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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 340 Related to ESBWR Design Certification Application – Fuel Pools - RAI Number 9.1-115 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) 9.1-115 S01 sent by NRC Letter 340, Reference 1. The response to RAI Number 9.1-115 was previously submitted to the NRC via Reference 2 in response to Reference 3.

GEH response to RAI Number 9.1-115 S01 is addressed in Enclosure 1. Enclosure 2 contains the DCD markups associated with this response.

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

Sincerely,

Richard E. Kingston

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Vice President, ESBWR Licensing

References:

1. MFN 09-397, Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, *Request for Additional Information Letter No. 340 Related to ESBWR Design Certification Application*, June 9, 2009
2. MFN 09-163, Response to Portion of NRC Request for Additional Information Letter Number No. 275, Related to ESBWR Design Certification Application – Auxiliary Systems - RAI Numbers 9.1-96 through 9.1-115, March 17, 2009
3. MFN 08-967, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 275 Related to ESBWR Design Certification Application*, December 11, 2008

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 340 Related to ESBWR Design Certification Application – Fuel Pools - RAI Number 9.1-115 S01
2. Response to Portion of NRC Request for Additional Information Letter No. 340 Related to ESBWR Design Certification Application – Fuel Pools - RAI Number 9.1-115 S01 – DCD Markups

cc:	AE Cubbage	USNRC (with enclosures)
	JG Head	GEH/Wilmington (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	eDRF Section	0000-0105-3699

Enclosure 1

MFN 09-530

Response to Portion of NRC Request for Additional Information Letter No. 340 Related to ESBWR Design Certification Application

Fuel Pools

RAI Number 9.1-115 S01

NRC RAI 9.1-115 S01

The staff's review of pools that could potentially contain new or spent fuel includes consideration of events that could lower the level of the pools and uncover fuel. In RAI 9.1-115, the staff asked the applicant to provide an elevation diagram of the spent fuel storage pool, lower fuel transfer pool, and cask pool, including any pits in the pools and interfaces (e.g., gates or removable weirs) between/among the pools or pathways that could potentially lower the water level in the pools to unacceptable levels. Similarly, the applicant was asked to provide an elevation diagram of the buffer pool, reactor well, upper fuel transfer pool, inclined fuel transfer system, and equipment storage pool, as well as any interfaces or pits in the pools. In its response dated March 17, 2009, the applicant provided a sketch of the equipment storage pool, buffer pool, upper fuel transfer pool and reactor well, as well as the lower fuel transfer pool, spent fuel pool, and cask pool. In addition the applicant stated that RAI 9.1-115 was essentially answered in its response to RAI 9.1-46 S01. The staff found the response to RAI 9.1-115 unacceptable. It did not address any gates, removable weirs, or other interfaces that potentially could lower the level of the pools and uncover fuel. The applicant's response to RAI 9.1-46 S01 was specific to transfer gates, and the applicant indicated that the number and dimension of gates or removable weirs in the pools discussed above was not determined yet. Since the response states that the specific number and dimensions of gates, removable weirs, or other interfaces have not been determined, GEH should clarify the second paragraph in Section 9.1.2.4, which states that, "The bottoms of the pool gates are higher than the minimum water level required over the spent fuel storage racks to provide adequate shielding and cooling. Pool fill and drain lines enter the pool above the safe shielding water level. Redundant antisiphon vacuum breakers are located at the high point of the pool circulation lines to preclude a pipe break from siphoning the water from the pool and jeopardizing the safe water level."

a. A clarification should be made that that the bottom of any gates, removable weirs, or other interfaces (e.g., piping) with these pools are least ten feet above the active fuel.

b. This paragraph should be applied to any pool that could contain new or spent fuel.

Include an ITAAC that would require that the bottom of any gates, removable weirs, or other interfaces (e.g., piping) associated with these pools be at least 10 feet above the active fuel.

GEH Response

In the context of the discussion of the ESBWR and its pools, a "weir" is an opening at the top of a pool, which receives overflow water. The specific locations of the weirs along the perimeter of the pool have not yet been defined; however, by definition the weirs cannot be located below the normal pool water level.

A “transfer gate” is a passageway between two adjacent pools through which fuel or equipment can be transferred. When these gates are closed, they form an effective seal, allowing a pool on one side to be drained while the pool on the other side remains full.

The GEH response to RAI 9.1-46 addressed an NRC concern about the consequences of a failure of the transfer gate resulting in a redistribution of SFP water inventory between the two adjacent empty pool volumes.

A telecon with the NRC regarding this RAI has clarified that a new scenario is being postulated in which the SFP drains through a failed transfer gate and then subsequently through a break in one of the adjacent pools. This event would result in the SFP water level being reduced to the elevation of the bottom of the transfer gate opening.

A previous RAI (14.3-442 3rd bullet) requested that GEH define the lower elevation of the gates, and add an appropriate ITAAC to Tier 1. In its response (Letter MFN 09-117, March 19, 2009), which was resolved, GEH defined this elevation to be “no lower than the bail handle of a stored spent fuel assembly” to ensure the TAF remained covered following an uncontrolled drain-down.

