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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 146 Related to ESBWR Design Certification Application, RAI Number 22.5-16 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 20, 2008 (Reference 1). The previous RAI and response were transmitted in References 2 and 3. The GEH response to RAI Number 22.5-16 S01 is in Enclosure 1.

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

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

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NRO

References:

1. MFN-08-157, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 146 Related To ESBWR Design Certification Application.* February 20, 2008.

2. MFN 07-578, Response to Portion of NRC Request for Additional Information Letter No. 101 Related to ESBWR Design Certification Application, RAI Numbers 22.5-8 and 22.5-16.

3. MFN 07-357, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 101 Related to ESBWR Design Certification Application*. June 21, 2007.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 146 Related to ESBWR Design Certification Application, Regulatory Treatment of Non-Safety Systems (RTNSS), RAI Number 22.5-16 S01

cc:	AE Cubbage	USNRC (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
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Enclosure 1

MFN 07-578, Supplement 1

Response to Portion of NRC Request for

Additional Information Letter No. 146

Related to ESBWR Design Certification Application

Regulatory Treatment of Non-Safety Systems (RTNSS)

RAI Number 22.5-16 S01

NRC RAI 22.5-16

Section 19A.8.4 refers to NEDO-33331, "ESBWR Availability Controls Manual," for regulatory oversight of structures, systems, and components (SSCs) and Table 19A-2 identifies RTNSS systems with the levels of regulatory treatment indicated as High Regulatory Oversight (HRO),Low Regulatory Oversight (LRO), or Support. Please provide additional information regarding categorization and treatment as follows:

A. *Section 19A.2.1 states that the ATWS actuation logic includes isolation of the Reactor Water Cleanup and Shutdown Cooling (RWCU/SDC) system. Discuss the valves that are isolated by this actuation logic, and their categorization and treatment.*

B. Section 19A.3.1.2, Decay Heat Removal, states that the Fire Protection System (FPS) provides on-site makeup water to extend the decay heat cooling period from 72 hours to 7 days. Discuss the categorization of the FPS components and their treatment.

C. Section 19A.3.1.4, Post-Accident Monitoring, 5 states that portions of the Heating, Ventilation, and Air Conditioning (HVAC) systems in the Reactor Building, Electrical Building, Fuel Building, Control Building, and some areas of the Turbine Building perform component and area cooling functions. The section also states that support for these nonsafety-related functions is required from Reactor Component Cooling Water (RCCW), Plant Service Water (PSW), and the Chilled Water System. Discuss the categorization of these components and functions, and their treatment.

D. Section 19A.4.3, Assessment of Uncertainties, states that the support systems needed to use the Fuel and Auxiliary Pools Cooling System (FAPCS) are the RCCWS, diesel generators, Fuel Building HVAC, and PSWS, that are covered by RTNSS. Discuss the treatment for the components in these systems under the RTNSS process.

E. Section 19A.4.4.8, Shutdown LOCA, states that breaks outside containment can be originated only in the Isolation Condenser System (ICS), RWCU/SDC or FAPCS piping, or instrument lines. The section does not appear to discuss the isolation of instrument lines. Discuss the categorization of the instrument lines and their isolation valves, and their treatment.

F. Section 19A.5, Criterion D: Containment Performance Assessment, states that Criterion D safety concerns are addressed in the ESBWR design, and no RTNSS candidates were identified. Discuss the categorization and treatment of those containment isolation valves, if any, which are not safety-related valves.
G. Section 19A.6 does not discuss potential adverse impacts from the failure of reactor pressure internals (e.g., steam dryer) on safety-related or RTNSS SSCs. Discuss the categorization and treatment of reactor pressure vessel internals (including the steam dryer).

H. Section 19A.6.1.1.3, Analysis of Potential Adverse System Interactions, refers to four motor operated valves attached to the FAPCS Cooling and Cleanup trains when describing the Gravity Driven Cooling System (GDCS). Discuss the categorization and treatment of these valves.

