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Subject: **Response to Portion of NRC RAI Letter No. 348 Related to ESBWR Design Certification Application – DCD Tier 2 Section 10.4 – Other Features of Steam and Power Conversion System - RAI Number 10.4-17**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to a portion of the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) letter number 348 sent by NRC letter dated June 5, 2009 (Reference 1). RAI Number 10.4-17 is addressed in Enclosure 1.

Enclosure 2 contains the DCD changes to Tier 2 as a result of GEH's response to this RAI. Verified DCD changes associated with these RAI responses 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 09-396 Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, GEH, *Request For Additional Information Letter No. 348 Related to ESBWR Design Certification* dated June 5, 2009

Enclosures:

1. MFN 09-486 - Response to Portion of NRC RAI Letter No. 348 Related to ESBWR Design Certification Application – DCD Tier 2 Section 10.4 – Other Features of Steam and Power Conversion System - RAI Number 10.4-17

2. MFN 09-486 - Response to Portion of NRC RAI Letter No. 348 Related to ESBWR Design Certification Application – DCD Tier 2 Section 10.4 – Other Features of Steam and Power Conversion System - DCD Markups for RAI Number 10.4-17

cc:	AE Cubbage	USNRC (with enclosures)
	JG Head	GEH/Wilmington (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	eDRF Section	0000-0104-6730 Rev. 1(RAI 10.4-17)

Enclosure 1

MFN 09-486

Response to Portion of NRC Request for

Additional Information Letter No. 348

Related to ESBWR Design Certification Application

DCD Tier 2 Section 10.4 –

Other Features of Steam and Power Conversion System -

RAI 10.4-17

NRC RAI 10.4-17:

ESBWR DCD Section 10.4.2, "Main Condenser Evacuation System (MCES)," is designed to remove air and other power cycle noncondensable gases from the main condenser during plant startup, cool down, and power operation and exhaust them to the off-gas system (OGS) or turbine building compartment exhaust (TBCE) subsystem. Therefore, this system interfaces with the condenser and other systems that contain radioactive materials. Acceptance of the MCES is based on meeting the requirements of General Design Criteria (GDC) 4, as it relates to the MCES design for the control of releases of radioactive materials to the environment. Additionally, the system is designed to meet the requirements of GDC 64, as it relates to monitoring of releases of radioactive materials to the environment during normal operation, including anticipated operational occurrences. Since the MCES interfaces with the condenser and other systems that contain radioactive gases, specify, in accordance with the design objectives of RG 4.21, the design features associated with the MCES that both minimize leaks and spills of radioactive gases to the environment and provide for adequate leak protection capability fpr radioactive gases. On the basis of the design criteria and its interfacing with other systems that process radioactive materials, the staff requests the MCES to be added to RG 4.21 Design Objective -1, "Minimize Leaks and spills and provide containment in areas where such events may occur," since the MCES is designed to remove the hydrogen and oxygen produced by radiolysis of water in the reactor, and other power cycle noncondensable gases. Also, the MCES interfaces with systems that are identified in the "Review Interfaces" section of Standard Review Plan Section 10.4.2.I, which contains radioactive materials. Further, the MCES needs to be added to RG 4.21 Design Objective - 2, "Provide for adequate leak detection capability…..," for the above reasons.

GEH Response:

Table 12.3-18 has been revised to include design information for the Main Condenser Evacuation System.

DCD Impact:

DCD Tier 2 Chapter 12 Table 12.3-18 will be revised in Revision 6 as shown on the attached mark-ups.

Enclosure 2

MFN 09-486

Response to Portion of NRC Request for

Additional Information Letter No. 348

Related to ESBWR Design Certification Application

DCD Tier 2 Section 10.4 –

Other Features of Steam and Power Conversion System

DCD Markups for RAI Number 10.4-17

Table 12.3-18

Regulatory Guide 4.21 Design Objective and Applicable DCD Subsection Information[BMO304]

