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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application, RAI Numbers 14.3-184, 14.3-233, and 14.3-246.**

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 dated December 20, 2007 (Reference 1). The GEH response to RAI Numbers 14.3-184, 14.3-233, and 14.3-246 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 regarding the information provided here, please contact me.

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

D068
NRO

Reference:

1. MFN 07-718, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application,* December 20, 2007

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application, RAI Numbers 14.3-184, 14.3-233, and 14.3-246

cc:	AE Cubbage	USNRC (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	DH Hinds	GEH/Wilmington (with enclosure)
	eDRF	0000-0081-0577 – RAI 14.3-184
		0000-0082-1534 – RAI 14.3-233
		0000-0080-4163 – RAI 14.3-246

Enclosure 1

MFN 08-086 Supplement 22

*Response to Portion of NRC Request for

Additional Information Letter No. 126

Related to ESBWR Design Certification Application

RAI Numbers 14.3-184, 14.3-233, and 14.3-246

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NRC RAI 14.3-184

NRC Summary:

RPV Level Instrumentation

NRC Full Text:

In DCD Tier 1, Revision 4, Section 2.1.2 Nuclear Boiler System, Table 2.1.2.1, ITAAC # 22 is deleted. In the list of changes, GEH states: "---is now addressed by the design." RPV Level instrumentation is safety significant and hence this item should be in Tier 1. Provide ITAAC to verify design features to preclude accumulation of non-condensable gases in the instrument lines. Identify the Tier 1 Section where this will be included.

GEH Response

The Reactor Vessel Water Level Instrumentation backfill water flow is supplied from the Control Rod Drive (CRD) system to the reactor water level instrumentation leg to prevent potential formation of non-condensable gas pockets (large bubbles) in the reference leg. The impact of non-condensable gases on the accuracy of reactor vessel level measurements is considered in the system design. The CRD system provides a process flow based on the results of BWR Owners Group testing in response to NRC Bulletin 93-03.

The backfill feature has been added as a system modification to most BWRs and is included in the ABWR and in the ESBWR designs as a nonsafety-related feature that supports the water level instrumentation by performing a nonsafety-related readiness function during normal operations. The backfill feature is not required to operate during anticipated operational occurrences (AOO) or during accidents or to mitigate abnormal events, and thus, is nonsafety-related.

The non-condensable gases ITAAC was deleted in Rev. 4 of Tier 1, because it does not meet the safety significance criteria in Reg. Guide 1.206, SRP 14.3 series and Tier 2 Section 14.3, which were reviewed prior to deleting the subject ITAAC. In accordance with Tier 2 Section 14.3.2.1, the Tier 1 design description and ITAACs address the top-level design features and performance standards.

The Tier 1 design descriptions should only contain information from Tier 2 that is most significant to safety. The backfill feature is not considered as a top level design feature, neither is it considered most significant to safety. Therefore the ITAAC was deleted from the ESBWR Tier 1 ITAAC.

It should be noted that the original inclusion of a related ITAAC in the ABWR DCD was due to the close timing between the1993 issue of a related NRC Bulletin 93-03 and the preparation of the ABWR DCD Tier 1, at which time the backfill system had not been fully tested and confirmed. Currently, the backfill feature is fully confirmed and has been operational for many years and there are no technical issues. In addition a Tier 2 description of the backfill system that is supplied from CRD purge flow is already included in the ESBWR DCD, Tier 2,

Subsection 4.6.1.2.4 which describes the backfill feature, as follows: "... purge flow provided to the NBS reference leg instrument lines.... ....The purge flow maintains the RPV water level reference leg instrument lines filled to address the effects of non-condensable gases in the instrument lines to prevent erroneous reference information after a rapid RPV depressurization event."

DCD Impact

No DCD change will be made in response to this RAI.

NRC RAI 14.3-233

NRC Summary:

Vacuum breaker proximity sensor should detect vacuum breaker open

NRC Full Text:

The acceptance criteria for Item 8 of DCD Tier 1, Revision 4, Table 2.15.3-2 states that "[t]est report(s) demonstrate that each as-built vacuum breaker proximity sensor indicates an open position with the vacuum breaker fully open and indicates a closed position when the vacuum breaker is in the fully closed position."

DCD Tier 2, Revision 4, Section 6.2.1.1.2, states that "[t]he vacuum breaker is provided with redundant proximity sensors to detect its closed position." Therefore, the proximity sensor should identify when the vacuum breaker is open causing drywell to wetwell bypass leakage that exceeds the design capacity. That is, the proximity sensor should be able to identify the vacuum breaker open position before it is "fully open." Please correct DCD Tier 1, Table 2.15.3-2.

GEH Response

Response to RAI 14.3-231 (MFN 08-086 supplement 12 dated 03-20-08) relocated the vacuum breakers by deleting item 8 of Table 2.15.3-2 and placing the vacuum breakers as item 16a in Table 2.15.1-2 (ITAAC for Containment System). GEH agrees that the proximity sensor should be able to identify the vacuum breaker open position before it is fully open. ITAAC acceptance criterion has been changed from "fully open" to "open" in Table 2.15.1-2 item 16a.

DCD Impact

DCD Tier 1, Table 2.15.1-2 will be revised as noted in the attached markup.

