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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 275 Related to ESBWR Design Certification Application – RAI Number 14.3-441**

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) response to the subject NRC RAI originally transmitted via the Reference 1 letter. Enclosure 2 contains the associated DCD markup pages for this response.

Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box.

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

Sincerely,

Richard E. Kingston

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Vice President, ESBWR Licensing

Reference:

1. MFN 08-967, Letter from the U.S. Nuclear Regulatory Commission to Robert E. Brown, Request for Additional Information Letter No. 275, Related To ESBWR Design Certification Application, dated December 11, 2008

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 275, Related to ESBWR Design Certification Application – RAI Number 14.3-441
2. Response to Portion of NRC Request for Additional Information Letter No. 275, Related to ESBWR Design Certification Application – RAI Number 14.3-441 - DCD Markups

cc: AE Cubbage USNRC (with enclosures)
RE Brown GEH/Wilmington (with enclosures)
DH Hinds GEH/Wilmington (with enclosures)
EDRF Section 0000-0095-5877

Enclosure 1

MFN 09-172

Response to Portion of NRC Request for

Additional Information Letter No. 275

Related to ESBWR Design Certification Application

RAI Number 14.3-441

NRC RAI 14.3-441:

Add "single failure proof" to the Tier 1 requirements for the RB and FB cranes, as the equipment hatch hoist and the containment maintenance hatch hoist

Table 9.1-5 "Reference Codes and Standards" of the ESBWR DCD, Revision 5 states that NUREG-0554, "Single Failure Proof Cranes for Nuclear Power Plants," is "[a]pplicable to the RB and FB overhead cranes. Applicable to the hoist on the refueling and fuel handling machines that handles the combined fuel support and control blade grapple." The ESBWR DCD, Tier 1 Section 2.16.1, "Cranes, Hoists, and Elevators," and Table 2.16.1-1, "ITAAC For The Cranes, Hoists and Elevators" do not list "single failure proof as certified design information with ITAAC for the RB crane, the FB crane, the hoist for the refueling machine or the hoist for the fuel handling machine. The staff believes that "single failure proof design criteria for the above listed cranes and hoists should be listed in Tier 1 as described below. One design criteria , among several design criteria for Tier 1 information, is that it should include features and functions that could have a significant effect on the safety of a nuclear plant or are important in preventing or mitigating severe accidents. A drop of the reactor vessel head or a spent fuel cask could affect plant safety. Therefore, design features that reduce the risk and/or analyses that provide assurance of safety after a dropped load are important to safety.

The staff considers "single failure proof" design criteria for the RB crane and the FB crane as Tier 1 safety significant design criteria. As a minimum, the following analyses would have to be performed in order to not consider "single failure proof" design criteria as safety significant criteria for the RB crane and the FB crane:

- *A heavy load analysis proving that a heavy load drop in safety related areas of the plant will not be the cause any of Items I through IV of section 5.1 of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants."*
- *SRP 9.1.5, "Overhead Heavy Load Handling Systems," Subsection III. 4, states that without "single failure proof design criteria, analyses are required for a dropped load on the reactor vessel, among other analyses. The DCD does not describe results of this analysis.*
- *Regulatory Guide 1.13, Regulatory Position C.5 states that an alternative to an "single failure proof crane is that the spent fuel cask loading area be designed to withstand a drop of the heaviest load at the maximum height. As a minimum, the following analysis would have to be performed in order to not consider "single failure proof" design criteria as safety significant criteria for the containment equipment hatch hoist and the containment maintenance hatch hoist: A heavy load analysis proving that a heavy load drop in safety related areas of the plant will not be the cause any of Items I through IV of Section 5.1 of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants."*

Without the analyses and design criteria stated above, the "single failure proof" design feature for the RB crane, FB crane, the hoist for the refueling machine and the hoist for the fuel handling machine becomes safety significant design criteria.

Please justify why the applicant did not include "single failure proof" design criteria and ITAAC in Tier 1 of the DCD, which are safety significant design criteria, for the RB crane, FB crane, the hoist for the refueling machine, and the hoist for the fuel handling machine.

GEH Response:

Per the telephone call between GEH and the NRC on February 19, 2009, both GEH and the NRC agreed that the single failure proof design criteria and an ITAAC should be included in DCD Tier 1 of Revision 6, for the Reactor Building overhead crane, the Fuel Building overhead crane, the refueling machine hoist and fuel handling machine hoist. Because the single failure proof design criteria and an ITAAC are being included in the DCD Tier 1, additional heavy load analyses are not needed. DCD Tier 1 is being revised in Revision 6 to add these ITAACs.