I. Section 19A.6.1.2.1, Design Features, for the Automatic Depressurization System (ADS) refers to the use of safety/relief valves (SRVs) and depressurization valves (DPVs). The section also refers to the nonsafety-related High Pressure Nitrogen Supply System. Discuss the categorization and treatment of SRVs, DPVs, and components in the High Pressure Nitrogen Supply System.

J. Section 19A.6.1.2.3, Analysis of Potential Adverse System Interactions, refers to the SRV solenoids and DPV squibs in the ADS. Discuss thecategorization and treatment of these components.

K. Section 19A.6.1.3.1, Design Features, of the ICS refers to a valve in the bottom of each IC/Passive Containment Cooling (PCC) pool subcompartment, and two valves in the condensate return piping. Discuss the categorization and treatment of these valves.
L. Section 19A.6.1.3.3, Analysis of Potential Adverse System Interactions for the ICS refers to the makeup water supply isolation valve, and the steam supply and condensate return line isolation valves. Discuss the categorization and treatment of these valves.

M. Section 19A.6.1.5.3, Analysis of Potential System Interactions, for the PCCS states that the PCCS and ICS have similar considerations for potential system interactions. Discuss the system interaction considerations and the treatment for components in the PCCS.

N. Section 19A.8.4.5, Diverse Protection System, states that the proposed level of regulatory oversight for the Diverse Protection System (DPS) is contained in Technical Specifications.

Discuss the categorization and treatment of components in the DPS.

GEH Response

A. The Reactor Water Cleanup and Shutdown Cooling (RWCU/SDC) valves that are isolated by SLCS actuation logic are the upper suction line isolation valves (G31-F002A,B and F003A,B) and the lower suction line isolation valves (G31-F007A,B and F008A,B). These valves are containment isolation valves and they are safety-related. Therefore, no additional regulatory treatment is required.

B. The FPS pump and the FPS piping and valves are classified as nonsafety-related. The components for connection of FPS makeup include the Fire Pump Enclosure (FPE), the water supply, the suction pipe from the water supply to the pump, and one of the supply pipes from the FPE to the Reactor Building. This function and the components are classified as RTNSS category B1 (actions required beyond 72 hours to ensure safe

shutdown conditions.) Their regulatory treatment is defined in DCD Tier 2 Section 19A.8.3. The availability requirements placed on the system are specified in the Availability Controls Manual (DCD Chapter 19, Appendix 19A) in ACM 3.7.1. C. Portions of the Heating, Ventilation, and Air Conditioning (HVAC) systems in the Reactor Building, Electrical Building, Fuel Building, Control Building, and some areas of the Turbine Building perform component and area cooling. These systems provide cooling for RTNSS systems that provide active mitigation functions. Support for these HVAC functions is required from Reactor Component Cooling Water (RCCW), Plant Service Water (PSW), and the Chilled Water System. The applicable portions of these systems are classified as RTNSS.

Their regulatory treatment is categorized as Support, as described in Section 19A.8.1 of DCD Chapter 19.

D. The systems that support the RTNSS functions of the Fuel and Auxiliary Pools Cooling System (FAPCS) are RCCWS, Diesel Generators, Fuel Building HVAC, and Plant Service Water. These systems are classified as RTNSS. Their regulatory treatment is categorized as Support, as described in Section 19A.8.1 of DCD Chapter 19.

E. Level and pressure sensing lines, up to the outboard excess flow check valve, are connected to the Reactor Coolant Pressure Boundary (RCPB) and are classified as Quality Group A, ASME Section III, safety-related, and Seismic Category 1. The typical arrangement for these sensing lines is a restricting orifice located inside the containment and a manual isolation valve located outside the containment which is followed by an excess flow check valve. If a line break occurs in a nonsafety-related portion of a sensing line, the excess flow check valve closes to stop the flow of reactor coolant. If there is a single failure of the excess flow check valve, a restriction orifice limits the flow of coolant to within acceptable bounds. Therefore, no additional regulatory treatment is required.

F. As described in DCD Section 3.2.3, the pressure-retaining portions, and their supports, of the primary containment that provide primary containment isolation are safety-related. Therefore, the containment isolation valves are safety-related.

