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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application - RAI Number 7.1-132**

Enclosures 1 contains the GE Hitachi Nuclear Energy (GEH) response to RAI Number 7.1-132 from the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by NRC letter dated November 6, 2008. Enclosure 2 contains the DCD markup pages associated with the response to RAI 7.1-132.

Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box.

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

Sincerely,

Richard E. Kingston

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Vice President, ESBWR Licensing

Reference:

1. MFN 08-625, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 263 Related To ESBWR Design Certification Application*, dated November 6, 2008

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application - RAI Number 7.1-132

2. Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application - DCD Tiers 1 & 2 Markups for RAI Number 7.1-132

cc:

AE Cubbage	USNRC (with enclosures)
RE Brown	GEH/Wilmington (with enclosures)
DH Hinds	GEH/Wilmington (with enclosures)
eDRF Section:	0000-0095-8975 (RAI 7.1-132)

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Enclosure 1

Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application

RAI Number 7.1-132

NRC RAI 7.1-132

DCD Tier 2, Section 7.1.6.6.1.13 states that if the nonsafety-related redundant HVAC is not available, safety-related temperature sensors with two-out-of-four logic trip the control room power that feeds the nonsafety-related I&C. DCD Tier 2, Sections 6.4.4, 9.4.1, 9.4.1.1, and 9.4.1.2 clarify that the purpose of this trip is to remove the heat load due to the N-DCIS. GEH is relying on the trip to minimize the temperatures in the safety-related I&C rooms as DCD Tier 2, Section 7.1.6.6.1.13 states that Q-DCIS and support equipment is qualified for the expected temperature rise. However, this trip is not included in either DCD Tier 2 Section 6.4.8, which describes the instrumentation requirements for the control room habitability systems, or in DCD Tier 2, Section 9.4.1.5, which describes the instrumentation requirements for the control building HVAC systems. Thus, the staff is unable to identify what system performs this trip or find it in DCD Tier 1. Clarify the system that contains the trip circuit to cut off power to the N-DCIS. Add this safety-related trip to the appropriate section of DCD Tier 1.

GEH Response

GEH agrees and will clarify the function of the safety-related Control Room Habitability Area HVAC Subsystem (CRHAVS) emergency trip circuit for N-DCIS equipment installed in the Control Room Habitability Area (CRHA) as described in subsections 6.4.8 and 9.4.1.5.

As described in DCD Tier 2, subsection 7.3.4.2, if the nonsafety-related N-DCIS AC power supply is not available and redundant, nonsafety-related CRHAVS cooling is lost, the safety-related temperature sensors installed in CRHA provide a trip signal via SSLC/ESF to remove power from major nonsafety-related N-DCIS equipment (defined by CRHA heat-up calculation) located in CRHA. These safety related temperature sensors monitoring CRHA temperatures provide the logic to trip major N-DCIS loads in the CHRA. This reduces the room heat load. The resulting CRHA heat-up, due to operation of Q-DCIS & remaining N-DCIS equipment, emergency lighting, human occupants (latent and sensible) and EFU airflow, is mitigated by the CRHA passive heat sink. This safety-related function will be added to the Tier 1 list of SSLC/ESF Automatic Functions, Initiators and Associated Interfacing Systems, and to the Tier1 list of SSLC/ESF Controls, Interlocks and Bypasses.

DCD Impact

The following documents will be revised in DCD revision 6 as noted in the attached markups:

DCD Tier 1, Tables 2.2.13-2 and 2.2.13-3,

DCD Tier 2, Subsections 6.4.8, 7.3.4.2, and 9.4.1.5.

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Enclosure 2

Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application

DCD Tiers 1 & 2 Markups for RAI Number 7.1-132

Table 2.2.13-2

SSLC/ESF Automatic Functions, Initiators, and Associated Interfacing Systems

Function	Initiator	Interfacing System
ADS	RPV reactor water level low (Level 1)	NBS
GDCS Injection	RPV reactor water level low (Level 1)	NBS, GDCS
GDCS Equalizing Lines	RPV reactor water level low (Level 1)	NBS, GDCS
ICS	RPV reactor water level low (Level 1)	NBS, ICS
SLC	RPV reactor water level low (Level 1)	NBS, SLC, ATWS/SLC
CRHAVS emergency filtration mode	CRHA inlet air supply radiation high from PRMS	PRMS, CRHAVS
CRHAVS temperature control	CRHA high room temperature	Nonsafety-related R13 MCR N-DCIS Load Groups A, B and C

