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MFN 08-422

Docket No. 52-010

April 25, 2008

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: **Response to Portion of NRC Request for Additional Information Letter No. 158 Related to ESBWR Design Certification Application - Auxiliary Systems - RAI Number 9.4-47 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 158, dated February 29, 2008, Reference 1. The original response was submitted via Reference 2 in response to Reference 3.

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

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

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NRO

References:

1. MFN 08-209, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 158 Related to the ESBWR Design Certification Application,* February 29, 2008.
2. MFN 07-592, Supplement 2, *Response to Portion of NRC Request for Additional Information Letter No. 103 Related to ESBWR Design Certification Application - Heating, Ventilation, and Air Conditioning - RAI Number 9.4-47,* November 23, 2007.
3. MFN 07-414, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 103 Related To ESBWR Design Certification Application*, July 23, 2007.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 158 Related to ESBWR Design Certification Application - Auxiliary Systems - RAI Number 9.4-47 S01

cc:

AE Cubbage	USNRC (with enclosure)
RE Brown	GEH/Wilmington (with enclosure)
DH Hinds	GEH/Wilmington (with enclosure)
GB Stramback	GEH/San Jose (with enclosure)
eDRF	0000-0084-1506

Enclosure 1

MFN 08-422

Response to Portion of NRC Request for

Additional Information Letter No. 158

Related to ESBWR Design Certification Application

Auxiliary Systems

RAI Number 9.4-47 S01

For historical purposes, the original text of RAI 9.4-47 and the GEH response is included.

NRC RAI 9.4-47

DCD, Tier 2, Revision 3, Figure 9.4-9 shows that the reactor building clean air sub system exhaust air directly outdoors.

How is the release monitored for radiation? What assurance is there that this release is clean and does not have to be monitored? Are there barriers that separate the clean area from the contaminated areas of the reactor building other than air pressure differential?

GEH Response

The Clean Area HVAC Subsystem (CLAVS) which is described in DCD Tier 2 Subsection 9.4.6 and outlined in DCD Tier 2 Figure 9.4-9 serves the clean (non-radiological controlled) areas of the Reactor Building, and therefore its exhaust does not contain any contaminants during CLAVS operation. The CLAVS ventilation subsystem is a recirculation ventilation system kept at a slightly positive pressure with respect to the other building ventilation subsystems. There are walls and internal barriers within the reactor building, which keep the clean areas (served by CLAVS) separate from either of the potentially contaminated RB areas (served by CONAVS or REPAVS), which additionally are maintained at a slightly negative pressure. The building separation design and the pressure differential maintained ensure that any exhaust from this subsystem is clean.

DCD Impact

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

NRC RAI 9.4-47 S01

The response to 9.4-47 provided by GE did not address post accident releases from the reactor building. GDC 64 requires that means shall be provided for monitoring the reactor containment atmosphere, spaces containing components for recirculation of loss-of-accident fluids. Effluent discharge paths, and the plant environs for radioactivity that may be released from normal operations, including anticipated operational occurrences, and from postulated accidents. For the specific case of postulated accidents (i.e. LOCA), there can be migration of contaminations from the contaminated areas to clean areas. Although there are some barriers separating the clean areas from the contaminated areas, these barriers have not been identified on drawings or shown to be leak tight which leads the staff to believe that there can be some contamination in the clean areas.

How does the ESBWR comply with GDC 64 with respect to monitoring releases from the reactor building?

GEH Response

DCD, Tier 2, Revision 4, subsection 11.5.5.4, Implementation of General Design Criteria 64, ensures means are provided for monitoring the radiation levels in the reactor containment atmosphere, spaces containing components for the recirculation of loss-of-coolant accident fluids, effluent discharge paths and important process streams are monitored for radioactivity. The paths and areas monitored include the Reactor Building HVAC subsystems shown in DCD Tier 2 Figure 11.5-1, Location of Radiation Monitors:

- Reactor Building HVAC Exhaust RMS- the RMS monitors the gross radiation level in the exhaust duct of the RB ventilation system from the RB exhaust duct and the Refueling Area Air Exhaust duct.
- Plant RB/FB Stack RMS, and
- Containment Purge Exhaust RMS.

A common supply air duct distributes conditioned air to the potentially contaminated areas of the Reactor Building. Air is exhausted from the potentially contaminated areas of the Reactor Building (CONAVS) by the operating exhaust fan and discharged to the RB/FB vent stack.

CONAVS also includes redundant Reactor Building HVAC Purge Exhaust Filter Units and exhaust fans. During radiological events, exhaust air from contaminated areas may be manually diverted through the Reactor Building HVAC Purge Exhaust Filter Units.

The Refueling and Pool Area Ventilation System (REPAVS) is a once-through ventilation system distributing conditioned air to the refueling area and across the pool surface. Exhaust air is ducted to the exhaust fans and exhausted to the outside atmosphere through the RB/FB vent stack.

The Clean Area Ventilation System (CLAVS) is a recirculating ventilation system that distributes conditioned air to and from the Reactor Building clean areas. Return air not directed back to the AHU is exhausted directly outdoors. A portion of the flow is directed to the battery rooms. Air is exhausted from the battery rooms by the battery room exhaust fans which discharge directly to the RB/FB vent stack.

GDC 64 is met due to the installation of the RB HVAC rad monitors, Fuel Handling Area HVAC rad monitors and Containment Purge HVAC rad monitors, all of which are safety-related.

The reactor building HVAC system (CONAVS, REPAVS and CLAVS) safety related boundary isolation dampers close on receipt of a high radiation signal or on a loss of AC power with or without the high radiation signal to isolate radioactive effluent discharges.

Contamination of reactor building clean areas (CLAVS) from contaminated areas will be minimal. By design, the building potentially contaminated areas (CONAVS and REPAVS) are separated from the clean area (CLAVS) of the Reactor Building. During normal operation and after post accident conditions when AC power is available, the CLAVS is maintained at a positive pressure relative to the CONAVS and REPAVS minimizing the possibility of contamination. The differential pressure, established during normal operation, between subsystems is not needed to maintain radiological areas from communicating with non-radiological areas during accident conditions. There are no flow paths, door louvers, etc. where air travels between ventilation subsystems (radiological and non-radiological areas). They are separated by the building compartmentalization. Also, direct leakage from the primary containment to the clean areas of the reactor building (CLAVS) is not credible with primary containment penetrations located in contaminated areas (not clean areas) and primary containment liner leakage through the concrete to CLAVS discounted due to the construction process. Therefore, potential contamination of CLAVS through communication with CONAVS or REPAVS is considered minimal.

If the CLAVS does become contaminated during normal operations, anticipated operational occurrences or postulated accidents, the effluent will be monitored and isolated, as required. A portion of the CLAVS flow, directed to the battery rooms, is exhausted by the battery room exhaust fans directly to the RB/FB vent stack. This effluent, representative of the radiation in the clean areas of the reactor building, will be monitored by the isokinetic probe for radiation. During system restoration following loss of power, a radiological assessment of the CLAVS area is made prior to restarting the ventilation subsystem by operating the system in recirc mode while exhausting the flow through the battery room to the stack monitoring system. Once the radiological

assessment concludes that the exhaust flow is within regulatory limits, the CLAVS subsystem will be restored to normal operation. This will ensure GDC 64 requirements are met for the CLAVS in addition to CONAVS and REPAVS.

DCD Impact

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