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MFN 08-603

Docket No. 52-010

July 30, 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. 178 Related to ESBWR Design Certification Application -
Heating, Ventilation, and Air Conditioning - RAI Number 9.4-39 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 178 dated May 6, 2008, Reference 1. The original response to the RAI was transmitted via Reference 2 in response to Reference 3. The GEH response to RAI Number 9.4-39 S01 is addressed in Enclosure 1.

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

Sincerely,

Richard E. Kingston
Vice President, ESBWR Licensing

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NRK

References:

1. MFN 08-460, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 178 Related to ESBWR Design Certification Application*, May 6, 2008.
2. MFN 07-592, Supplement 3, 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 9.4-39, November 28, 2007.
3. 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. Response to Portion of NRC Request for Additional Information Letter No. 178 Related to ESBWR Design Certification Application – Heating, Ventilation, and Air Conditioning - RAI Number 9.4-39 S01

cc: AE Cubbage USNRC (with enclosure)
RE Brown GEH/Wilmington (with enclosure)
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eDRF 0000-0076-3520, Revision 1

Enclosure 1

MFN 08-603

**Response to Portion of NRC Request for
Additional Information Letter No. 178
Related to ESBWR Design Certification Application
Heating, Ventilation, and Air Conditioning
RAI Number 9.4-39 S01**

For historical purposes, the original text of RAI 9.4-39 and the GEH response is included.

NRC RAI 9.4-39

DCD Section 19A.8.4.10, Tier 2, states that component cooling will be performed by the HVAC systems in the Reactor Building, Electrical Building, Fuel Building, Control Building, and parts of the Turbine Building.

- A. Please identify which components in the Reactor Building HVAC System (RBVS) are RTNSS qualified. Please discuss how the RBVS or its sub-system would be used in the post 72-hour period and identify areas of the Reactor Building or equipment which require ventilation or cooling. Is there any impact on the control of the release of radioactivity by using the RBVS in the post 72-hour period that could be caused by opening building isolation dampers, discharging to the stack, or discharging to the Contaminated Air Ventilation System (CONAVS).*
- B. Please identify which components in the Electrical Building HVAC System (EBVS) are RTNSS qualified. Please discuss how the EBVS or its sub-system would be used in the post 72-hour period and identify areas of the Electrical Building or equipment which require ventilation or cooling.*
- C. Please identify which components in the Fuel Building HVAC System (FBVS) are RTNSS qualified. Please discuss how the FBVS or its sub-system would be used in the post 72-hour period and identify areas of the Fuel Building or equipment which require ventilation or cooling. Is there any impact on the control of the release of radioactivity by using the FBVS in the post 72-hour period that could be caused by opening building isolation dampers, discharging to the stack, or discharging to the Contaminated Air Ventilation System (CONAVS).*
- D. Please identify which components in the Control Building HVAC System (CBVS) are RTNSS qualified. Please discuss how the CBVS or its sub-system would be used in the post 72-hour period and identify areas of the Control Building or equipment which require ventilation or cooling. Is there any impact on the control of the release of radioactivity by using the CBVS in the post 72-hour period that could be caused by opening building isolation dampers, discharging to the stack, or discharging to the Contaminated Air Ventilation System (CONAVS).*
- E. Please identify which components in the Turbine Building HVAC System (TBVS) are RTNSS qualified. Please discuss how the TBVS or its sub-system would be used in the post 72-hour period and identify areas of the Turbine Building or equipment which require ventilation or cooling.*

GEH Response

- A. The RTNSS qualified subsystems within the Reactor Building HVAC System (RBVS) are the Clean Area HVAC Subsystem (CLAVS) and Contaminated Area HVAC Subsystem (CONAVS) including the system fans, dampers, and ductwork. Both subsystems support the RTNSS post 72-hr function to provide cooling for the DCIS cabinets and their electrical supporting equipment. Critical heat generating areas served by these subsystems will be equipped with room or cabinet coolers scoped under the respective subsystem. The room coolers are available with the building isolated or concurrent with the ventilation subsystems running.

There is no impact on the control of the radioactivity release because the building isolation dampers remain closed after a radiological event. Radiological conditions are assessed, and appropriate actions are taken prior to reopening the dampers.

- B. The RTNSS qualified subsystems within the Electrical Building HVAC System (EBVS) are those subsystems that provide cooling for the standby diesel generators and their applicable electric and electronic equipment. These systems include the Electric and Electronic Rooms (EER) HVAC Subsystem (EERVS) and Diesel Generators (DG) HVAC Subsystem (DGVS). The Electrical Building HVAC System also supports the RTNSS function of maintaining electrical power to FAPCS. System components designated as RTNSS include the system fans, dampers, and ductwork necessary to perform this function. The post 72-hr period, ventilation subsystems are restarted to provide ventilation and cooling to the EBVS.

