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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 215 Related to ESBWR Design Certification Application ESBWR RAI Numbers 14.3-220 S01 and 14.3-221 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 dated June 23, 2008 (Reference 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 the DCD.

Enclosure 1 contains the GEH response to each of the subject RAIs. Previous RAIs and responses were transmitted in References 2 and 3. The enclosed changes will be incorporated in an upcoming DCD Revision.

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

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

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References:

1. MFN 08-550, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 215 Related To ESBWR Design Certification Application*, dated June 23, 2008.

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

3. MFN 08-086, Supplement 38, Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application, RAI Number 14.3-220, 14.3-221, 14.3-222, 14.3-223, and 14.3-301, dated April 25, 2008.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 215 Related to ESBWR Design Certification Application DCD Tier 1 RAI Numbers 14.3-220 S01 and 14.3-221 S01

   Enclosure 1, Attachment 1 DCD Tier 1, Revision 5 Markups

cc:	AE Cubbage	USNRC (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	eDRF Section	0000-0089-7036 RAI 14.3-220 S01
		0000-0090-5086 RAI 14.3-221 S01

Enclosure 1

MFN 08-086, Supplement 69

Response to Portion of NRC Request for

Additional Information Letter No. 215

Related to ESBWR Design Certification Application

DCD Tier 1

RAI Numbers 14.3-220 S01 and 14.3-221 S01

***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.**

For ease of reference, the original text of RAI 14.3-220 and the GEH response is included.

NRC RAI 14.3-220

NRC Summary:

Isolation of RB systems and volumes

NRC Full Text:

A. *DCD Tier 1, Table 2.16.2-1 does not list safety-related dampers for supply inlet, exhaust outlet and smoke purge outlets of the Reactor Building Clean Area HVAC Subsystem (CLAVS). The description states that the CLAVS area is "non-radilogically controlled." The staff needs additional information on how the Reactor Building Contaminated Area HVAC Subsystem (CONAVS) volumes and Reactor Building Refueling and Pool Area HVAC Subsystem (REPAVS) volumes which are isolated by SR dampers are sealed from the CLAVS clean area volume during an accident when the negative pressure differentials between volumes are not maintained. Since there are no safety-related dampers to assure CLAVS isolation post accident, the CLAVS volume may be considered part of the external environment. As such, all releases to the CLAVS by way of the CONAVS or REPAVS volumes must be considered as exfiltration from the RB.*

B. *Has the volume used in the design basis analysis for the reactor building been reduced by the volume of the non-radiologically controlled CLAVS volume which is not isolated by safety-related dampers? If the CLAVS area is credited as a radiation control area, please revise the description and add the CLAVS dampers to the list of safety-related components in Tier 1 Table 2.16.2-1.*

C. *The CLAVS area is stated as being a non-radiological control area which may mean that no credit is given to these non-safety-related dampers and that the CLAVS area is effectively open to the environment. In the testing of RBVS isolation dampers per Table 2.16.2-2, Item 2, are the CLAVS exhaust and supply dampers which are not listed as safety related in Table 2.16.2-1 tested for isolation?*

GEH Response

A. The Reactor Building Ventilation subsystem CLAVS is provided with Safety-related dampers for the supply and exhaust building penetrations including smoke purge and battery room exhaust as discussed in response to RAI 9.4-42. By design, the building potentially contaminated areas (CONAVS and REPAVS) are separated from the clean area (CLAVS) of the Reactor Building. The differential pressure, established during normal operation, between subsystems is not needed to maintain radiological areas from communicating with non-radilogical areas during accident conditions. There are no flow paths, door louvers, etc. where air travels between ventilation subsystems (radiological and non-radilogical areas). They are separated by the building compartmentalization. On a Loss of Power, all three subsystem's isolation dampers close to isolate the entire reactor building.

B. RAI 6.2-165 will cover the volume used in the design basis accident in its entirety. Safety-related CLAVS isolation dampers have been added to DCD Tier 1 Table 2.16.2-1 per RAI 14.3-52 S01. The CLAVS subsystem is not a radiation area, however, this area is isolated during an accident coincident with a loss of power. This serves as an additional building boundary / barrier.

C. The CLAVS subsystem is a non-radiological controlled ventilation system, which is designed to run, creating a slightly positive pressure, unless there is a loss of power event. With a loss of power, the system is designed to isolate the CLAVS area from the outside environment. Safety-related dampers perform this function. The CLAVS subsystem is not effectively open to the environment. The CLAVS Safety-related dampers were added to Table 2.16.2-1 under RAI 14.3-52 S01, and they will be tested per Table 2.16.2-2 numbers 2 and 3.

DCD Impact

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

NRC RAI 14.3-220 S01

NRC Summary:

CLAVS isolation

NRC Full Text:

In Item C of the GEH response to RAI 14.3-220, it was stated that the CLAVS subsystem is not effectively open to the environment and that Safety-related dampers perform this function. The Battery room exhaust to the stack has isolation dampers on it. Are these safety related dampers and should they be included in Table 2.16.2-1 with the other safety related isolation dampers?

