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Security and Proprietary Notice
This letter forwards security and proprietary information in accordance with 10CFR2.390. Upon the removal of Enclosures 1 and 3, the balance of this letter may be considered non-security-related and non-proprietary.

MFN 09-792, Revision 1

Docket No. 52-010

January 28, 2010

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: **Revised Response (Revision 1) to Portion of NRC Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6 – Dose Rate – RAI Number 9.1-50 S04**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) revised response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) 9.1-50 S04 sent by NRC Letter 380, Reference 1. This revised response provides additional explanatory text and markups to DCD, Tier 2, Chapter 3 not provided in the original response (Reference 2). The response to RAI Number 9.1-50 S03 (Reference 3) was previously submitted to the NRC in response to Reference 4.

The GEH revised response (Revision 1) to RAI Number 9.1-50 S04 is contained in Enclosure 1, which is GEH proprietary information as defined by 10 CFR 2.390. GEH customarily maintains this information in confidence and withholds it from public disclosure. Enclosure 2 provides a public version of Enclosure 1 with proprietary information redacted.

Enclosure 3 contains the security-related DCD markups associated with this response. The security-related information is identified by the designation "{{{Security-Related Information - Withhold Under 10 CFR 2.390}}}". GEH hereby requests this information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390. Enclosure 4 provides a public version of Enclosure 3 with security-related information redacted.

The affidavit contained in Enclosure 5 identifies that the information contained in Enclosure 1 has been handled and classified as sensitive and proprietary to GEH. GEH hereby requests that the information in Enclosure 1 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17.

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NRO

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

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

References:

1. MFN 09-684, Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, *Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6*, October 28, 2009
2. MFN 09-792, Response to Portion of NRC Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6 – Dose Rate – RAI Number 9.1-50 S04, December 18, 2009
3. MFN 09-427, Response to Portion of NRC Request for Additional Information Letter Number No. 337 Related to ESBWR Design Certification Application – Auxiliary Systems - RAI Number 9.1-50 S03, June 25, 2009
4. MFN 09-331, Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, *Request for Additional Information Letter No. 337 Related to Design Control Document (DCD) Revision 5*, May 14, 2009

Enclosures:

1. Revised Response (Revision 1) to Portion of NRC Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6 – Dose Rate – RAI Number 9.1-50 S04 – GEH Proprietary Information
2. Revised Response (Revision 1) to Portion of NRC Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6 – Dose Rate – RAI Number 9.1-50 S04 – Public Version
3. Revised Response (Revision 1) to Portion of NRC Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6 – Dose Rate – RAI Number 9.1-50 S04 – DCD Markups – Security-Related Information
4. Revised Response (Revision 1) to Portion of NRC Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6 – Dose Rate – RAI Number 9.1-50 S04 – DCD Markups – Public Version
5. Revised Response (Revision 1) to Portion of NRC Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6 – Dose Rate – RAI Number 9.1-50 S04 - Affidavit

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 Section	0000-0111-1912 (Original Response, including DCD Tier 2, Chapter 9 markups)
		0000-0111-1912, Rev. 1 (Revision 1 Response, including DCD Tier 2 Chapter 3 markups)

Enclosure 2

MFN 09-792, Revision 1

Revised Response (Revision 1) to Portion of NRC Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6

Dose Rate

RAI Number 9.1-50 S04

Public Version

NRC RAI 9.1-50 S04

In the response to RAI 9.1-50 S03, GEH states that the estimated dose rate to a person standing on a fuel handling machine platform during the handling of a fuel assembly will be [[ ]] mrem/h at 2 meters above the surface of the spent fuel pool water.

In the recent response to RAI 12.2-27, GEH stated that, using the revised fuel element source term calculated in response to supplement 2 of RAI 12.2-19, "the resulting radiation level on the fuel transfer machine increases from [[ ]] mrem/h at 2 meters to [[ ]] mrem/h at 2 meters."

