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MFN 06-066, Supplement 3

Docket No. 52-010

August 9, 2007

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. 07 Related to ESBWR Design Certification Application – Process Radiation Monitors – RAI Numbers 11.5-6S02 and 11.5-8S02**

Enclosure 1 contains GE-Hitachi Nuclear Energy Americas (GEH) response to the subject NRC RAIs transmitted via Reference 1. Enclosure 2 contains the DCD Markup associated with the response to RAI 11.5-6S02.

If you have any questions or require additional information regarding the information provided here, please contact me.

Sincerely,

Kathy Sedney for

James C. Kinsey
Project Manager, ESBWR Licensing

D068

NRO

Reference:

1. MFN 06-043 – Letter from US Nuclear Regulatory Commission (NRC) to David H. Hinds, *Request for Additional Information Letter No. 07 Related to ESBWR Design Certification Application,* dated January 26, 2006

Enclosures:

1. Response to NRC Request for Additional Information Letter No. 07 Related to ESBWR Design Certification Application – Process Radiation Monitors, RAI Numbers 11.5-6S02 and 11.5-8S02
2. DCD Markup

cc:	AE Cubbage	USNRC (with enclosures)
	GB Stramback	GEH /San Jose (with enclosures)
	RE Brown	GEH /Wilmington (with enclosures)
	eDRF	0071-7639 for RAI 11.5-6S02
		0071-7640 for RAI 11.5-8S02

Enclosure 1

MFN 06-066, Supplement 3

Response to Portion of NRC Request for Additional Information Letter No. 07 Related to ESBWR Design Certification Application

Process Radiation Monitoring System

RAI Numbers 11.5-6S02 and 11.5-8S02

NRC RAI 11.5-6 S02:

In RAI 11.5-6, as it relates to DCD Tier 2, Rev. 1, Sections 11.5.3 and 11.5.4, the staff requested the applicant to describe how the Reactor Building HVAC Exhaust system captures discharges from the Isolation Condenser Vent exhaust. In Revision 3 of the DCD Tier 2, Section 11.5.3.1.5, the discussion about the air exhaust from the atmospheric area above each condenser pool is incomplete. Although the exhaust is monitored by the Isolation Condenser Vent Exhaust RMS, it is not clear from this discussion and information presented in DCD Rev. 3, Sections 5.4.6.5 and 5.1.2 and Figure 5.1-3, what design features are provided to prevent the exhaust from the atmospheric area above each condenser pool from becoming an uncontrolled and unmonitored release to the environment.

GEH Response:

In the normal plant operation, the steam from the reactor is directed to the main condenser. The isolation condensers remain in a standby mode without any airflow out of the building. This path only has flow through it when the isolation condensers are in operation. Boil-off steam formed in the compartments containing IC heat exchangers are non-radioactive and has a slight positive pressure relative to station ambient. The air space above the pool that contains the isolation condenser is exhausted to atmosphere through large–diameter discharge vents after first passing through a large face area passive-type steam dryer. Moisture removed by the dryer from the boil-off steam is ducted back to the IC pool.

Each ventilation path, from the air space above the pool in which the isolation condenser is submerged, is monitored for radioactivity by a series of radiation monitors. Upon detection of radioactivity escaping the pool, as might be the case from a leak from an isolation condenser, the radiation monitors initiate closure of the containment isolation valves of the affected condenser. An appropriate setpoint is established (via the Radiation Protection Program) to ensure isolation of the condenser prior to exceeding the applicable offsite regulatory guidelines, thereby preventing the atmospheric area above the condenser pool from becoming an uncontrolled and unmonitored release to the environment.

DCD Impact:

DCD Tier 2, Subsection 11.5.3.1.5 will be revised as noted on the attached markup.

NRC RAI 11.5-8 S02:

In RAI 11.5-8, as it relates to DCD Tier 2, Rev. 1, Sections 11.5.3 and 11.5.4, the staff requested the applicant to address inconsistencies in addressing competing objectives of Regulatory Guides 1.21 and 1.97 in describing dynamic response ranges and expected activity levels. The specific information is presented in DCD Rev. 1, Tables 11.5-1, 11.5-2, 11.5-4, and 11.5-9. In Revision 3 of the DCD Tier 2, Section 11.5.2.1 and Table 11.5-9, the applicant states that the PRMS dynamic instrumentation response ranges are consistent system designs and qualifications under the provisions of Regulatory Guide 1.97. A review of DCD Rev. 3, Sections 7.5 indicates that the instrumentation design requirements are based on Rev. 4 of Regulatory Guides 1.97. A review of Rev. 4 of the regulatory guide indicates that it does not provide criteria for instrumentation variables as does Revision 2 or 3 of the same guide. In Rev. 4 of the guide, the basis and numerical values for instrumentation are to be established in the licensing basis documentation, which is non-existent at this time. The discussion in DCD Rev. 3, Section 11.5.2.1 and basis for the chosen dynamic response ranges listed in DCD Rev. 3, Table 15.5-9 reflect adoption of the design and qualification criteria and instrumentation variables of Tables 1 and 2 of Regulatory Guide 1.97, either as Revision 2 or 3. DCD Rev. 3, Section 7.5.1, discussing conformity with Regulatory Guide 1.97, states that compliance cannot be specified at this time and that compliance to these requirements is [to be] addressed during the detailed design phase. However, DCD Rev. 3, Sections 7.5.7 and 11.5.7 (COL Information) do not identify this issue as COL action items. Accordingly, the inconsistency in confirming compliance with either Revision 2/3 or Revision 4 of Regulatory Guide 1.97 for accident monitoring instrumentation described in DCD Rev. 3, Sections 7.5.1 and 11.5.2 is left for the applicant to resolve.