Table 2.2.13-3

SSLC/ESF Controls, Interlocks, and Bypasses

Parameter	Description
Control	ADS sequence actuation from VDUs in the MCR (one arm/fire switch per division) GDCS sequence actuation from VDUs in the MCR (one arm/fire switch per division)
Interlock	ECCS-LOCA confirmation time delay for ADS Group 1 SRV open Group 2 SRV open time delay Group 1 DPV open and SLC initiation time delay Group 2 DPV open time delay Group 3 DPV open time delay Group 4 DPV open time delay GDCS manual initiation interlock on low reactor pressure signal GDCS injection squib valve open time delay GDCS equalization line squib valve open time delay GDCS equalization line squib valve open interlock (RPV water level low (Level 0.5) CRHAVS CRHA high room temperature signal to trip major N-DCIS power supplies within CRHA
Bypass	SSLC/ESF Division of sensors division manual bypass switch SSLC/ESF manual control bypasses (disables) the load driver/discrete output

main control room is confirmed via the differential pressure transmitters within the control room. The installed flow meters are utilized to verify the system flow rates. The pressurization of the control room limits the ingress of radioactivity to maintain operator dose limits below regulatory limits. Air quality within the CRHA environment is confirmed to be within the guidelines of ASHRAE Standard 62 requirements for continued occupancy via meeting the fresh air supply requirement of 9.5 l/s (20 cfm) per person for the type of occupancy expected in the CRHA. The capacity of the safety-related battery is verified to ensure it can power an EFU fan for a minimum of 72 hours. Heat loads within the CRHA are verified to be less than the specified values. Preoperational testing of the CRHAVS isolation dampers is performed to verify the leaktightness of the dampers. Preoperational testing for CRHA inleakage during EFU operation is conducted in accordance with ASTM E741. Testing and inspection of the radiation monitors is discussed in Section 11.5. The other tests noted above are discussed in Chapter 14.

Inservice Testing

Inservice testing of the CRHAVS includes operational testing of the EFU fans and filter unit combinations, EFU filter performance testing, automatic actuation testing of the CRHA isolation dampers and EFU fans, and unfiltered air inleakage testing of the CRHA envelope boundary. The CRHA boundary is Pressure Tested (PT) periodically to verify leakage tightness on the envelope walls, doors, and boundaries. Testing to demonstrate the integrity of the CRHA envelope is performed in accordance with RG 1.197 and ASTM E741.

Nuclear Air Filtration Unit Testing

The EFU filtration components are periodically tested in accordance with ASME AG-1, Code On Nuclear Air And Gas Treatment, to meet the requirements of RG 1.52.

Periodic surveillance testing of safety-related CRHA isolation dampers and the EFU components are carried out per IEEE-338. Safety-related CRHA isolation dampers and the EFU are operational during plant normal and abnormal operating modes.

6.4.8 Instrumentation Requirements

A description of the required instrumentation is given in Subsection 9.4.1.5. Instrumentation required for actuation of the CRHAVS emergency habitability system, a description of initiating circuits, logic, periodic testing requirements, and redundancy of instrumentation relating to the habitability systems is provided in Section 7.3. Details of the radiation monitors used to provide the main control room indication of actuation of a CRHA isolation and EFU initiation are given in Section 11.5. Alarms for the following CRHA/CRHAVS conditions are provided in the MCR:

- Low airflow (each EFU fan, recirculation AHU, and Outside Air Intake Fan);
- High filter pressure drop (each EFU and normal Outside Air Intake filters);
- High ~~space~~ room temperature~~s~~ (nonsafety-related temperature detection);
- High room temperature (safety-related temperature detection);
- Low ~~space~~room temperature~~s~~;
- Low recirculation AHU entering air temperature;

- Low CRHA differential pressure;
- Smoke detected;
- High and low humidity in the CRHA;
- CRHA airlock doors are open during an station blackout (SBO);
- Area high radiation in the CRHA; and
- High radiation in the Outside Air Intake duct.

If the redundant, nonsafety-related CRHAVS cooling is lost, and the CRHA temperature increases, safety-related sensors provide a trip signal via SSLC/ESF to de-energize nonsafety N-DCIS equipment located in the CRHA. Safety-related temperature sensors monitoring CRHA temperatures provide the logic to trip major N-DCIS loads in the CRHA.

6.4.9 COL Information

6.4-1-A CRHA Procedures and Training

The COL Applicant will verify procedures and training for control room habitability address the applicable aspects of NRC Generic Letter 2003-01 and are consistent with the intent of Generic Issue 83 (Subsection 6.4.4).

6.4-2-A Toxic Gas Analysis

The COL Applicant will identify potential site specific toxic or hazardous materials that may affect control room habitability in order to meet the requirements of TMI Action Plan III. D.3.4 and GDC 19. The COL Applicant will determine the protective measures to be instituted to ensure adequate protection for control room operators as recommended under RG 1.78. These protective measures include features to (1) provide capability to detect releases of toxic or hazardous materials, (2) isolate the control room if there is a release, (3) make the control room sufficiently leak tight, and (4) provide equipment and procedures for ensuring the use of breathing apparatus by the control room operators (Subsection 6.4.5).

6.4.10 References

6.4-1 MIL-HDBK-759C, Human Engineering Design Guidelines.

6.4-2 MIL-STD-1472E, Human Engineering.

