GE Hitachi Nuclear Energy

James C. Kinsey
Vice President, ESBWR Licensing

PO Box 780 M/C A-55
Wilmington, NC 28402-0780
USA

T 910 675 5057
F 910 362 5057
jim.kinsey@ge.com

MFN 08-439

Docket No. 52-010

May 1, 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. 158 Related to ESBWR Design Certification Application - Auxiliary Systems - RAI Number 9.1-50**

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 158 dated February 29, 2008, Reference 1. The GEH response to RAI Number 9.1-50 is addressed in Enclosure 1.

Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box. The marked-up pages may contain unverified changes in addition to the verified changes resulting from this RAI response. Other changes shown in the markup(s) may not be fully developed and approved for inclusion in DCD Revision 5.

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

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

DO68
NRO

Reference:

1. MFN 08-209, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 158 Related to the ESBWR Design Certification Application,* February 29, 2008.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 158 Related to ESBWR Design Certification Application – Auxiliary Systems - RAI Number 9.1-50

cc:	AE Cubbage	USNRC (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	DH Hinds	GEH/Wilmington (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	eDRF	0000-0084-7575

Enclosure 1

MFN 08-439

*Response to Portion of NRC Request for

Additional Information Letter No. 158

Related to ESBWR Design Certification Application

Auxiliary Systems

RAI Number 9.1-50

***Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box. The marked-up pages may contain unverified changes in addition to the verified changes resulting from this RAI response. Other changes shown in the markup(s) may not be fully developed and approved for inclusion in DCD Revision 5.**

NRC RAI 9.1-50

DCD Tier 2, Rev. 4, Section 9.1.4.5 states that there are interlocks in the refueling machine to ensure that the grapple, in its retracted position, provides sufficient water shielding over the active fuel during transit. Please revise DCD Tier 2 to include the actual height of water above the top of active fuel that will be provided by the interlocks to ensure adequate shielding.

GEH Response

DCD Tier 2, Subsections 9.1.4.1 and 9.1.4.5 will be revised in Revision 5 to include the actual height of water 2591 mm (8.5 ft.) above the top of active fuel that is provided by the interlocks to ensure adequate shielding.

DCD Impact

DCD Tier 2, Subsections 9.1.4.1 and 9.1.4.5 will be revised in Revision 5 as noted in the attached markup.

9.1.4 Light Load Handling System (Related to Refueling)

The reactor and fuel servicing system associated with the handling of light loads includes the fuel storage arrangements and the necessary facilities, special tools, and equipment required to accomplish normal fueling and refueling outage tasks.

The system is integrated with other customer provided equipment and supporting services to enhance and implement the fuel handling procedure in a safe and efficient manner.

9.1.4.1 Design Bases

The fuel handling system is designed to provide a safe and effective means for transporting and handling fuel from the time it reaches the plant until it leaves the plant after post-irradiation cooling. Safe handling of fuel includes design considerations for maintaining occupational radiation exposures as low as reasonably achievable (ALARA).

The following subsections briefly describe the integrated fuel transfer and reactor vessel servicing system that ensures that the design bases of the fuel handling system and the requirements of Regulatory Guide 1.13 are satisfied.

Table 9.1-4 provides the design criteria for major fuel handling system equipment and lists the safety class, quality ~~group~~ requirement and seismic category. ~~Where applicable,~~ Table 9.1-5 identifies applicable ASME, American National Standards Institute (ANSI), Industrial and Electrical Codes. Additional design criteria are described below and expanded further discussed in Subsection 9.1.4.2.

Fuel transfer from the point of receipt up to inspection, storage, and placement in the reactor core is accomplished with fuel grapples. A general purpose fuel grapple is used when fuel movement is performed by the fuel building crane on the fuel building floor prior to placement in the fuel preparation machine and transfer to the Spent Fuel Pool or buffer pool. During refueling operations, however, fuel movement is performed in the fuel building by the fuel handling machine and in the Reactor Building by the refueling machine telescoping grapples.

The refueling machine and the fuel handling machine are classified as nonsafety-related Seismic Category ~~H~~I, and are constructed in accordance with ~~a supplemental~~the quality assurance ~~program~~ requirements of 10 CFR 50, Appendix B to ensure compliance with applicable design, construction and test requirements.

Working loads of the refueling machine and fuel handling machine structures are in accordance with the American Institute of Steel and Construction (AISC) Manual of Steel Construction. All parts of the hoist systems are designed to have a safety factor of at least 10, based on the ultimate strength of the material. A redundant load path is incorporated in the fuel grapples.

Both the refueling machine and the fuel handling machine have telescoping masts with integral grapples mounted from a trolley structure. They are also equipped with auxiliary hoists and jib cranes to which other grapples are attached when required. Both have redundant safety features and indicators that ensure positive engagement with fuel bundles. The fuel masts have interlocks that provide the necessary position control boundaries during deployment and limit travel during transfer of irradiated fuel. These safety provisions prevent physical damage to the mast~~ensure that.~~ A~~a~~ safe water shielding depth of at least 2591 mm (8.5 ft.) is always maintained over the active fuel during transit~~, while preventing physical damage to the mast~~.

equipment consoles on the fuel building floor. The crane consists of two parallel girders along which the trolley traverses across its span.