DCD Tier 2 Table 1.9-22, "Industrial Codes and Standards Applicable to ESBWR" lists ANSI/ANS-57.1-1992 as being applicable to the ESBWR design. Paragraph 6.3.4.1.5 of ANSI/ANS-57.1-1992 states that "Fuel handling equipment shall be designed so that the operator will not be exposed to >2.5 mrem/hr from an irradiated fuel unit, control component, or both, elevated to the up-position interlock with the pool at normal operating water level."

Provide justification of how the estimated dose rate of [[ ]] mrem/h on the ESBWR fuel handling machine during the handling of a fuel assembly meets the criteria stated in this ANSI/ANS standard for a maximum dose rate of 2.5 mrem/h to the operator for fuel handling equipment.

GEH Revised Response (Revision 1)

In response to this RAI supplement, GEH will make the following changes. First, the depth of water coverage with the RB refueling floor pools at normal water level is increased from 2.59 m (8.5 feet) to 2.74 m (9 feet) over a fuel assembly on the grapple with the mast raised to the up-position interlock when transiting fuel to/from the reactor vessel. Second, additional shielding, equivalent to one foot of water, is incorporated in the refueling machine design to ensure the dose rate is within the limit stated in standard ANSI/ANS 57.1-1992. Third, for the fuel handling machine on the FB fuel handling floor, the safe shielding depth when transiting fuel to/from the spent fuel racks is increased by adjusting the up-position interlock setting from 2.59 m (8.5 feet) to 3.05 m (10 ft), which satisfies the dose rate limit of ANSI/ANS 57.1.

In response to the original NRC request, GEH stated that the refueling machine grapple up-position interlock provided a depth of 2591 mm (8.5 feet) in MFN 08-439 (RAI 9.1-50); which is now revised to 2.74 m (9 feet), as stated above. The NRC made a supplemental request with reference to SRP 9.1.2 and RG 1.13 for which GEH responded in MFN 08-557 (RAI 9.1-50 S01) that the water depth of 2591 mm (8.5 feet) "provides adequate shielding."

In a follow-up request, the NRC requested that GEH either perform a design modification for a minimum shielding depth to 3.05 m (10 feet) or identify the design features that satisfy the SRP acceptance criteria. GEH responded in MFN 09-169 (RAI 9.1-50 S02) that the shielding calculation would be made available for NRC review and added a dose rate from the calculation results to DCD Tier 2, Subsection 12.3.2.2.3.

In supplement 03 to the RAI, the NRC requested additional clarifications regarding the dose rate calculations, and by the response in MFN 09-427 (RAI 9.1-50 S03), GEH reported the dose rate of [[ ]]. By a separate request, the NRC asked for additional clarification of the dose rate, and in MFN 09-569 (RAI 12.2-27) GEH reported a dose rate of [[ ]].

There is sufficient overall water depth in both the refueling pools and the fuel building pools to provide safe shielding water coverage. However, the up-position interlock setting for the grapple of the refueling machine on the refuel deck is constrained by the need to lift the fuel high enough to clear physical obstructions to fuel transit. Similar physical obstruction is not present for fuel transit on the grapple of the fuel handling machine. Thus, the safe shield depth can be achieved by setting the up-position interlock for the fuel handling machine lower to obtain 10 foot coverage without raising the spent fuel pool normal water level or modifying the fuel handling machine.

The refueling machine shielding depth increase of 152 mm (6 inches) is effected by raising the design normal level of the upper pools located between Elevations 27000 mm and 34000 mm of the Reactor Building (RB) (DCD Tier 2, Figure 1.2-10). The normal refueling pools water level with this level increase remains below the refueling floor elevation. The additional volume of water is within the capacity of the IC/PCCS Pools and Expansion Pools in the event of an inadvertent opening of an Equipment Storage Pool to IC/PCCS Pool cross-tie line. The additional water volume does not exceed the total volume of water considered in the analysis of the RB, or alter the structural evaluation results of the RB as described in DCD Tier 2, Appendices 3F and 3G. The additional water volume does not inhibit fuel handling or core alterations activities, and does not alter the assumptions used in the evaluation of the fuel handling accident (DCD Tier 2, Section 15.4.1).