NRC RAI 14.3-246

NRC Summary:

No NBS control room alarms displays or controls listed

NRC Full Text:

Add a list of Alarm with transmitters in Table 2.1.2-2. Identify the location of the transmitters and alarm.

GEH Response

Table 2.1.2-2 contains a list of pressure and level transmitters. The alarm list is created as part of the Human Factors Engineering (HFE) process and an approved list of alarms will not be available until the HSI design process is complete. Table 2.1.2-3 will be revised to maintain consistency with table 2.2.1-6 Item 6.

DCD Impact

DCD Tier 1, Section 2.1.2 and Table 2.1.2-3 will be updated as shown in the attached markup

Table 2.15.1-2

ITAAC For The Containment System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
15. Each vacuum breaker isolation valve automatically closes if the vacuum breaker does not fully close when required.	A test will be performed by providing a simulated or real not-fully closed vacuum breaker signal originating from the closed position proximity sensor and temperature senors to close the associated vacuum breaker isolation valve.	A report demonstrates that each as-built vacuum breaker isolation valve automatically closes when a simulated or real not-fully closed signal is provided from the closed position proximity sensor of its associated vacuum breaker.
16a. Each vacuum breaker has proximity sensors to detect open/close position. This indication is available in the main control room.	Testing will be performed with each as-built vacuum breaker to demonstrate that the proximity sensors indicate open and closed position.	Test report(s) demonstrate that each as-built vacuum breaker proximity sensor indicates an open position with the vacuum breaker ~~fully~~ open and indicates a closed position when the vacuum breaker is in the fully closed position. The open and closed position indications of the as-built vacuum breakers are available in the main control room.
16b. Each vacuum breaker has temperature sensors to detect bypass leakage. This indication is available in the main control room.	A vendor type test will be performed on a vacuum breaker to detect bypass leakage.	Records of vendor type test concludes vacuum breakers temperature sensors detect bypass leakage.
17. The containment penetration isolation design for each fluid piping system requiring isolation meets the single-failure criterion to ensure completion of penetration isolation.	Single-failure analysis is performed on the isolation design of each penetration class or penetration, as applicable.	A study of all applicable primary containment fluid system penetrations demonstrates that, for each penetration or penetration class isolation design, the single-failure criterion is satisfied.

(7) Each mechanical train of safety-related NBS equipment located in the Reactor Building outside the drywell is physically separated from the other trains.

(8) ~~Instrumentation and Control~~Isolation Capability

a. The MSIVs close upon command

b. The FWIVs close upon command

~~a.~~c. NBS minimum inventory of alarms, displays, and status indications in the main control room are addressed in section 3.3~~Control Room alarms, displays, and/or controls provided for the NBS are defined in Table 2.1.2-2.~~

~~b.The MSIVs close upon any of the following conditions:~~

~~-Main Condenser Vacuum Low (Run mode)~~

~~-Turbine Area Ambient Temperature High~~

~~-MSL Tunnel Ambient Temperature High~~

~~-MSL Flow Rate High~~

~~-Turbine Inlet Pressure Low~~

~~-Reactor Water Level Low~~

(9) ~~Repositional~~ Repositionable valves (not including the DPVs~~-(squib-activiated valves)~~ or safety/relief valves) with operators designated in Table 2.1.2-2 as having an active safety-related function open, close, or both open and also close under ~~design~~ differential pressure, fluid flow, and temperature conditions.

(10) ~~The pneumatically operated valve(s) shown in Figure 2.1.2-2 closes (opens) if either electric power to the valve actuating solenoid is lost, or pneumatic pressure to the valve(s) is lost.~~Deleted

(11) Check valves designated in Table 2.1.2-1 as having an active safety-related function open, close, or both open and also close under ~~design~~ system pressure, fluid flow, and temperature conditions.

(12) The throat diameter of each MSL flow restrictor is sized for design choke flow requirements.

(13) Each MSL flow restrictor has taps for two instrument connections to be used for monitoring the flow through ~~each~~ its associated MSL.

(14) The combined steamline volume from the RPV to the main steam turbine stop valves and steam bypass valves is sufficient to meet the assumptions for AOOs and infrequent events.

(15) The MSIVs are capable of fast closing under design differential pressure, fluid flow and temperature conditions.

(16) When all four inboard or outboard MSIVs are stroked from a full-open to full-closed position by their actuators~~closed by normal means~~, the combined leakage through the MSIVs for all four MSLs will be less than or equal to the design bases assumption value.

Table 2.1.2-3

ITAAC For The Nuclear Boiler System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. ~~Instrumentation and Control~~Isolation Capability		
a) The MSIVs close upon command	Valve closure tests will be performed on the as-built MSIVs using a manual closure command to simulate an isolation signal.~~Inspections will be performed on the as-built Control Room alarms, displays, and/or controls for the NBS System.~~	Report(s) document that MSIVs close upon command.~~Report(s) document that alarms, displays, and/or controls exist or can be retrieved in the Control Room as defined in Table 2.1.2-2.~~
b) The FWIVs close upon command	Valve closure tests will be performed on the as-built FWIVs using a manual closure command to simulate an isolation signal.	Report(s) document that the FWIVs close upon command
c) NBS minimum inventory of alarms, displays, and status indications in the main control room are addressed in Section 3.3.~~Control Room alarms, displays, and/or controls provided for the NBS System are defined in Table 2.1.2-2~~.	See Section 3.3.	See Section 3.3