GEH Response:

Compliance to Regulatory Guide 1.97 was addressed in GEH's response to RAI 11.5-46 submitted by GEH letter MFN 07-301 dated July 23, 2007.

DCD Impact:

The DCD Tier 2 markup from the July 23, 2007 letter MFN 07-301 reads as follows: "The Plant Stack radiation monitor is a post-accident monitor and meets the guidelines of Regulatory Guide 1.97 (Reference 11.5.11), which endorses (with certain exceptions specified in Section C of the Regulatory Guide) IEEE Std. 497. The IEEE Std. 497 establishes flexible, performance based criteria for selection, performance, design, qualification display, and quality assurance of accident monitoring variables. See Subsection 7.5.1.3.1.4 for a complete discussion of Regulatory Guide 1.97 compliance. NUREG-0737 (Reference 11.5-15) conformance is described in Subsections 7.1.5.1.2 and 7.1.5.5.1."

No further changes to the DCD are warranted.

Enclosure 2

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DCD Markup for

RAI 11.5-6S02

11.5.3.1.5 Isolation Condenser Vent Exhaust RMS

This subsystem monitors the gross radiation from the exhaust of the air from the atmospheric pool area above each isolation condenser. In normal plant operation, the steam from the reactor is directed to the main condenser. The isolation condensers remain in a standby mode, with the path to outside the building without any air flow. This path only has flow through it when the isolation condensers are in operation. Boil-off steam formed in the compartments containing Isolation Condenser (IC) heat exchangers are non-radioactive and are maintained at a slight positive pressure relative to station ambient. The air space above the pool that contains the isolation condenser is exhausted to atmosphere though large-diameter discharge vents after first passing through a large face area passive-type steam dryer. Moisture removed by the dryer from the boil-off steam is ducted back to the IC pool.

Each ventilation path, from the air space above the pool in which the isolation condenser is submerged, is monitored for radioactivity by a series of radiation monitors. Upon detection of radioactivity escaping the pool, as might be the case from a leak from the isolation condenser, the radiation monitors initiate closure of the containment isolation valves for the affected condenser. A setpoint will be calculated to ensure isolation of the condenser prior to exceeding the applicable offsite regulatory guidelines.

The subsystem consists of sixteen channels (four per isolation condenser vent) that are physically and electrically independent of each other.

~~Each subsystem initiates isolation of the affected isolation condenser by closure of isolation valves in the steam line to the condenser and in the condensate return line from the condenser.~~

~~The detectors monitor radioactivity in the isolation condenser discharge pool area exhaust that might have resulted from a tubing break or a defective condenser.~~

The subsystem consists of four redundant instrument channels. Each channel consists of a gamma-sensitive detector and a MCR radiation monitor.

Leak Detection and Isolation System receives the individual channel signals and compares the signal level to the setpoint trips.

Any two-out-of-four channel trips result in the closure of isolation valves in the steam line to the condenser and in the condensate return line from the condenser.

Trip circuits initiate their respective alarms in the MCR.

A single channel may be taken out of service for testing without affecting the protective functionality of the remaining channels. Two-out-of-three channel trips cause protective actions in the test mode.

Each channel has a monitor failure alarm in the MCR.

The range of channel measurement and display is shown in Table 11.5-1 and Table 11.5-2. The range is selected to provide sufficient coverage from normal operation up to, and several decades beyond, for radioactivity released prior to exceeding limits of 10 CFR 20

(Reference 11.5-21). Under normal operation, there is no radioactivity expected to be exhausted from this path since there shouldn't be any leakage into the pool area.

11.5.3.1.6 Fuel Building General Area HVAC RMS

This subsystem monitors the gross radiation level in the FBHV exhaust duct for the general area. The system consists of four channels that are physically and electrically independent of each other. The subsystem monitors the radiation levels of the air exiting the FB general areas as well as the rooms with the fuel pool cooling and cleanup equipment.

The subsystem consists of four redundant instrument channels. Each channel consists of a gamma-sensitive detector and a MCR radiation monitor.

The individual channel signals are compared to the setpoint trips.

Any two-out-of-four channel trips result in the closing the exhaust damper and tripping of the FB General Area fan.

Trip circuits initiate their respective alarms in the MCR.

A single channel may be taken out of service for testing without affecting the protective functionality of the remaining channels. Two-out-of-three channel trips cause protective actions in the test mode.

Each channel has a monitor failure alarm in the MCR.

The range of channel measurement and display is shown in Table 11.5-1 and Table 11.5-2. The range is selected to provide sufficient coverage for radioactivity released during normal operation up to, and including several decades beyond, the amount associated with a refueling accident and the subsequent air flow into the FBHV.

11.5.3.1.7 Fuel Building Fuel Pool HVAC RMS

The FB Fuel Pool HVAC RMS consists of a total of four channels that monitor the radiation level of the air exiting the FB Spent Fuel Storage Pool and equipment areas.

The subsystem consists of four redundant instrument channels. Each channel consists of a gamma-sensitive detector and a MCR radiation monitor.

The individual channel signals are compared to the setpoint trips.

Any two-out-of-four channel trips result in the closing the exhaust damper and tripping of the FB Fuel Pool General Area fan.

Trip circuits initiate their respective alarms in the MCR.

A single channel may be taken out of service for testing without affecting the protective functionality of the remaining channels. Two-out-of-three channel trips cause protective actions in the test mode.

Each channel has a monitor failure alarm in the MCR.