DCD Impact:

DCD Tier 1, Subsections 2.5.5, 2.16.1 and Tables 2.5.5-1 and 2.16.1-1 will be revised in Revision 6 as noted in the attached markup, as shown in Enclosure 2.

Enclosure 2

MFN 09-172

Response to Portion of NRC Request for

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Related to ESBWR Design Certification Application

RAI Number 14.3-441
DCD Markups

Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box.

2.5.5 Refueling Equipment

The ESBWR is supplied with a Reactor Building (RB) refueling machine for fuel movement and a fuel handling machine used for fuel servicing and transporting tasks in the Fuel Building (FB).

Design Description

The functional arrangement of the RB refueling machine is that it is a gantry-type crane that spans the reactor vessel cavity and fuel and storage pools to handle fuel and perform other ancillary tasks. It is equipped with a traversing trolley on which is mounted a telescoping mast and integral fuel grapple. The machine is a rigid structure built to ensure accurate and repeatable positioning during the refueling process.

The functional arrangement of the FB fuel handling machine is that it is equipped with a traversing trolley on which is mounted a telescoping mast and integral fuel grapple. The machine is a rigid structure built to ensure accurate and repeatable positioning while handling fuel.

(1) The functional arrangement of the RB refueling machine is as described in the Design Description of this Subsection 2.5.5.

(2) The RB refueling machine is classified as nonsafety-related, but is designed as Seismic Category I.

(3) The RB refueling machine has an auxiliary hoist with sufficient load capability.

(4) The RB refueling machine is provided with controls interlocks.

(5) The functional arrangement of the FB fuel handling machine is as described in the Design Description of this Subsection 2.5.5.

(6) The FB fuel handling machine is classified as nonsafety-related, but is designed as Seismic Category I.

(7) The FB fuel handling machine has an auxiliary hoist with sufficient load capability.

(8) The FB fuel handling machine is provided with controls interlocks.

(9) The RB refueling machine hoist is designed such that a single failure will not result in the loss of the capability to safely retain the load.

(10) The FB fuel handling machine hoist is designed such that a single failure will not result in the loss of the capability to safely retain the load.

(11) The FB fuel handling machine passes over the centers of gravity of heavy loads included in the certified design that are to be lifted.

(12) The RB refueling machine passes over the centers of gravity of heavy loads included in the certified design that are to be lifted.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.5.5-1 provides a definition of the inspection, test, and/or analyses, together with associated acceptance criteria for the refueling ~~machine~~equipment.

Table 2.5.5-1

ITAAC For The Refueling ~~Machine~~Equipment

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. The FB fuel handling machine has an auxiliary hoist with sufficient load capability.	Load tests on the as-built auxiliary hoists will be conducted.	Report(s) ~~document~~ exist and conclude that a successful load test of the as-built auxiliary hoist has been performed at 125% of rated load capacity.
8. The FB fuel handling machine is provided with controls interlocks.	Test will be performed with actual or simulated signals to demonstrate that the as-built interlocks function as required.	Report(s) ~~document~~ exist and conclude that the tests have been completed and results demonstrate that the required interlocks function as follows: • ~~a.~~ Prevent collision with fuel pool walls or other structures; • ~~b.~~ Limit travel of the fuel grapple; • ~~c.~~ Interlock grapple hook engagement with hoist load and hoist up power; and • ~~d.~~ Ensure correct sequencing of the transfer operation in the automatic or manual mode.
9. The RB refueling machine hoist is designed such that a single failure will not result in the loss of the capability to safely retain the load.	Inspection of the RB refueling machine hoist design documents will be performed.	Report(s) exist and conclude the RB refueling machine hoist is designed so that a single failure will not result in the loss of the capability to safely retain the load.

Table 2.5.5-1

ITAAC For The Refueling ~~Machine~~Equipment

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10. The FB fuel handling machine hoist is designed such that a single failure will not result in the loss of the capability to safely retain the load.	Inspection of the FB fuel handling machine hoist design documents will be performed.	Report(s) exist and conclude the FB fuel handling machine hoist is designed so that a single failure will not result in the loss of the capability to safely retain the load.
11. The FB fuel handling machine passes over the centers of gravity of heavy loads included in the certified design that are to be lifted.	Tests will be conducted of the as-built FB fuel handling machine.	Report(s) exist and conclude that the FB fuel handling machine passes over the centers of gravity of heavy loads included in the certified design that are to be lifted.
12. The RB refueling machine passes over the centers of gravity of heavy loads included in the certified design that are to be lifted.	Tests will be conducted of the as-built RB refueling machine.	Report(s) exist and conclude that the RB refueling machine passes over the centers of gravity of heavy loads included in the certified design that are to be lifted.