- C. The RTNSS qualified subsystem within Fuel Building HVAC System (FBVS) is the Fuel Building General Area HVAC Subsystem (FBGAVS) that provides cooling for Fuel and Auxiliary Pools Cooling System (FAPCS) and its supporting equipment. System components designated as RTNSS include the system fans, dampers, and ductwork necessary to perform this function. The post 72-hour period, cooling is provided for FAPCS pump motors, rooms, and/or electrical/instrument panels designed to limit the room/equipment's environmental qualification temperature when the building is isolated. The ventilation subsystems are restarted to provide once-thru ventilation / cooling provided there are no radiological conditions present.

There is no impact on the control of the radioactivity release because the building isolation dampers remain closed after a radiological event until radiological conditions are assessed; appropriate actions are taken prior to opening the building isolation dampers.

- D. The RTNSS function supported by the Control Room HVAC System (CRVS) is to provide post 72-hour cooling for DCIS and Control Room habitability. Subsystems supporting this RTNSS function are the CRHAVS (Control Room Habitability Area Ventilation System) and the CRGAVS (Control Room General Area Ventilation System). The CRGAVS provides cooling for the electronic equipment of Control Room and cooling the Control Room Habitability Area (CRHA) envelope. This includes providing cooling for the DCIS cabinets and their electrical supporting equipment. The CRHAVS also provides filtered ventilation to the CRHA envelope (for fresh air and maintaining the positive pressure) via the CRHA Emergency Filter Units and their fans. This is accomplished using a dedicated portable RTNSS generator once the station batteries are depleted. If the standby diesel generators are available in the pre- or post-72 hour timeframe, then cooling is provided by the normal CRVS subsystems. The CRVS has no interaction with the CONAVS subsystem. The CRVS does not house any equipment that can act as a source of radioactive material so unisolating the CRVS after an accident poses no radioactive release hazard.
- E. The RTNSS qualified subsystems within the Turbine Building HVAC System (TBVS) are the subsystems that provide cooling for the RTNSS supporting systems: room cooling for the Reactor Component Cooling Water System (RCCWS) equipment rooms inside the Turbine Building; Chilled Water System (CWS) equipment rooms that house the RTNSS portion of the CWS; and, for cooling the rooms that house the electric and electronic equipment supporting the CWS RTNSS portions and RCCWS. The TBVS supports the RTNSS function to provide post 72-hour cooling for DCIS in the Turbine Building. The aforementioned area rooms are served by the TBVS, which includes fans, dampers and ductwork necessary to perform this function. The RCCW and NICWS pump rooms are to be equipped with room coolers that are available with or without the main ventilation system in service.

For all above cases see DCD Tier 2 Appendix 19A for further and detailed information regarding to RTNSS requirements.

For detailed information regarding the above subsystems see DCD Tier 2 Section 9.4: Subsection 9.4.1 for CBVS; Subsection 9.4.2 for FBVS; Subsection 9.4.4 for TBVS; Subsection 9.4.6 for RBVS; and, Subsection 9.4.7 for EBVS.

DCD Impact

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

NRC RAI 9.4-39 S01

The GEH response to RAI 9.4-39 identified a number of HVAC systems that have RTNSS functions. Please provide the following information for each these systems to allow the staff to complete its evaluation.

A. General Comment: HVAC systems may depend on instrument air to position dampers. Cooling functions may also depend on chilled water systems and chiller operation. Please state clearly in the DCD that supporting systems, such as instrument air, are also RTNSS systems, if they are required to assure that the RTNSS HVAC systems are capable of meeting their RTNSS functions. This should be stated in the appropriate HVAC system descriptions in DCD Tier 2 Section 9.4 and in DCD Section 19A.

B. RTNSS HVAC systems that are required to operate after 72 hours to fulfill a long-term safety function should be identified in the appropriate HVAC system descriptions in DCD Tier 2 Section 9.4 and in DCD Section 19A along with the safety function and any key parameters that system operation should meet (such as temperature limits, air flow rates, filtration efficiencies, etc.)

C. RTNSS HVAC systems that have safety function post 72 hours should be addressed in the Availability Controls Manual in DCD Tier 2, Section 19A, with appropriate Actions and Surveillances and the basis for these Actions and Surveillances.

D. Consistent with the ITAAC selection criteria provided in DCD Tier 2, Section 14.3, RTNSS HVAC systems should have ITAAC established in Tier 1, Section 2.16.2, to assure that the system has been installed in accordance with the design requirements and that it is capable of meeting its post-72-hour safety functions. For example, in the GEH response to RAI 14.3-61 S01 and in RAI 9.4-39 item B, it was stated that the Electrical Building HVAC System (EBVS) has RTNSS functions to provide cooling for the standby diesel generators and their applicable electric and electronic equipment. Please provide an ITAAC that demonstrates that the EBVS (and specifically, the Electric and Electronic Rooms HVAC Subsystem (EERVS) and the Diesel Generators HVAC Subsystem (DGVS)) are capable of meeting the design flow rates and cooling capacity to meet the RTNSS functions in post 72-hour service.