In Items A and B, the staff has concerns about building compartmentalization and leakage between contaminated areas and clean areas. These will be addressed in RAI 9.4-47 S02. GEH stated in the response to the RAI 14.3-220 that RAI 6.2-165 would re-confirm the volume used in the design basis accident in its entirety. The staff will consider information in RAI 6.2-165 when it is received.

GEH Response

The battery room dampers are safety related. These dampers are considered part of the CLAVS building exhaust/supply air isolation dampers that are listed in DCD Rev 5 Tier 1, Table 2.16.2-1 Reactor Building HVAC System Safety-Related Components. The RB volume used in the dose consequence analysis was provided in response to RAI 6.2-165, GEH MFN Number 08630 dated August 14, 2008.

DCD Impact

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

For historical purposes, the original text of RAI 14.3-221 and the GEH response is included.

NRC RAI 14.3-221

NRC Summary:

Post 72 hour operating requirements of RBVS

NRC Full Text:

A. *Regarding the Design Description in Tier 1 Section 2.16.2.1, how does the Reactor Building HVAC System (RBVS) maintain isolation and control of releases post accident as in item 2 (The RBVS isolation dampers automatically close upon receipt of a high radiation signal or loss of AC power) if it operates to provide post 72-hour cooling as in Item 7 (The RBVS provides post 72-hour cooling for DCIS, CRD and RWCU pump rooms...)?*

B. *What parts of the RBVS are operating and does it exhaust from the building? Does it provide for either cooling or control of hydrogen in safety-related battery rooms?*

C. *In testing the RB for leak tightness as per Tier 1 Table 2.16.5-2, item 4, does the test have to consider the RBVS running in the 72 hour post accident cooling mode? What portions of the RBVS system are classified as RTNSS? Is the CLAVS area of the RB considered as part of the RB for testing?*

D. *How is the RTNSS qualification demonstrated and verified? Can the releases be demonstrated to be less than the 50% mass per day leakage rate assumed in the design basis analysis?*

E. *What cooling systems (chilled water, component cooling water, etc.) are required to support the RBVS cooling functions? What source of power is supplied to these systems?*

F. *Are the supporting cooling systems classified as RTNSS?*

G. *Has the 72-hour post accident RBVS operation requirements been evaluated for winter and summer design temperature conditions?*

GEH Response

A. The RBVS isolation dampers automatically close upon receipt of a high radiation signal (CONAVS and REPAVS) or loss of AC power (CONAVS, REPAVS and CLAVS). The building is designed to remain isolated post accident until power is restored and a radiological assessment is made prior to restarting the ventilation subsystems (CONAVS, REPAVS and CLAVS). During this isolation period, the room coolers are designed for removing heat from the DCIS, CRD and RWCU pump room areas, provided power has been restored. During the first 72-hours, with no power available, the heat is removed passively by the surrounding structures.

B. The RBVS building isolation and post accident cooling is described in response #A above. Prior to restarting the CONAVS and REPAVS ventilation subsystems, a radiological assessment of the subsystem atmosphere would be performed. The redundant Reactor Building HVAC Purge Exhaust Filter Units would be available to clean up and discharge the building air, creating a negative pressure in the CONAVS area, when power is available.

Upon restoration of power, a radiological assessment of the CLAVS area is made prior to restarting this ventilation subsystem, which includes battery room exhaust fans. Once this assessment approves the restart of the CLAVS ventilation subsystem, battery recharge can follow ensuring that battery room exhaust fans are running while charging takes place. The battery room area is served by the CLAVS subsystem of the RBVS. Since batteries do not generate hydrogen while discharging, there is no potential building-up of hydrogen gas in the battery rooms until power restoration at recharging. When power is restored, the CLAVS area ventilation (including battery exhaust fans) will be restarted concurrent with the recharging of the batteries effectively removing any hydrogen generated and heat generated in this area.

C. The RB leak tightness test will be conducted to validate the leakage assumptions of the ESBWR Containment Fission Product Removal Evaluation Model. This analysis does not consider the RBVS in operation, as during the 72 hour post accident cooling mode. Therefore, the RB HVAC systems will not be in operation during RB leak tightness testing. The RB leak tightness test per Table 2.16.5-2, item 4, will be performed with no RB subsystems CONAVS, CLAVS, and REPAVS running. The room coolers, which have no ventilation contact outside their specific areas, will not be required to be running. The CLAVS subsystem is not considered as part of the RB for testing. The RBVS RTNSS functions are listed in DCD Chapter 19A, Table 19A-2.

D. RBVS RTNSS functions will be tested as per Chapter 19 Availability Controls Manual and initially per ITAAC Table 2.16.2-2, Item 7. The release will be demonstrated by test to be less than the assumed value in the design basis analysis as stated in Table 2.16.5-2, item 4.

E. Chilled Water is the cooling system required to support post 72 hr RBVS RTNSS functions. The source of power to the Nuclear Island Chilled Water subsystem (NICWS) is from PIP Plant Investment busses A and B. This power supply is provided with onsite diesel backup.