G. Safety-related reactor pressure vessel internal structures are: the SLC header and spargers and piping, in-core guide tubes and stabilizers, and non-pressure boundary portion of in-core housings. Nonsafety-related reactor pressure vessel internals are: the chimney and partitions, chimney head and steam separator assembly, steam dryer assembly, feedwater spargers, surveillance sample holders, and RPV vent assembly. The plant meets the requirements of GDC 4, which requires that reactor internals are designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operations, maintenance, testing, and postulated LOCA.

Furthermore, the main steam flow exits the reactor pressure vessel, past redundant isolation valves, and goes to balance of plant equipment.

Therefore, reactor pressure vessel internals have no adverse impact on safety-related or RTNSS functions. DCD Section 3.9.5 provides details on the classification of safety-related and nonsafety-related reactor internals.

H. The significance of the four motor-operated valves in the FAPCS Cooling and Cleanup trains is whether they have the potential to adversely impact the Gravity Driven Cooling System (GDCS) pools. These valves are not required to operate during accident conditions to support GDCS. Since neither failure to operate, nor inadvertent operation of these valves has an adverse impact on the pools, they are not candidates for RTNSS.
I. The SRVs and DPVs are safety-related. The High Pressure Nitrogen Supply System (HPNSS) does not have an active function with respect to RTNSS. HPNSS provides pressurized nitrogen to charge the safety-related SRV accumulators during normal plant operations. HPNSS is not needed to support SRV actuation during an ADS demand. Therefore, no additional regulatory treatment is required.

J. The SRV solenoids and DPV squibs are safety-related. Therefore, no additional regulatory treatment is required.

K. The locked-open manual valve in the bottom of each IC/Passive Containment Cooling (PCC) pool subcompartment and the two valves in the ICS condensate return piping are verified to be in their correct position by Technical Specification Surveillance Requirements 3.5.4.1 and 3.5.4.3. Therefore the valves are not categorized as RTNSS.
L. Pool inventory makeup during normal operations is controlled by the makeup water supply isolation valve, which is part of the FAPCS pool cooling and cleanup mode. This is not a RTNSS function because this FAPCS mode does not provide pool inventory makeup during an accident. The ICS steam supply and condensate return line isolation valves are safety-related.

Therefore, no additional regulatory treatment is required.

M. Due to similar passive designs and physical arrangements, PCCS and ICS have similar considerations for potential system interactions. For example, the IC/PCC pools are similar in design and function. As described in Section 19A.6.1.3.3, the potential for adverse system interactions in ICS is not significant. In fact, PCCS is less susceptible than ICS to adverse interactions because it requires no active components for operation.
N. In accordance with DCD Section 16.0, the RTNSS functions of the Diverse Protection System (DPS) will be reflected in the Technical Specifications. DCD Section 19A.8.1 describes the RTNSS classification of the DPS.

DCD/NEDO-33201 Impact

DCD Revision 4, Section 19A ACM 3.7.1 has been revised in response to item B of this RAI.

No impact to NEDO 33201 Revision 2.

NRC RAI 22.5-16 S01

In the response to RAI 22.5-16, GEH refers to the Availability Controls Manual or other DCD sections for the treatment of several RTNSS systems and components. The references for those systems discuss technical specification availability provisions (rather than treatment provisions). GEH is requested to describe the treatment provisions, such as controls for design, procurement, installation, testing, monitoring, maintenance, corrective action, and feedback, for RTNSS structures, systems, and components. If this information cannot be provided in the DCD, GEH is requested to specify in the DCD that the COL applicant will provide this information.

GEH Response

DCD Tier 2 Section 19.A.8.2 states that "All RTNSS systems shall be in the scope of the Design Reliability Assurance Program, as directed by DCD Tier 2 Chapter 17, which will be incorporated into the Maintenance Rule program." The Design Reliability Assurance Program, as described in DCD Tier 2 Section 17.4 contains the requirements for treatment of risk-significant, including RTNSS, structures, systems and components.

DCD/NEDO-33201 Impact

No change to DCD Tier 2, Revision 5 will be included in response to this RAI.

No change to NEDO-33201, Rev. 3 will be included in response to this RAI.