HITACHI

GE Hitachi Nuclear Energy

Richard E. Kingston
Vice President, ESBWR Licensing

P.O. Box 780 M/C A-65
Wilmington, NC 28402-0780
USA

T 910.675.6192
F 910.362.6192
rick.kingston@ge.com

MFN 09-715 Docket No. 52-010

November 17, 2009

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. 390 Related to ESBWR Design Certification Application – Fuel Pools – RAI Numbers 9.1-140 and 9.1-143**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Requests for Additional Information (RAIs) 9.1-140 and 9.1-143 sent by NRC Letter No. 390, Reference 1.

GEH responses to RAIs 9.1-140 and 9.1-143 are addressed in Enclosure 1. Enclosure 2 contains the DCD markups associated with these responses.

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

Sincerely,

FOR

Richard E. Kingston
Vice President, ESBWR Licensing

Reference:

1. MFN 09-693, Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, *Request for Additional Information Letter No. 390 Related to ESBWR Design Certification Application*, November 2, 2009

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 390 Related to ESBWR Design Certification Application – Fuel Pools - RAI Numbers 9.1-140 and 9.1-143
2. Response to Portion of NRC Request for Additional Information Letter No. 390 Related to ESBWR Design Certification Application – Fuel Pools - RAI Numbers 9.1-140 and 9.1-143 – DCD Markups

cc:	AE Cubbage	USNRC (with enclosures)
	JG Head	GEH/Wilmington (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	TL Enfinger	GEH/Wilmington (with enclosures)
	eDRF Sections	0000-0109-4302 (RAI 9.1-140)
		0000-0109-4373 (RAI 9.1-143)

Enclosure 1

MFN 09-715

Response to Portion of NRC Request for Additional Information Letter No. 390 Related to ESBWR Design Certification Application

Fuel Pools

RAI Numbers 9.1-140 and 9.1-143

NRC RAI 9.1-140

In Tier 2, Rev 6, Section 9.1.5.2, General, for Overhead Heavy Load Handling Systems, page 9.1-34, it discusses that hoists, cranes, or other lifting devices comply with the requirements of NRC Bulletin 96-02, NUREG-0554, ..., NUREG-0612 Subsection 5.1.1(4) or 5.1.1(5) and ASME NOG-1. The subsections of NUREG-0612 should have included Section 5.1.1(6) that is specific to SFP cranes. Modify Tier 2 by adding this reference.

GEH Response

Section 5.1.1(6) of NUREG-0612 will be added to DCD Tier 2, Subsection 9.1.5.2, as requested and as shown in the attached markup.

DCD Impact

DCD Tier 2, Subsection 9.1.5.2 will be revised as shown in the attached markup.

NRC RAI 9.1-143

In the DCD Tier 2, Section 9.1.4.17 a step in the vessel closure process had operators install both an equipment pool gate and buffer pool gates. However, later in the process, only the equipment pool gate was removed. Clarify why the buffer pool gate is not also removed? Revise the DCD to clarify when the buffer pool gate is removed such that it needs to be installed during the refueling process.

GEH Response

Buffer pool water level is maintained regardless of plant condition, during reactor operation or reactor shut down. Toward the end of a refueling outage, once the containment drywell head is installed and the reactor cavity above is flooded in preparation of reactor start up, the equipment storage pool gate is removed and the buffer pool gate is left in place. There are two reasons for this configuration during reactor operation:

1) Communication between the equipment storage pool and reactor cavity is maintained during reactor operation as the water in these two compartments is credited as a make up source to the IC/PCCS pools. Water in the buffer pool is not credited; therefore, the gate is installed to maintain the separation boundary.

2) Water in the buffer pool is not credited for IC/PCCS pool make-up due to the potential for maintenance or clean-up activities that can occur in the buffer pool during reactor operation. For example, even though all spent fuel must be removed from the buffer pool prior to reactor start up, other irradiated items such as control rods or LPRMs (or dry tubes) can be handled once the outage is completed. Additionally, new fuel is staged in the buffer pool during reactor operation in preparation for the next refueling outage.

