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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 340 Related to ESBWR Design Certification Application - Auxiliary Systems - RAI Number 9.1-110 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) sent by NRC letter 340, dated June 9, 2009, Reference 1. The GEH response to RAI 9.1-110 S01 is addressed in Enclosure 1. Enclosure 2 contains the DCD markups associated with this response.

If you have any questions about the information provided here, please contact me.

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

Reference:

1. MFN 09-397, Letter from the U.S. Nuclear Regulatory Commission to Jerald G. Head, Request for Additional Information Letter No. 340, Related to ESBWR Design Certification Application, dated June 9, 2009

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 340 Related to ESBWR Design Certification Application - Auxiliary Systems - RAI Number 9.1-110 S01
2. Response to Portion of NRC Request for Additional Information Letter No. 340 Related to ESBWR Design Certification Application - Auxiliary Systems - RAI Number 9.1-110 S01 - DCD Markups

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Enclosure 1

MFN 09-462

Response to Portion of NRC Request for

Additional Information Letter No. 340

Related to ESBWR Design Certification Application

Auxiliary Systems

RAI Number 9.1-110 S01

NRC RAI 9.1-110 S01

In Section 9.1.4.12, "Fuel Transfer System," DCD, Revision 5, it states that there is a means to seal off the upper and lower ends of the Inclined Fuel Transfer System (IFTS) transfer tube while allowing filling and venting of the tube. In RAI 9.1-110, the staff asked the applicant to explain how this is to be accomplished and to discuss the implications of failure of these seals (i.e., valve failure) in such a manner as to drain the tube while fuel is being transported in it. In its response dated March 17, 2009, the applicant stated the sealing of the upper and lower ends is done with valves (two at the top and two at the bottom). The response did not discuss the effects of draining the transfer tube with fuel in the tube. Please (1) address the effects (including flooding and the possibility of loss of core cooling) that would be associated with failure of these transfer tube valves including the implications of draining upper pools that can communicate with the transfer pool and (2) address the effects from draining the transfer tube while fuel is being transported in it.

GEH Response

At least one of the upper valves (top or fill) and one of the lower valves (bottom or drain) would have to be in the open position simultaneously to provide a drain path that would allow draining of water from the upper pool through the IFTS tube in an uncontrolled manner. There is no operational alignment that permits an upper and lower valve to be in the open position simultaneously. The failure of either a single upper or lower valve does not provide a drain path that would allow uncontrolled draining from the upper pool through the IFTS tube.

GEH and the NRC had a conference call on March 23, 2009 to discuss the GEH response to RAI 9.1-110 and RAI 9.1-111. GEH agreed to a NRC request to modify DCD Tier 1 Subsection 2.5.10 Item 4 and Table 2.5.10-1 Design Commitment 4 to add the following sentence to the current text, “No single active failure can cause the draining of water from the upper pool in an uncontrolled manner into the spent fuel pool or other areas.” Therefore, draining of the upper pool that can lead to flooding or loss of core cooling is not credible due to a single IFTS upper or lower valve failure.

While fuel is being transported in IFTS, the transfer tube is full of water and no draining of water occurs until the carriage is in the tube fill position just above the bottom valve. If one of the upper valves were to fail in the open position during fuel transfer, the fuel is in a safe configuration as the transfer tube is full of water and the lower valves are closed. If one of the lower valves were to fail in the open position during fuel transfer, the fuel would be placed in a safe configuration, either in the upper pool or in the tube fill position. In either position, the fuel assembly remains covered with water.

DCD Impact

DCD Tier 1 Subsection 2.5.10 and Table 2.5.10-1, and DCD Tier 2 Subsection 9.1.4.12 are being revised in Revision 6 as noted in the attached markup.

Enclosure 2

MFN 09-462

Response to Portion of NRC Request for

Additional Information Letter No. 340

Related to ESBWR Design Certification Application

Auxiliary Systems

RAI Number 9.1-110 S01

DCD Markups

2.5.10 Fuel Transfer System

Design Description

The ESBWR is equipped with ~~an Inclined~~ Fuel Transfer System (IFTS). The functional arrangement of the IFTS consists of a terminus at the upper end in the Reactor Building refueling pool that allows the fuel to be tilted from a vertical position to an inclined position prior to transport to the spent fuel pool in the Fuel Building. There is means to lower the transport device (i.e., a carriage), means to seal off the top end of the transfer tube, and a control system to effect transfer. It has lower terminus in the fuel building storage pool, and a means to tilt the fuel to be removed from the transport cart. There are controls contained in local control panels to control fuel transfer. There is a means to seal off the upper and lower end of the tube while allowing filling and venting of the tube. The IFTS is anchored to the bottom of the refueling pool floor in the Reactor Building. The IFTS penetrates the Reactor Building at an angle down to the fuel storage pool in the Fuel Building. To ensure that there are no modes of normal or abnormal operation that will trap fuel assemblies without the ability to add water or prevent unconditional venting of pressure that may develop due to boiling, the IFTS is vented to the building through the hoist cable piping that originates at the top of the transfer tube which extends above the level of the water in the RB with no valves or obstructions.

(1) The functional arrangement of the IFTS is as described in this Section 2.5.10.