Among its required light load lifting tasks during plant operation is to handle small tools and equipment normally used during inspection and servicing activities.

During fuel transport, the main crane is also called upon to move and store pool gates. The principal design criteria for the Reactor Building crane are contained in Subsection 9.1.5.

9.1.4.5 Refueling Equipment

Refueling Machine

The refueling machine is located in the Reactor Building and is similar to a gantry style crane and is used to transport fuel and reactor components to and from buffer pool storage, the inclined fuel transfer system, and the reactor vessel. The machine spans the buffer pool on embedded tracks in the refueling floor. A telescoping mast and grapple suspended from a trolley system is used to lift and orient fuel assemblies for placement in the core or storage rack. Control of the machine is from an operator station on the refueling machine.

A position indicating system and travel limit computer is provided to locate the grapple over the vessel core and prevent collisions with pool obstacles. Two auxiliary hoists are provided for in-core servicing. The grapple in its retracted position provides sufficient water shielding of at least 2591 mm (8.5 ft.) over the active fuel during transit. The fuel grapple hoist has a redundant load path so that no single component failure results in a fuel bundle drop. Interlocks on the machine:

- Prevent hoisting a fuel assembly over the vessel with a control rod removed;
- Prevent collision with fuel pool walls or other structures;
- Limit travel of the fuel grapple;
- Interlock grapple hook engagement with hoist load and hoist up power; and
- Ensure correct sequencing of the transfer operation in the automatic or manual mode.

The refueling machine is Seismic Class ~~II~~. The refueling machine is designed to withstand the SSE. A standard dynamic analysis using the appropriate response spectra is performed to demonstrate compliance to design requirements. Except for hoisting speed, the fuel hoist is designed to meet the requirements of NUREG-0554, Single Failure Proof Cranes. An auxiliary hoist is designed to meet the requirements of NUREG-0612, Control of Heavy Loads at Nuclear Power Plants to allow simultaneous handling of the control blade and fuel support casting with the dual function grapple. A second auxiliary hoist is provided for handling smaller lightweight tools.

Fuel Handling Machine

The fuel handling machine is similar to a gantry style crane, and is used to transport fuel and reactor components to and from the inclined fuel transfer system and the spent fuel storage and equipment storage racks. It is also used to move spent fuel to the shipping cask. The machine spans the Spent Fuel Pool on embedded tracks in the refueling floor. A telescoping mast and grapple suspended from a trolley system is used to lift and orient fuel assemblies for placement

in the cask or storage rack. Control of the machine is from an operator station on the fuel handling machine.

A position indicating system and travel limit computer is provided to locate the grapple over the spent fuel racks, IFTS, and prevent collisions with pool obstacles. An auxiliary hoist is provided for additional servicing. The grapple in its retracted position provides sufficient water shielding of at least 2591 mm (8.5 ft.) over the active fuel during transit. The fuel grapple hoist has a redundant load path so that no single component failure results in a fuel bundle drop. Interlocks on the machine:

- Prevent collision with fuel pool walls or other structures;
- Limit travel of the fuel grapple;
- Interlock grapple hook engagement with hoist load and hoist up power; and
- Ensure correct sequencing of the transfer operation in the automatic or manual mode.

The fuel handling machine is Seismic Class ~~II~~I. The fuel handling machine is designed to withstand the SSE. A standard dynamic analysis using the appropriate response spectra is performed to demonstrate compliance to design requirements. Except for hoisting speed, the fuel hoist is design to meet the requirements of NUREG-0554, Single Failure Proof Cranes.

9.1.4.6 Fuel Servicing Equipment

Fuel Prep Machine

Two fuel preparation machines are mounted on the wall of the Spent Fuel Pool and are used to assist in the loading of new fuel into the spent fuel storage pool racks and for ~~channeling and~~ re-channeling ~~of new and~~ spent fuel assemblies. The machines are also used with fuel inspection fixtures to provide an underwater inspection capability.

Each fuel preparation machine consists of a work platform, a frame, and a movable carriage. The frame and movable carriage are located below the normal water level in the Spent Fuel Pool, thus providing a water shield for the fuel assemblies being handled. The fuel preparation machine carriage has an up-travel-stop to prevent raising fuel above the safe water shield level. The operator places assembled new fuel in the fuel preparation machine, the carriage is lowered and the fuel removed from the fuel preparation machine using the fuel handling machine.

New Fuel Inspection Stand

The new fuel inspection stand is a vertical frame mounted in a pit that supports two fuel bundles contained in a mechanically driven inspection carriage. In the carriage the lower tie plate of each fuel bundle rests on a bearing seat and at the top each fuel assembly is supported in a separate bearing assembly. The fuel assemblies can be individually rotated about their longitudinal axis to permit viewing all sides. The fuel channel is placed on the fuel bundle in the new fuel inspection stand.

To facilitate fuel inspection, the stand is set into an inspection pit designed to allow the carriage to be lowered and raised permitting eye level viewing by inspecting personnel on the refueling floor.