The refueling tasks, including manipulation of gates, are presented in Sections 9.1.4.15, 9.1.4.16, and 9.1.4.17. Section 9.1.4.15 discusses activities associated with reactor shut down through reactor disassembly. Section 9.1.4.16 addresses refueling and core verification. Section 9.1.4.17 discusses maintenance activities and presents the tasks associated with reactor reassembly such that the plant configuration, including gates, is prepared for reactor start up. In addition to the text in the sections described above, Figure 9.1-3 provides a sequence flow chart that that describes refueling tasks, including removal and installation of gates.

The gate configuration during normal reactor operation is also the configuration at the beginning of refueling activities. To provide additional clarity of gate configuration at the beginning of the refueling outage, a sentence will be added to the beginning of Subsection 9.1.4.15 of the DCD stating that the equipment pool storage gate is removed and the buffer pool gate is installed.

Once the drywell head, insulation frame, and RPV head are removed, the reactor well is flooded in preparation for fuel movement. When flooding is complete, both the equipment pool storage and buffer pool gates are removed for the refueling process (see Subsections 9.1.4.15, "Removal of Equipment Storage Pool and Buffer Pool Gates", and Figure 9.1-3).

DCD Impact

DCD Tier 2, Subsection 9.1.4.15 will be revised as shown in the attached markup.

Enclosure 2

MFN 09-715

Response to Portion of NRC Request for Additional Information Letter No. 390 Related to ESBWR Design Certification Application

Fuel Pools

RAI Numbers 9.1-140 and 9.1-143

DCD Markups

9.1.5 Overhead Heavy Load Handling (OHLH) Systems

9.1.5.1 Design Bases

The objective for the OHLH system is to control the movement of heavy loads in order to ensure the safe handling of heavy loads, to reduce the potential for uncontrolled movement of heavy loads or load drops, and to limit the consequences of dropping a heavy load.

9.1.5.2 General

The equipment described in this subsection covers items considered as heavy loads that are handled under conditions that mandate critical handling compliance.

Critical load handling conditions relate to the moving of loads, the use of equipment and the performance of operations, which, by inadvertent operation or equipment malfunctions, either separately or in combination, could cause:

- A release of radioactivity;
- A criticality accident;
- The inability to cool fuel within the reactor vessel or within the Spent Fuel Pool; and
- Prevent a safe shutdown of the reactor.

This includes risk assessments of spent fuel and of storage pool levels, cooling of fuel pool water, or new fuel criticality. Critical load handling, therefore, includes all components and equipment used for moving loads weighing more than one fuel assembly with its associated handling devices.

The RB and FB cranes provide a safe and effective means for transporting heavy loads including the handling of new and spent fuel, plant equipment, service tools and fuel casks. Safe handling includes design considerations for maintaining occupational radiation exposure as low as practicable during transportation and handling.

Where applicable, the appropriate seismic category, safety classification, ASME, ANSI, industrial and electrical codes have been identified (refer to Tables 3.2-1 and 9.1-5). The designs conform to the relevant requirements of General Design Criteria 1, 2, 4, and 61 of 10 CFR 50, Appendix A by meeting the guidance of RGs 1.13, 1.29, 1.115, 1.117, ANSI/ANS 57.1, ANSI N14.6, ASME B30.9, and NUREG-0554. The OHLH system is housed within a Seismic Category I structure that is designed to withstand the effects of extreme wind and tornado missiles. The OHLH system is built in accordance with an acceptable QA program, which includes the following program elements:

- Design and procurement document control;
- Instructions, procedures, and drawings;
- Control of purchased material, equipment, and services;
- Inspection;
- Testing and test control;
- Non-conforming items;

- Corrective action; and
- Records.

The lifting capacity of each crane or hoist is designed to at least the maximum actual or anticipated weight of equipment and handling devices in a given area serviced. The hoists, cranes, or other lifting devices comply with the requirements of NRC Bulletin 96-02, NUREG-0554, ANSI N14.6, ASME/ANSI B30.9, ASME/ANSI B30.10, NUREG-0612 Subsection 5.1.1(4) or 5.1.1(5), NUREG-0612 Subsection 5.1.1(6), and ASME NOG-1. Cranes and hoists are also designed to criteria and guidelines of NUREG-0612 Subsection 5.1.1(7), ASME/ANSI B30.2 and CMAA-70 specifications for electrical overhead traveling cranes, including ASME/ANSI B30.11, and ASME/ANSI B30.16 as applicable.