6.4-3 A Prioritization of Generic Safety Issues, NUREG-0933, October 2006.

6.4-4 ASHRAE Standard 62.1/2007, Ventilation for Acceptable Indoor Air Quality.

handling unit continues to operate normally providing temperature control in the MCR. If the normal AC power is not available, the nonsafety-related redundant HVAC equipment installed in the CRHA is powered for two hours from nonsafety-related batteries. After that interval, if the nonsafety-related HVAC equipment stops running, safety-related temperature sensors with two-out-of-four logic automatically trip the power to N-DCIS components in the MCR, removing the heat load generated by these sources. Smoke removal is described in Subsections 9.4.1.2 and 9.5.1.11.

If the redundant, nonsafety-related CRHAVS cooling is lost, and the CRHA temperature increases, safety-related sensors provide a trip signal via SSLC/ESF to de-energize nonsafety N-DCIS equipment located in the CRHA. Safety-related temperature sensors monitoring CRHA temperatures provide the logic to trip major N-DCIS loads in the CRHA.

The redundant safety-related components, including the I&C (i.e., monitoring channels) in the CRHA, CRHA isolation dampers, and EFUs, satisfy the single-failure criterion. The isolation dampers in each pair are physically separated. They are physically separated from the EFUs as well. The nonsafety-related air handling units and the safety-related isolation dampers and EFUs are mechanically and electrically separated. There is no intervention by the nonsafety-related components on the safety-related components. CRHA air operated isolation dampers are closed following loss of power, loss of air, or control signal failures. This conforms to the fail-safe principle, in which components or systems are designed to return automatically to their safe condition upon failure.

The CRHS isolation and EFU operation cannot be shut down automatically. EFU disengagement and de-energization of safety-related isolation dampers can be accomplished manually.

The CRHS isolation and EFU actuation are part of the SSLC/ESF system logic is illustrated in Figure 7.3-5. The required instrumentation for CRHS is described in Subsection 9.4.1.5. Alarms for CRHA/Control Room Habitability Area Heating, Ventilation, and Air Conditioning Subsystem conditions are discussed in Subsection 6.4.8.

7.3.4.3 Safety Evaluation

A safety evaluation of the CRHS is provided in Subsections 6.4.5 and 9.4.1.3.

Table 7.1-1 identifies the CRHS and the associated codes and standards applied, in accordance with the SRP. This subsection addresses I&C systems conformance to regulatory requirements, guidelines, and industry standards.

7.3.4.3.1 Code of Federal Regulations

10 CFR 50.55a(a)(1), Quality Standards for Systems Important to Safety:

- Conformance: The CRHS design complies with these standards.

10 CRF 50.55a(h), Criteria for Protection Systems for Nuclear Power Generating Stations ~~(IEEE Std. 603)~~:

The CRHAVS EFU components are periodically tested in accordance with the applicable portions of ASME AG-1 Code on Nuclear Air And Gas Treatment to meet RG 1.52 requirements. The EFUs have a credited HEPA efficiency of 99% and a credited carbon efficiency of 99%.

9.4.1.5 Instrumentation Requirements

The CBVS component operating status and system parameters are monitored, indicated and controlled in the MCR and locally when required.

CRHA Isolation Damper position indicators (open/closed) are provided and are located in the MCR.

Flow instrumentation is provided for fans and AHUs to indicate status and to trip malfunctioning units on low flow and to start standby units.

Differential pressure transmitters are used to indicate filter pressure drop and alarm high filter pressure levels.

CRHAVS differential pressure transmitters are provided to monitor CRHA pressure with respect to adjacent areas. Multiple transmitters are used with low select logic to compensate for wind effects. The CRHAVS EFUs have safety-related instrumentation and controls that detect low air flow and detect radiation downstream of the EFUs. Such detection will initiate the standby EFU.

CRHA airlock door position instrumentation is provided and an audible alarm sounds if airlock doors are open during a CRHA isolation.

CRHAVS non-safety related CRHA r~~R~~oom temperature sensors are provided to:

- Monitor Room Temperature;
- Provide control signals to heating elements and cooling coils; and
- Provide alarms on high or low space temperatures.

If the redundant, nonsafety-related CRHAVS cooling is lost, and the CRHA temperature increases, safety-related sensors provide a trip signal via SSLC/ESF to de-energize nonsafety N-DCIS equipment located in the CRHA. Safety-related temperature sensors monitoring CRHA temperatures provide the logic to trip major N-DCIS loads in the CRHA.

Duct temperature sensors are provided to indicate outside air, AHU coil entering and leaving temperatures as required by system logic control.

Instrument sensing elements are located and mounted such that the accuracy of the measured parameter is representative and optimized.

Smoke detectors are provided as required by NFPA 90A to detect smoke in the system ductwork and Control Building areas.

The Q-DCIS provides a control and instrumentation data communication network to support the CBVS safety-related functions.

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