The small volume increase to the upper pools by raising the normal water level adds a proportional margin to the evaluation of time-to-boiling in the event of a loss of normal decay heat removal from the core during Refuel Mode activities. This change to increase the RB refueling pools normal water level is also benign with respect to any evaluated event or equipment malfunction probability frequencies, and is not a part of any initiating event affecting the core, vessel, or the refueling facilities.

With the RB refueling pools coverage for the refueling machine increased to 2.74 m (9 ft), combined with additional refueling machine shielding equivalent to one foot of water; and with the FB spent fuel pool safe shielding depth for the fuel handling machine set to 3.05 m (10 ft), GEH commits that the dose rate satisfies the ANSI/ANS 57.1-1992 standard dose rate for operator exposure of no greater than 2.5 mrem/hr. For NRC convenience, the proprietary dose calculation that supports this commitment is available for viewing in the GE Washington, D.C., office.

DCD Impact

DCD Tier 2, Subsections 9.1.4.1, 9.1.4.5 and 12.3.2.2.3; and Figures 12.3-9, 12.3-10 and 12.3-11, will be revised as noted in the attached markups. Note, these markups are identical to those provided in the original response to this RAI, provided via Letter MFN 09-792, dated December 18, 2009.

Additionally, DCD Tier 2, Subsection 3.8.2.1.4 and Table 3G.1-4 will be revised to identify the correct value of the refueling pools water depth with the additional 152 mm (6 inches) depth increase. These markups are new to this revised response.

Enclosure 4

MFN 09-792, Revision 1

Revised Response (Revision 1) to Portion of NRC Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6

Dose Rate

RAI Number 9.1-50 S04

DCD Markups

Public Version

3.8.2.1.4 Drywell Head

A 10,400 mm (34 ft. 1-7/16 in.) diameter opening in the RCCV upper drywell top slab over the RPV is covered with a removable steel torispherical drywell head, which is part of the pressure boundary. This structure is shown in Appendix 3G Figure 3G.1-51. The drywell head is designed for removal during reactor refueling and for replacement prior to reactor operation using the RB crane. One pair of mating flanges is anchored in the drywell top slab and the other is welded integrally with the drywell head. Provisions are made for testing the flange seals without pressurizing the drywell.

There is water in the reactor well above the drywell head during normal operation. The height of water is ~~6.7 m (21 ft. 11-3/4 in.)~~found in Table 3G.1-4. The stainless steel clad thickness for the drywell head is 2.5 mm (98 mils) and is determined in accordance with NB-3122.3 requirements so that it results in negligible change to the stress in the base metal.

There are six support brackets attached to the inner surface of the drywell head circumferentially to support the head on the operating floor during refueling. These support brackets have no stiffening effect and do not resist loads when the head is in the installed configuration.

To provide a leak resistant refueling seal, a structural seal plate with an attached compressible-bellows sealing mechanism between the Reactor Vessel and Upper Drywell opening is utilized. The Refueling Seal is a continuous gusseted radial plate that is anchored to the Drywell opening in the Top floor slab. The radial plate surrounds the RPV with a radial gap opening to allow for thermal radial expansion of the RPV. A circumferential radial bracket from the RPV connects to a circumferential bellows that is also connected to the underside of the Drywell opening plate, thus providing a refueling seal, and allowing for axial thermal expansion of the RPV.

3.8.2.1.5 PCCS Condenser

There are six PCCS Condensers located in the PCCS subcompartment pools. The condensers form an integral part of the containment boundary while the pool structure and pool water are outside containment. The PCCS Condensers are described in Subsection 6.2.2, and their structural evaluation is documented in Appendix 3G.

3.8.2.2 Applicable Codes, Standards, Specifications and Regulatory Guides

3.8.2.2.1 Codes, Standards and Regulatory Guides

[*In addition to the documents specified in Subsection 3.8.1.2.2, the following code, standard and regulatory guide apply:*

(1) ASME B&PV Code, Section III, Division 1, Nuclear Power Plant Components, Subsection NE, Class MC and Code Case N-284.