(2) The IFTS tubes and supporting structure can withstand an SSE without failure of the basic structure or compromising the integrity of adjacent equipment and structures. Therefore, the portion of the IFTS transfer tube assembly from where it interfaces with the upper fuel pool, the portion of the tube assembly extending through the building, the drain line connection, and the lower tube equipment (valve, support structure, and bellows) are designated as Nonsafety-Related and Seismic Category I. The winch, upper upender, and lower terminus are designated as Nonsafety-related and Seismic Category II. The remaining equipment is designated as Nonsafety-Related and Seismic Category NS.

(3) The IFTS is functionally capable of moving fuel.

(4) No single active failure can cause the draining of water from the upper pool in an uncontrolled manner into the spent fuel pool or other areas. There is sufficient redundancy and diversity in equipment and controls to prevent loss of load (carriage with fuel is released in an uncontrolled manner) and ~~that~~ there are no modes of operation that allow simultaneous opening of valves that could cause draining of water from the upper pool in an uncontrolled manner.

(5) The IFTS can be maintained filled with water for cooling in the event the fuel transport cart with fuel loaded within the IFTS cannot be moved.

(6) For personnel radiation protection, access (ingress and egress) to areas adjacent to the transfer tube is controlled through a system of physical barriers, interlocks and alarms.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.5.10-1 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria for the ~~Inclined~~ Fuel Transfer System.

Table 2.5.10-1

ITAAC For The ~~Inclined~~ Fuel Transfer System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3. The IFTS is functionality capable of moving fuel.	Tests will be performed using installed controls and power supplies utilizing dummy fuel bundles for successful demonstration of fuel movement from the refuel pool to the spent fuel pool and return.	Report(s) ~~document~~ exist and conclude that tests conclude that the as-built IFTS passes functional testing.
4. No single active failure can cause the draining of water from the upper pool in an uncontrolled manner into the spent fuel pool or other areas. There is sufficient redundancy and diversity in equipment and controls to prevent loss of load (carriage with fuel is released in an uncontrolled manner) and ~~that~~ there are no modes of operation that allow simultaneous opening of valves that could cause draining of water from the upper pool in an uncontrolled manner.	Tests and inspections will be performed on the as-built IFTS to confirm it prevents loss of load and draining water from the upper pool in an uncontrolled manner.	Report(s) ~~document~~ exist and conclude that tests and inspections confirm the as-built IFTS prevents loss of load and draining water from the upper pool in an uncontrolled manner.
5. The IFTS can be maintained filled with water for cooling in the event the fuel transport cart with fuel loaded within the IFTS cannot be moved.	Tests and inspection will be performed on the as-built IFTS that confirm the as-built IFTS can be maintained filled with water in the event the fuel transport cart with fuel loaded within the IFTS cannot be moved.	Report(s) ~~document~~ exist and conclude tests and inspections that confirm the as-built IFTS can be maintained filled with water in the event the fuel transport cart with fuel loaded within the IFTS cannot be moved.

9.1.4.12 Fuel Transfer System

The ESBWR is equipped with an Inclined Fuel Transfer System (IFTS). In general the arrangement of the IFTS (refer to Figure 9.1-2) consists of a terminus at the upper end in the ~~Reactor Building~~RB buffer pool that allows the fuel to be tilted from a vertical position to an inclined position prior to transport to the Spent Fuel Pool. There is a means to lower the transport device (i.e., a carriage), means to seal off the top end of the transfer tube, and a control system to effect transfer. It has a lower terminus in the ~~fuel building~~FB storage pool, and a means to tilt the fuel into a vertical position allowing it to be removed from the transport cart. There are controls contained in local control panels to effect transfer. There is a means to seal off the upper and lower end of the tube while allowing filling and venting of the tube.

No single active failure can cause the draining of water from the upper pool in an uncontrolled manner into the spent fuel pool or other areas. There is sufficient redundancy and diversity in equipment and controls to prevent loss of load (carriage with fuel is released in an uncontrolled manner) and there are no modes of operation that allow simultaneous opening of ~~any set of valves~~ the upper (top and fill) valves and lower (bottom and drain) valves that could cause draining of water from the upper pool in an uncontrolled manner. In order for the bottom valve to open, all of the following logic conditions must be met:

- Top valve closed,
- Fill valve closed,
- Carriage in proper position in transfer tube (below water level elevation in spent fuel pool),
- Tube drained (water level in tube at the same level as the water level in the spent fuel pool); and
- Diverse Tube Drained (low water pressure at bottom valve compared to water head when tube is open and exposed to upper pool).

In order for the drain valve to open, all of the following logic conditions must be met:

- Top valve closed,
- Fill valve losed; and
- Carriage in proper position in transfer tube (below water level elevation in spent fuel pool).

The carriage and valves may be manually operated in the event of a power failure, to allow completion of the fuel transfer process.

The IFTS has sufficient cooling such that two freshly removed fuel assemblies can remain in the IFTS until they are removed without damage to the fuel or excessive overheating.

The IFTS tube~~s~~, ~~and~~ supporting structure, fuel assemblies and/or components within the IFTS tube, can withstand an SSE without failure of the basic structure or compromising the integrity of adjacent equipment and structures. Therefore, the portion of the IFTS transfer tube assembly from where it interfaces with the upper fuel pool, the portion of the tube assembly extending through the building, the drain line connection, and the lower tube equipment (valve, support