added by the EFU fan, which automatically actuates during an extended loss of AC power (DCD Tier 2, Revision 4, page 9.4-3). The remaining heat load of 7000 W is considered conservative based upon expected electrical, electronic and personnel heat loads, with margin. In addition, the analysis models 200 l/s of outside air injection, which accounts for the EFU outside air supply fan. The analysis is performed with an intake temperature profile for a dry bulb temperature of 47.2°C (117°F) and a daily temperature range of 15°C (27°F).

The analysis is based on an initial CRHA temperature of 25.60°C (78.08°F), which represents the upper limit for the normal operational temperature range. The results of the analysis show that the peak CRHA temperature reached after 72 hours was 33.85°C (92.93°F), an increase of 8.25°C (14.85°F). Thus, the main control room temperature increase meets the requirement of DCD Tier 1, Revision 4, Table 2.16.2-4, Item 4a.) to not exceed a 8.3°C (15°F) temperature increase during the first 72 hours after a Station Blackout (SBO) or accident condition. Figure 9.4-33-1 represents the CRHA temperature profile for the respective initial temperature conditions with the DCD Tier 1, Revision 4, Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) for maximum temperature rise above the assumed initial condition.

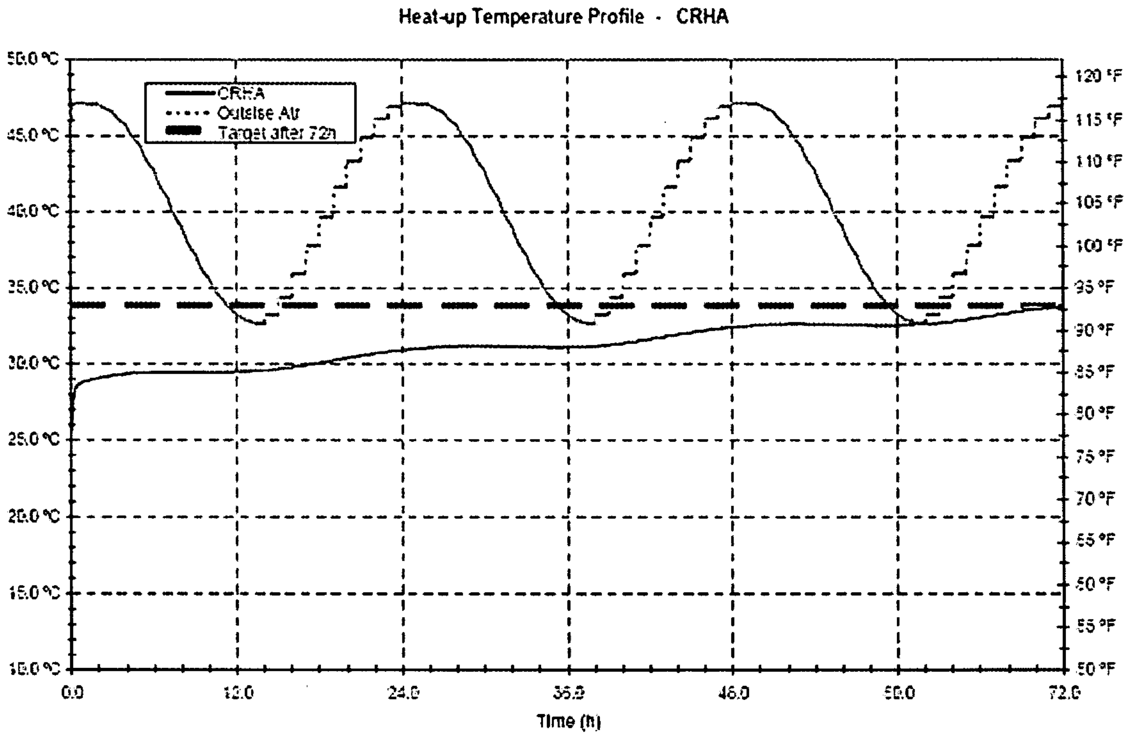

Figure 9.4-33-1. CRHA Temperature Profile (Initial Temperature 25.6°C (78°F))

DCD Impact:

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