(2) ANSI/AISC N690-1994s2 (2004) Specification for the Design, Fabrication and Erection of Steel Safety-Related Structures for Nuclear Facilities.

(3) Regulatory Guide 1.57, Design Limits and Loading Combinations for Metal Primary Reactor Containment Components.]*

Text sections that are bracketed and italicized with an asterisk following the brackets are designated as Tier 2. Prior NRC approval is required to change.

Table 3G.1-4

Equipment and Hydrostatic Loads in RB Pools

Description	*Weight*	*Remarks*
Reactor Well		
a. Water (H=6.85~~7~~m)	*66 kN/m²*	
b. Wall Liner	*1.0 kN/m²*	
c. Floor Liner	*1.6 kN/m²*	
Equipment Storage Pool		
a. Water (H=6.85~~7~~m)	*66 kN/m²*	
b. Wall Liner	*1.0 kN/m²*	
c. Floor Liner	*1.6 kN/m²*	
d. Steam Dryer, Steam Separator	*66 kN/m²*	*During refueling*
Fuel Buffer Pool		
a. Water (H=6.85~~7~~m)	*66 kN/m²*	
b. Wall Liner	*1.0 kN/m²*	
c. Floor Liner	*1.6 kN/m²*	
d. Fuel Storage Racks	*153 kN/m²*	*During refueling*
IC/PCCS Pools		
a. Water (H=4.8m)	*47 kN/m²*	
b. Wall Liner	*1.0 kN/m²*	
c. Floor Liner	*1.6 kN/m²*	
d. IC heat exchanger	*333 kN/unit*	
e. PCCS heat exchanger	*233 kN/unit*	
Inclined Fuel Transfer Tube Pool		
a. Water (H=11.64m)	*114 kN/m²*	
b. Wall Liner	*1.0 kN/m²*	
c. Floor Liner	*1.6 kN/m²*	
IC/PCCS Expansion Pools		
a. Water (H=4.8m)	*47 kN/m²*	
b. Wall Liner	*1.0 kN/m²*	
c. Floor Liner	*1.6 kN/m²*	
Equipment Storage Pool Gate	*300 kN*	

valve. A local panel-mounted flow transmitter sends the signals from these transmitters to flow indicators in the MCR.

System Controls

All FAPCS operating modes are manually initiated, except Suppression Pool Cooling (SPC) mode. The SPC mode is initiated either manually, or automatically upon receipt of a high suppression pool temperature signal from the Containment Monitoring System. The automatic SPC mode initiation selects the FAPCS standby train (if available) to be initiated.

Upon receipt of a containment isolation signal from the Leak Detection and Isolation System, all containment isolation valves are signaled to close, with the exception of the containment isolation valves on the suppression pool supply and return lines as well as the drywell spray line.

FAPCS cooling and cleanup train pumps are automatically tripped under the following operating conditions:

- Low water levels in skimmer surge tank;
- Low water level in Suppression Pool;
- Low water level in GDCS pools;
- High water level in GDCS pools;
- Low pump suction pressure;
- Low pump discharge flow; and
- High pump discharge flow.

The FAPCS IC/PCCS pools cooling and cleanup subsystem pump is automatically tripped on low water level in IC/PCCSpools. Water level in the skimmer surge tanks is maintained by automatic open/closure of the makeup water supply isolation valve. Water level in the IC/PCCS pools is maintained by automatic open/closure of the makeup water supply isolation valve.

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.

This Subsection provides the description for the ESBWR Standard Plant light load handling system and how the system satisfies the guidelines of NUREG-0612.

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 RG 1.13 are satisfied.