Design Objective 1: Minimize leaks and spills and provide containment in areas where such events may occur	
DCD Chapter Section/Subsection	**Description of design feature in DCD to meet design objective**
10.4.1.2.3 Main Condenser System Operation	The condenser is also designed to receive relief valve discharges and any necessary venting from MSR vessels, feedwater heater shells, gland seal steam header, steam seal regulator, sampling system and various other steam and liquid supply lines. Spray pipes and baffles are designed to provide protection of the condenser tubes and components from high-energy inputs to the condenser. During normal operation, radioactive leakage to the atmosphere via circulating water does not occur because the main condenser shells operate at a vacuum and air leakage is into the shell side of the main condenser.
10.4.2 Main Condenser Evacuation System	Noncondensable gases are removed from the power cycle by the MCES. The MCES removes the hydrogen and oxygen produced by radiolysis of water in the reactor, and other power cycle noncondensable gases. The MCES exhausts to the Offgas System (OGS) during normal power operation and to the Turbine Building Compartment Exhaust (TBCE) subsystem during startup and shutdown.
10.4.3.3 Turbine Gland Seal System Evaluation	Relief valve(s) on the seal steam header prevent excessive seal steam pressure. The valve(s) discharge to the condenser shell.
10.4.7.3 Condensate and Feedwater System Evaluation	The C&FS is designed to minimize leakage with welded construction utilized where practicable. Relief valve discharges and operating vents are channeled through closed systems. If it is necessary to remove a component from service such as a FW heater, pump, or control valve, continued operation of the system is possible by use of the multi-string arrangement and the provisions for isolating and bypassing selected equipment and sections of the system.
11.1	Radioactive Waste Management: Source Terms
11.1.5 Process Leakage Sources	Process leakage results in potential release of noble gases and other volatile fission products via ventilation systems. Liquid from process leaks is collected and routed to the liquid-solid radwaste system. Leakage of fluids from the process system results in the release of radionuclides into plant buildings. In general, the noble radiogases remain airborne and are released to the atmosphere with little delay via the building ventilation exhaust ducts. Other radionuclides partition between air and water and may plate-out on metal surfaces, concrete, and paint. Radioiodines are found in ventilation air as methyl iodide and as inorganic iodine (particulate, elemental, and hypoiodous acid forms). As a consequence of normal steam and water leakage into the drywell, equilibrium drywell concentrations exist during normal operation. Purging of this activity from the drywell to the environment occurs via the Reactor Building Contaminated Area HVAC Subsystem (CONAVS) as described in Subsection 9.4.6.2.

Table 12.3-18
Regulatory Guide 4.21 Design Objective and Applicable DCD Subsection Information

Design Objective 2: Provide for adequate leak detection capability to provide detection of leakage for any SSC which has the potential for leakage	
DCD Chapter Section/Subsection	**Description of design feature in DCD to meet design objective**
9.1.3.2 Fuel and Auxiliary Pools Cooling System Description	The FAPCS is designed to provide for the collection, monitoring, and drainage of pool liner leaks from the spent fuel pools, auxiliary pools, and IC/PCCS pools (refer to Table 9.1-1) to the Liquid Waste Management System. The spent fuel pool is equipped with drainage paths behind the liner welds. These paths are designed to: • Prevent stagnant water buildup behind the liner plate; • Prevent the uncontrolled loss of contaminated pool water; and • Provide liner leak detection and measurement. The reactor well, equipment storage pool, buffer pool, upper and lower fuel transfer pools, cask pool, and IC/PCCS pools are also equipped with stainless steel liners, and shall be equipped with leak detection drains as part of the FAPCS. All leak detection drains are designed to permit free gravity drainage to the Liquid Waste Management System.
9.2	Auxiliary Systems: Water Systems
9.2.1.2 Plant Service Water System Description	Means are provided to detect leakage into the PSWS from the RCCWS, which may contain low levels of radioactivity.
9.2.2.1 RCCWS Design Bases	The RCCWS is designed to limit leakage of radioactive or chemical contamination to the environment.
9.2.6.1 Condensate Storage and Transfer System Design Bases	The Condensate Storage and Transfer System is designed to: • Provide sampling of the retention area sump prior to disposal to determine if the activity of the sump contents is within 10 CFR 20 limits.
10.4	Steam and Power Conversion System: Other Features of Steam and Power Conversion System.
10.4.2.2 Description	Process Radiation Monitoring System (PRMS) radiation detectors in the TBCE system and vent stack produce an alarm in the main control room if abnormal radioactivity is detected (Section 11.5). Radiation monitors are provided on the main steam lines, to trip and isolate the mechanical vacuum pump(s) if abnormal radioactivity is detected in the steam being supplied to the condenser.