GEH will comply with the request in 9.1-115 S01 and change this elevation to one that provides 3.05 m (10 ft) of shielding above TAF, and effectively supersede the response to the 3rd bullet of RAI 14.3-442.

As discussed in the telecon, the only pool for which this requirement applies is the SFP. The buffer pool also has transfer gates, but because spent fuel can only be stored in the deep pit (9.5 m below the rest of the pool), the concern about fuel uncovering does not apply.

DCD Impact

DCD Tier 1, Section 2.16.7 and Table 2.16.7-2 will be revised as noted in the attached markup.

DCD Tier 2, Subsection 9.1.2.4 will be revised as noted in the attached markup.

Also, the change to DCD Tier 2, Subsection 9.1.3 that was proposed by RAI 14.3-442 is superseded.

Enclosure 2

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Response to Portion of NRC Request for Additional Information Letter No. 340 Related to ESBWR Design Certification Application

Fuel Pools

RAI Number 9.1-115 S01

DCD Markups

(7) RTNSS equipment in the FB is located above the maximum flood level for that location or is qualified for flood conditions.

(8) The spent fuel pool is a reinforced concrete structure with a stainless steel liner that is equipped with embedments designed to Seismic Category I requirements.

(9) The transfer gates that connect the SFP to adjacent pools are designed so that the bottom of the gate is at least 3.05 m (10.0 ft) above TAF.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.16.7-2 provides a definition of the inspections, test and/or analyses, together with associated acceptance criteria for the Fuel Building.

Table 2.16.7-2

ITAAC For The Fuel Building

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. The spent fuel pool is a reinforced concrete structure with a stainless steel liner that is equipped with embedments designed to Seismic Category I requirements.	Inspection or analysis of the as-built spent fuel pool will be performed.	Report(s) exist and conclude that the as-built spent fuel pool is a reinforced concrete structure with a stainless steel liner that is equipped with embedments and can withstand seismic dynamic loads without loss of structural integrity.
9. The transfer gates that connect the SFP to adjacent pools are designed so that the bottom of the gate is at least 3.05 m (10.0 ft) above TAF.	Inspection of the as-built spent fuel pool will be performed.	Report(s) exist and conclude that the transfer gates that connect the SFP to adjacent pools are built so that the bottom of the gate is at least 3.05 m (10.0 ft) above TAF.

racks are designed to protect the fuel assemblies from excessive physical damage which may cause the release of radioactive materials in excess of ~~Reg. Guide~~ RG 1.183 requirements, under normal and abnormal conditions caused by impact from fuel assemblies, or other equipment.

The Spent Fuel Pool and buffer pool are reinforced concrete structures with a stainless steel liner. Fuel storage racks and pool liners ~~embedments~~ are designed to meet Seismic Category I requirements. Pool liner and anchorage are designed to the same loads and load combinations as the pool concrete structure in accordance with Table 3.8-15, except that load factors for all cases are equal to 1.0, and the acceptance criteria follow ASME Section III, Division 2, CC-3700. Pool liners are evaluated to ensure structural integrity under fuel handling accidents. The bottoms of the pool gates are ~~higher than the minimum water level required over the spent fuel storage racks~~at least 3.05 m (10.0 ft) above TAF to provide adequate shielding and cooling. Pool fill ~~and drain~~ lines enter the pool above the safe shielding water level and overflow weirs are located above normal water level. Redundant anti-siphon vacuum breakers are located at the high point of the pool circulation lines to preclude a pipe break from siphoning the water from the pool and jeopardizing the safe water level.

The racks include individual solid tube storage compartments, which provide lateral restraints over the entire length of the fuel assembly or bundle. The weight of the fuel assembly or bundle is supported axially by the rack fuel support. Lead-in guides at the top of the storage spaces provide guidance of the fuel during insertion. There are no unanalyzed locations within a fuel rack or array of fuel racks. Individual racks are spaced less than one fuel assembly apart so that a fuel assembly cannot be inserted between racks. In the event that a fuel assembly is lowered adjacent to an exterior rack, this configuration is analyzed.

Materials used for construction are specified in accordance with the latest issue of applicable ASTM specifications at the time of equipment order. The racks are constructed in accordance with the ~~quality assurance~~QA requirements of 10 CFR 50, Appendix B.

The structural integrity of the rack is demonstrated for the loads and load combinations described below using linear elastic design methods.

The applied loads to the rack are as follows:

- *Dead loads-weight of rack and fuel assemblies plus the hydrostatic loads;*
- *Live loads—effect of lifting an empty rack during installation;*
- *Thermal loads—effects caused by pool temperature changes occurring as a result of normal operating or abnormal conditions, as applicable;*
- *Dynamic loads (Square Root of the Sum of the Squares [SRSS] combination of Seismic, Loss-of-Coolant-Accident [LOCA],Safety Relief Valve [SRV] loads);*
- *Fuel drop load-effect of an accidental drop of the heaviest fuel assembly or bundle from the maximum possible height; and*
- *Stuck fuel load-upward force on the rack caused by a postulated stuck fuel assembly.*

The load combinations considered in the rack design are as follows:

- *Dead plus live loads;*