Table 3.2-1 provides the design criteria for major fuel handling system equipment and lists the safety class, quality requirement and seismic category. Table 9.1-5 identifies applicable ASME, American National Standards Institute (ANSI), Industrial and Electrical Codes. Additional design criteria are described below and further discussed in Subsection 9.1.4.2. Relevant interlocks for the fuel handling system discussed in Subsection 9.1.4 are a partial list of the interlocks listed in Table 1 of ANSI/ANS 57.1. The interlocks listed in Table 1 of ANSI/ANS 57.1 are applicable to the ESBWR design except for interlocks associated with the New Fuel Elevator, which is not a part of the ESBWR design.

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 FB crane on the FB 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 FB by the fuel handling machine and in the RB by the refueling machine telescoping grapples.

The refueling machine and the fuel handling machine are classified as nonsafety-related Seismic Category I, and are constructed in accordance with the QA 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 ten, 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. A safeSafe water shielding depth of at least 2591 mm of the operator on either the refueling machine or fuel handling machine is achieved by shielding that is equivalent to a water depth of at least 3.05 m (8.510.0 ft.) that is always maintained over the active fuel during transit.

The spent fuel cask pit is intentionally located outside the areas normally confined to fuel movement. The cask and other heavy loads are not permitted to encroach within any part of any spent fuel, spent fuel storage pool, or safety-related structure.

Inadvertent cask movement by the main crane over the fuel storage pools is prevented by travel limit controls. See Subsection 9.1.5.

9.1.4.2 System Description

Table 9.1-6 is a listing of typical heavy-load tools and servicing equipment, used to handle light loads. The following Subsections describe the use of some of the major tools and equipment and address safety aspects of the design where applicable for light loads.

9.1.4.3 Spent Fuel Cask

Not in ESBWR Standard Plant Scope.

9.1.4.4 Overhead Bridge Cranes

Fuel Building Crane

The FB crane is classified as Seismic Category I to maintain crane structural integrity. The crane is used for lifting large heavy components and tools up to and over the FB floor. The crane is also used during plant maintenance activities to move light loads such as inspection equipment consoles on the FB floor. The crane consists of two parallel girders along which the trolley traverses across its span. It is supported on its track on the FB wall structural columns.

Among its required light load lifting tasks during fuel handling is to lift the fuel bundle from the shipping container and place it in the new fuel inspections stand. It is also used to remove the channeled fuel assembly from the fuel inspection stand and place it in the fuel preparation machine.

The FB crane is required for lifting heavy components, fuel containers, fuel assemblies during inspection, and handling the fuel shipping cask. It also provides extensive support to general construction and operation activities in the FB. The principal design criteria for the FB crane is the same as the RB crane as contained in Subsection 9.1.5.

Reactor Building Crane

The RB crane is classified as Seismic Category I to maintain crane structural integrity. The crane is used for lifting large heavy components and tools up to and over the refueling floor. The crane is also used during plant maintenance activities to move light loads such as inspection equipment consoles on the FB 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 RB crane are contained in Subsection 9.1.5.

9.1.4.5 Refueling Equipment

Refueling Machine

The refueling machine is located in the RB 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 that traverse ~~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 by integrally installed shielding (equivalent to one foot of water) on the telescoping mast in combination with maintaining a safe shielding water depth of at least 2591 mm2.74 m (89.05 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 Category I. 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 and ASME NOG-1, Rules for Construction of Overhead and Gantry 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 located in the FB and 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 refuelingfuel handling 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 3.05 m (10.08.5 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 Category 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 and ASME NOG-1, Rules for Construction of Overhead and Gantry Cranes.

The ESBWR employs a passive cooling system in addition to the RWCU/SDC System for cooling the core and vessel. Access into the cubicles is not required to operate the systems. All such components that could become contaminated in the event of an accident are located in the containment except those components that would be used as part of the RWCU/SDC System.

Fuel Storage - The fuel storage pool is designed to ensure the dose rate around the pool area is less than 25 μSv/hr (2.5 mrem/hr). In the event of an anticipated operational occurrence where the fuel sustains significant damage, such as a fuel drop accident, airborne dose rates in the pool area could significantly exceed this dose rate.