2.16 STRUCTURES AND SERVICING SYSTEMS/EQUIPMENT

2.16.1 Cranes, Hoists and Elevators

Design Description

Cranes and hoists are used for maintenance and refueling tasks. The reactor building (RB) crane, fuel building (FB) crane and associated lifting devices, such as hoists, and elevators in various areas of the plant are nonsafety-related.

(1) The RB crane has a lifting capacity greater than its heaviest expected load.

(2) The FB crane has a lifting capacity greater than its heaviest expected load.

(3) The RB crane is interlocked to prevent movement of heavy loads over new or spent fuel in the RB.

(4) The FB crane is interlocked to prevent movement of heavy loads over spent fuel in the FB.

(5) The RB crane is classified as Seismic Category I to maintain crane structural integrity.

(6) The FB crane is classified as Seismic Category I to maintain crane structural integrity.

(7) The RB crane passes over the centers of gravity of heavy loads included in the certified design that are to be lifted.

(8) The FB crane passes over the centers of gravity of heavy loads included in the certified design that are to be lifted.

(9) Heavy load equipment other than the RB crane, FB crane, fuel handling machine and refueling machine are designed or interlocked such that movement of heavy loads is restricted to areas away from stored fuel.

(10) The RB crane is designed such that a single failure will not result in the loss of the capability of the crane to safely retain the load. These features are limited to the hoisting system and braking system for the trolley and bridge.

(11) The FB crane is designed such that a single failure will not result in the loss of the capability of the crane to safely retain the load. These features are limited to the hoisting system and braking system for the trolley and bridge.

(12) The GDCS system is not susceptible to a load drop that could result in the GDCS not meeting the Technical Specifications for modes 5 and 6.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.16.1-1 provides a definition of the inspections, test and/or analyses, together with associated acceptance criteria for the Cranes, Hoists and Elevators.

Table 2.16.1-1

ITAAC For ~~The~~ Cranes, Hoists and Elevators

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. The RB crane passes over the centers of gravity of heavy loads included in the certified design that are to be lifted.	Tests will be conducted of the as-built RB crane.	Report(s) exist and conclude that the RB crane passes over the expected locations of the centers of gravity of heavy loads included in the certified design that are to be lifted.
8. The FB crane passes over the centers of gravity of heavy loads included in the certified design that are to be lifted.	Tests will be conducted of the as-built FB crane.	Report(s) exist and conclude that the FB crane passes over the expected locations of the centers of gravity of heavy loads included in the certified design that are to be lifted.
9. Heavy load handling equipment other than the RB crane, FB crane, fuel handling machine and refueling machine are designed or interlocked such that movement of heavy loads is restricted to areas away from stored fuel.	Inspections of as-built heavy load handling equipment will be performed.	Report(s) exist and conclude that heavy load handling equipment are designed or interlocked such that movement of heavy loads is restricted to areas away from stored fuel.
10. The RB crane is designed such that a single failure will not result in the loss of the capability of the crane to safely retain the load. These features are limited to the hoisting system and braking system for the trolley and bridge.	Inspection of the RB crane design documents will be performed.	Report(s) exist and conclude the RB crane is designed so that a single failure will not result in the loss of the capability of the crane to safely retain the load.

Table 2.16.1-1

ITAAC For ~~The~~ Cranes, Hoists and Elevators

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11. The FB crane is designed such that a single failure will not result in the loss of the capability of the crane to safely retain the load. These features are limited to the hoisting system and braking system for the trolley and bridge.	Inspection of the FB crane design documents will be performed.	Report(s) exist and conclude the FB crane is designed so that a single failure will not result in the loss of the capability of the crane to safely retain the load.
12. The GDCS system is not susceptible to a load drop that could result in the GDCS not meeting the Technical Specifications for modes 5 and 6.	Inspection and analysis of the GDCS piping will be performed.	Report(s) exist and conclude that GDCS components are not susceptible to a load drop that could result in the GDCS not meeting the Technical Specification for modes 5 and 6.