F. Yes, the room coolers and Chilled Water (as stated above) for the DCIS area cooling are supporting RTNSS functions. These functions are listed in DCD Table 19A-2.

G. The 72 hour post accident RBVS system requirements have been evaluated for winter and summer design temperature operation.

DCD Impact

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

NRC RAI 14.3-221 S01

NRC Summary:

Post accident migration of contamination to clean areas

NRC Full Text:

In Item D of the response to RAI 14.3-221, Table 2.16.5-2 Item 4 states that the RB is being tested. Please clarify in the table that only the contaminated portion of the RB is being tested.

GEH Response

In accordance with DCD section 16B3.6.3.1 Reactor Building Contaminated Area Ventilation Subsystem (CONAVS) area, the ESBWR reactor building exfiltration test will evaluate leakage from the contaminated areas of the reactor building (CONAVS area) only. By design, the building potential contaminated areas are CONAVS and REPAVS. Reactor Building exfiltration testing will be a positive pressure test of the reactor building volume confirming that the contaminated area ventilation system leakage rate is less than that assumed in the radiological analysis for the LOCA inside containment.

DCD Impact

DCD Tier 1 Table 2.16.5-2 will be revised to show the testing of the RB (CONAVS area) only.

Enclosure 1

Attachment 1

DCD Tier 1

Revision 6 Markups

Section 2.16-5 Reactor Building Design Description

Table 2.16.5-2 ITAAC For The Reactor Building

2.16.5 Reactor Building

Design Description

The Reactor Building (RB) houses the reactor system, reactor support and safety systems, concrete containment, essential power supplies and equipment, steam tunnel, and refueling area. On the upper floor of the RB are the new fuel pool and small spent fuel storage area, dryer/separator storage pool, refueling and fuel handling systems, the upper connection to the Inclined Fuel Transfer System and the overhead crane. The Isolation Condenser/Passive Containment Cooling System pools are below the refueling floor.

The RB structure is integrated with a reinforced concrete containment vessel (RCCV); the RCCV is located on a common basemat with the RB. The RB is a rigid box type shear wall building. The external walls form a box surrounding a large cylindrical containment. The RB shares a common wall and sits on a large common basemat with the Fuel Building. The RB is a safety-related, Seismic Category I structure. The building is partially embedded.

The key characteristics of the RB are as follows:

(1) The RB is designed and constructed to accommodate the dynamic, static and thermal loading conditions associated with the various loads and load combinations, which form the structural design basis. The loads are (as applicable) those associated with:

- Natural phenomena—wind, floods, tornados (including tornado missiles), earthquakes, rain and snow.
- Internal events—floods, pipe breaks including LOCA and missiles.
- Normal plant operation—live loads, dead loads, temperature effects and building vibration loads.

(2) The functional arrangement of the RB is as described in the Design Description of this Subsection 2.16.5 and is as shown in Figures 2.16.5-1 through 2.16.5-11.

(3) The critical dimensions used for seismic analyses and the acceptable tolerances are provided in Table 2.16.5-1.

(4) The RB (Contaminated Area Ventilation Subsystem [CONAVS]) design provides a holdup volume and delays release of radioactivity to the environment consistent with the LOCA dose analysis maximum exfiltration assumptions.

(5) The RB provides three-hour fire barriers for separation of the four independent safe shutdown divisions.

(6) The RB is protected against external and internal floods. In regards to external flooding, the RB incorporates structural provisions into the plant design to protect the structures, systems and components from postulated flood and groundwater conditions. This approach provides:

a. Wall thicknesses below flood level designed to withstand hydrostatic loads;

b. Water stops provided in all expansion and construction joints below flood and groundwater levels;

Table 2.16.5-2

ITAAC For The Reactor Building

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3. The critical dimensions and acceptable tolerances for the RB are as described in Table 2.16.5-1.	Inspection of the RB will be performed. Deviations from the design conditions will be analyzed using the design basis loads.	Report(s) exist which reconcile construction deviations from the critical dimensions and tolerances specified in Table 2.16.5-1 and conclude that the as-built RB will withstand the design basis loads specified in the Design Description of this subsection 2.16.5 without loss of structural integrity or the safety-related functions.
4. The RB (Contaminated Area Ventilation Subsystem [CONAVS]) design provides a holdup volume and delays release of radioactivity to the environment consistent with the LOCA dose analysis maximum exfiltration. assumptions .	Leakage rate testing of the as-built RB (Contaminated Area Ventilation Subsystem [CONAVS]) under a differential pressure of 62.3 Pa (0.25" w.g.) will be conducted.	Test and analysis report(s) document that the RB (Contaminated Area Ventilation Subsystem [CONAVS]) leakage rate under the conditions expected to exist during a LOCA is ≤ 141.6 l/s (300 cfm).
5. The RB provides three-hour fire barriers for separation of the four independent safe shutdown divisions.	Inspections of the as-built RB will be conducted.	Inspection report(s) document that each division is separated by fire barriers having ≥ 3-hour fire ratings.