Fuel Handling – A In combination with integral shielding installed on the refueling machine (equivalent to one foot of water), a safe water shielding depth of at least 2591 mm 2.74 m (89.05 ft.) is always maintained over the active fuel during transit of a single grappled fuel bundle from/to the reactor vessel. or For the fuel handling machine, a safe shielding depth of 3.05 m (10 ft) is maintained over the active fuel during transit of a single grappled fuel bundle from/to the spent fuel racks. Under these conditions, the dose rate is calculated to be less than 25 267 μSv/hr (2.57 mrem/hr) at the water surface, satisfying the dose rate standard of ANSI/ANS 57.1. The effective dose rate for plant personnel on the refueling floor or fuel handling floor, and for the operators on the refueling machine or the fuel handling machine, is consistent with Figures 12.3-4, 12.3-9, 12.3-10 and 12.3-11.

Control Room - The dose rate in the MCR is limited to 6 μSv/hr (0.6 mrem/hr) during normal reactor operating conditions. The outer walls of the Control Building (CB) are designed to attenuate radiation from radioactive materials contained within the RB and from possible airborne radiation surrounding the CB following a LOCA. The walls provide sufficient shielding to limit the direct-shine exposure of MCR personnel following a LOCA to a fraction of the 5 rem limit as is required by 10 CFR 50 Appendix A, GDC 19.

Main steam tunnel - The main steam tunnel extends from the primary containment boundary in the RB up to the turbine stop valves. The primary purpose of the steam tunnel is to shield the plant complex from N-16 gamma shine in the main steam lines. The tunnel walls provide sufficient shielding to limit the direct-shine exposure from the main steam lines at any point that may be inhabited during normal operations.

12.3.3 Ventilation

The HVAC systems for the various buildings in the plant are discussed in Section 9.4, including the design bases, system descriptions, and evaluations with regard to the heating, cooling, and ventilating capabilities of the systems. This Subsection discusses the radiation control aspects of the HVAC systems.

12.3.3.1 Design Objectives

The following design objectives apply to all building ventilation systems:

- The systems are designed to make airborne radiation exposures to plant personnel and releases to the environment ALARA. To achieve this objective, the guidance provided in Reference 12.3-11 is followed.
- The concentration of radionuclides in the air in areas accessible to personnel for normal plant surveillance and maintenance is below the concentrations that define an airborne

Figure 12.3-9. Nuclear Island Radiation Zones for Full Power and Shutdown Operation - Elevation 34000 mm

Figure 12.3-10. Nuclear Island Radiation Zones for Full Power and Shutdown Operation Section A-A

Figure 12.3-11. Nuclear Island Radiation Zones for Full Power and Shutdown Operation Section B-B

Enclosure 5

MFN 09-792, Revision 1

Revised Response (Revision 1) to Portion of NRC Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6

Dose Rate

RAI Number 9.1-50 S04

Affidavit

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, **Larry J. Tucker**, state as follows:

(1) I am Manager, ESBWR Engineering, GE Hitachi Nuclear Energy ("GEH"), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in enclosure 1 of GEH's letter, MFN 09-792, Revision 1, Mr. Richard E. Kingston to U.S. Nuclear Regulatory Commission, entitled "Revised Response (Revision 1) to Portion of NRC Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6 – Dose Rate – RAI Number 9.1-50 S04" dated January 28, 2010. The proprietary information in enclosure 1, entitled "*Revised Response (Revision 1) to Portion of NRC Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6 – Dose Rate – RAI Number 9.1-50 S04 - GEH Proprietary Information,*" is delineated by a [[dotted underline inside double square brackets{3}]]. Figures and large equation objects are identified with double square brackets before and after the object. In each case, the superscript notation {3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GEH relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. above.

(5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GEH. Access to such documents within GEH is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2) is classified as proprietary because it contains details of GEH's design and licensing methodology. The development of the methods used in these analyses, along with the testing, development and approval of the supporting methodology was achieved at a significant cost to GEH.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's

comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 28th day of January 2010.

Larry J. Tucker

Larry J. Tucker
GE-Hitachi Nuclear Energy Americas LLC