GEH Response

A. The ESBWR HVAC Systems provide RTNSS functions as described in DCD Rev 5, Appendix 19A, REGULATORY TREATMENT OF NON-SAFETY SYSTEMS. Any support system required to fulfill the RTNSS function must also

be classified as RTNSS. This is the case for the Nuclear Island Chilled Water System (NICWS) components where the RTNSS function relies on chilled water system cooling. Service Air, Instrument Air and the High Pressure Nitrogen Supply systems are not required for support of any RTNSS function including HVAC functions. The importance of these nonsafety-related compressed gas systems was evaluated relative to the criteria for special regulatory treatment of nonsafety-related systems in DCD Tier 2 Appendix 19A. These systems do not meet the criteria for special regulatory treatment as discussed in response to RAI 9.3-32 (reference MFN 07-259, May 8, 2007). Therefore, under detailed system design, it will be assured that all RTNSS functions are met without crediting any operation of the Service Air, Instrument Air and the High Pressure Nitrogen Supply systems. The applicable DCD Tier 2 subsections related to HVAC systems performing RTNSS functions are revised under revision 5 to describe RTNSS requirements.

B. RTNSS HVAC systems, required to operate after 72 hours to fulfill a long-term safety function, are identified in revision 5 of the DCD in the appropriate HVAC system descriptions (DCD Tier 2 Section 9.4) and in DCD Section 19A. While the actual values for key parameters related to RTNSS functions will be refined during the detailed design process, a Tier 1 ITAAC validating the RTNSS design function is provided as described in the DCD Tier 2 subsection 14.3.7.3.

C. With the exception of the Reactor Building Purge Exhaust Filter Unit, (which is covered under ACM 3.7.5 revision 5 of DCD Tier 2); HVAC systems are not included in the ACM. Since HVAC systems are normally running, time out of service and surveillances are not indicative of system reliability/availability. These HVAC systems use design controls (procurement specifications, redundancy, separation, corrective action, etc) and credit for the Maintenance Rule Program to ensure availability as identified in DCD Tier 2, Table 19A-2.

D. Consistent with the ITAAC selection criteria provided in DCD Tier 2, Section 14.3, HVAC systems with RTNSS functions have ITAAC established under revision 5 of Tier 1, Section 2.16.2, reference Tier 1 Table 2.16.2-10. This ensures that the system has been installed in accordance with the design requirements and that it is capable of meeting its post-72-hour safety functions.

DCD Impact

There is no DCD Impact. Revision 5 of the DCD incorporated the changes as described below.

DCD Tier 2, subsection 9.4.1.1, Control Building HVAC System-Design Basis, was revised to state that the CB HVAC system has RTNSS functions as described in DCD Appendix 19A with the associated RTNSS design requirements.

DCD Tier 1, subsection 2.16.2.2, Control Building HVAC System Design Description Item 10 and Table 2.16.2-4 Item 10 were added to provide additional ITAAC for RTNSS functions.

DCD Tier 2, subsection 9.4.2.1, Fuel Building HVAC System-Design Basis, was revised to state that the FB HVAC system has RTNSS functions as described in DCD Appendix 19A with the associated RTNSS design requirements.

DCD Tier 1, subsection 2.16.2.5, Fuel Building HVAC System Design Description Item 5 and Table 2.16.2-9 Item 5 were added to provide additional ITAAC for RTNSS functions associated with cooling FAPCS pump motors and N-DCIS components.

DCD Tier 2, subsection 9.4.4.1, Turbine Building HVAC System-Design Basis, was revised to state that the TB HVAC system has RTNSS functions as described in DCD Appendix 19A with the associated RTNSS design requirements.

DCD Tier 1, subsection 2.16.2.4, Turbine Building HVAC System Design Description Item 2 and Table 2.16.2-7 Item 2 were added to provide additional ITAAC for RTNSS functions associated with post 72-hour cooling for DCIS in the Turbine Building and room cooling for the Nuclear Island Chilled Water System and RCCW pumps.

DCD Tier 2, subsection 9.4.6.1, Reactor Building HVAC System-Design Basis, was revised to state that the RB HVAC system has RTNSS functions as described in DCD Appendix 19A with the associated RTNSS design requirements.

DCD Tier 1, subsection 2.16.2.1, Reactor Building HVAC System Design Description Item 7 and Item 11 and Table 2.16.2-2 Item 7 and Item 11 were added to provide additional ITAAC for RTNSS functions associated with post 72-hour N-DCIS cooling for FAPCS and Reactor Building Purge Exhaust filter efficiency.

DCD Tier 2, subsection 9.4.7.1, Electrical Building HVAC System-Design Basis, was revised to state that the EB HVAC system has RTNSS functions as described in DCD Appendix 19A with the associated RTNSS design requirements.

DCD Tier 1, subsection 2.16.2.7, Electrical Building HVAC System Design Description Item 2 and Table 2.16.2-10 Item 2 were added to provide additional ITAAC for RTNSS functions associated with post 72-hour cooling for Diesel Generators and Safety-Related Electrical Distribution, and support for electrical power to FAPCS.