9.1.5.3 Applicable Design Criteria for All OHLH Equipment

All handling equipment subject to heavy loads handling criteria has ratings consistent with lifts required and the design loading will be visibly marked. Cranes/hoists or monorail hoists pass over the centers of gravity of heavy equipment that is to be lifted. In locations where a single monorail or crane handles several pieces of equipment, the routing is such that each transported piece passes clear of other parts.

Pendant control is required for the bridge, trolley, and auxiliary hoist to provide efficient handling of fuel shipping containers during receipt and also to handle fuel during new fuel inspection. The crane control system is selected considering the long lift required through the equipment hatch as well as the precise positioning requirements when handling the RPV and drywell heads, the RPV internals, and the RPV head stud tensioner assembly. The control system provides stepless regulated variable speed capability with high empty-hook speeds. Efficient handling of the drywell and RPV heads and stud tensioner assembly require that the control system provide spotting control. Because fuel shipping cask handling involves a long duration lift, low speed, and spotting control, thermal protection features are incorporated.

Heavy load equipment is also used to handle light loads and related fuel handling tasks. Therefore, much of the handling systems and related design, descriptions, operations, and service task information of Subsection 9.1.4 is applicable here. The cross-reference for the handling operations/equipment and Subsection 9.1.4 is provided in Table 9.1-6.

Transportation routing drawings are made covering the transportation route of every piece of heavy load removable equipment from its installed location to the appropriate service shop or building exit. Routes are arranged to prevent congestion and to assure safety while permitting a free flow of equipment being serviced. The frequency of transportation and usage of route are documented based on the predicted number of times usage either per year or per refueling or service outage.

9.1.5.4 System Description

9.1.5.5 Fuel Building and Reactor Building Cranes

Table 3.2-1 lists the equipment safety designation, QA requirements, and seismic category. Special lifting devices for lifting heavy loads are designed using a dual load path or designed for a safety factor of 10 or better with respect to the ultimate strength of the material used. NUREGsequence diagram is shown on Figure 9.1-3. It depicts, in chronological order, each event based on historical BWR fleet experience.

9.1.4.14 Arrival of Fuel at Reactor Site

Upon receipt, each new fuel bundle is uncrated from its shipping crate and the fuel bundle container is moved to the floor of the FB using the FB crane. The containers must be in a vertical position before removal of the fuel, which is usually accomplished by the combined use of the FB crane auxiliary hook and the new fuel inspection stand. The fuel is inspected and channels placed over the fuel bundle. The fuel assembly is then placed in the spent storage racks.

Channeling New Fuel

Channeling of new fuel is performed on the new fuel inspection stand. With the aid of a channel handling tool, the channel is lowered over the fuel after inspection and bolted in place using a channel bolt wrench. The fuel is then transported using the FB crane auxiliary hook to the spent fuel storage pool, in preparation for eventual transfer to the RB for fueling the reactor.

9.1.4.15 Reactor Preparation for Refueling

The reactor is shut down and cooled down to reduce the reactor water temperature to under 50°C (120°F), so that open vessel work may take place. The configuration of gates during reactor operation and as the reactor is shut down for refueling has the equipment storage pool gate removed and the buffer pool gate installed.

Drywell Head Removal

The equipment storage pool gate will be installed to facilitate draining of the reactor well. Following drain down of the reactor well and the completion of wall cleaning, the drywell head is lifted by the RB crane and transported to its storage area on the refueling floor. The drywell seal protection is then installed before any other activity can proceed.

Reactor Bulkhead Servicing

Following drywell head removal, penetration openings in the reactor bulkhead are sealed to prevent leakage from well flooding. The RPV head insulation frame is removed and placed in its storage area on the refueling floor.

Vessel Head Removal

Removal of the reactor vessel head is performed with the RB crane, utilizing the RPV strongback. The RB crane and RPV strongback with the RPV head stud tensioning system is used to handle the RPV head and attachments. The strongback is designed so that no single component failure causes the load to drop or swing uncontrollably out of the horizontal attitude. The RPV strongback and stud tensioning equipment is detached from the RB crane during stud de-tensioning or tensioning operations. Following stud de-tensioning operations, the RB crane is used to lift the RPV head using the previously mounted strongback with the tensioning system, nuts, and washers.