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Supplement 1

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**Subject: Response to NRC Request for Additional Information Letter No. 1
Related to ESBWR Design Certification Application – Radiation
Protection – RAI 11.5.3-3 – Supplement 1**

Enclosure 1 contains a supplemental response to the subject NRC RAI. This supplemental response is being provided based on discussions with the NRC on May 16, 2006 and the resultant e-mailed comments provided by the NRC (Enclosure 2). GE's original response to the subject RAI was transmitted via the Reference 1 letter.

This letter does not affect any other RAI responses in the Reference 1 letter.

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

Sincerely,

Bathy Sedney for

David H. Hinds
Manager, ESBWR

DS68

Reference:

1. MFN 05-153, Letter from David H. Hinds to U.S. Nuclear Regulatory Commission, *Response to NRC Request for Additional Information Letter No. 1 Related to ESBWR Design Certification Application – Chapters 11 and 12 – Radiation Protection*, December 9, 2005

Enclosures:

1. MFN 05-153, Supplement 1 – Response to NRC Request for Additional Information Letter No. 1 Related to ESBWR Design Certification Application – Radiation Protection – RAI 11.5.3-3 – **Supplement 1**
2. MFN 05-153, Supplement 1 – NRC e-mail Transmittal – Evaluation of GE Responses to NRC RAI Letter No. 7 – ESBWR DCD Rev. 1, Tier 2

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ENCLOSURE 1

MFN 05-153, Supplement 1

Response to NRC Request for

Additional Information Letter No. 1

Related to ESBWR Design Certification Application

Radiation Protection

RAI 11.5.3-3 – Supplement 1

RAI 11.5-3-3

The designation of radiation monitoring systems and their respective ID codes are inconsistently presented in Table 11.5.3 and Figure 11.5-1. This section refers to Table 11.5-3 and Fig. 11.5-1 for information about the designation and ID codes of radiation monitoring systems. A review of instrumentation ID codes indicates that the numbering system is inconsistent for ID No. 21, 22 and 23. The system identified as No. 21 on Fig. 11.5-1 is not listed in Table 11.5-3 and its designation ("#21, COPS") and function are not described in the Section. As a result, ID codes No. 21 and 22 presented in Table 11.5-3 are not consistent with those shown in Fig. 11.5-1. Also, instrument ID code No. 23 is missing in Table 11.5-3, but is included in Fig. 11.5-1. Provide figures and tables (and text as needed) with updated information.

GE Response:

Original response based on comments relevant to DCD Tier 2, Revision 0

DCD Chapter 11, Revision 1 corrected Figure 11.5-1 so that COPS is not shown and the numbers are adjusted, so that reference to COPS is eliminated.

Additional response based on comments relevant to DCD Tier 2, Revision 1

The Isolation Condenser / Passive Containment Cooling (IC/PCC) pool is vented to the atmosphere as shown in ESBWR DCD Figure 5.1-3. It is not routed to Reactor Building HVAC. Under normal IC operating conditions, boil-off steam formed in the compartments containing Isolation Condenser heat exchangers are non-radioactive and has a slight positive pressure relative to station ambient. It 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 this boil-off steam is ducted back to the IC/PCC pool.

DCD Figure 11.5-1 will be revised to show the isokinetic probe for the Offgas Post-Treatment subsystem as noted in the attached markup.

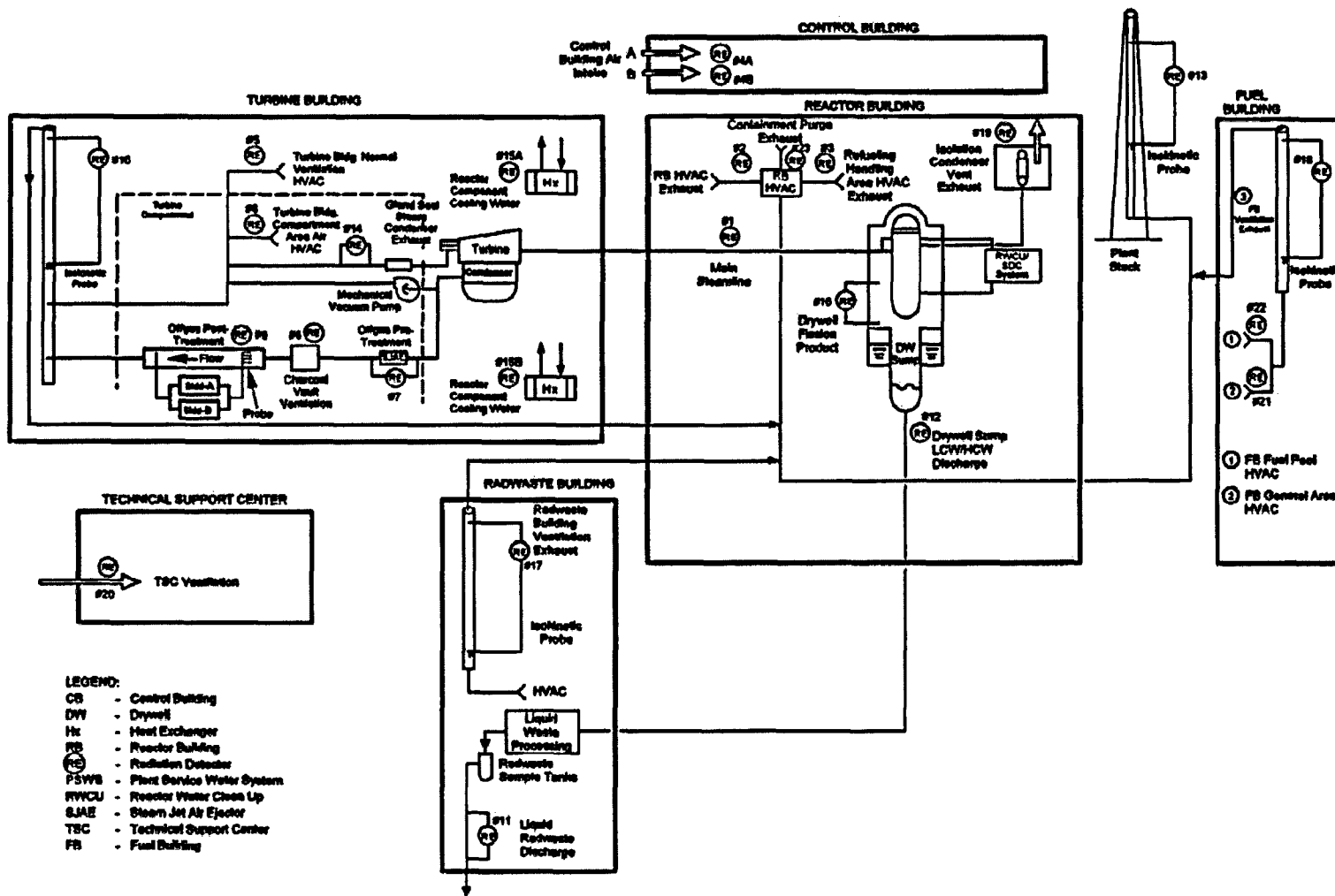


Figure 11.5-1. Location of Radiation Monitors

ENCLOSURE 2

MFN 05-153, Supplement 1

NRC e-mail Transmittal

Evaluation of GE Responses to NRC RAI Letter No. 7

ESBWR DCD Rev. 1, Tier 2

**Evaluation of GE Responses to NRC RAI Letter No. 7
ESBWR DCD Rev. 1, Tier 2**

The following comments are provided on the revised Chapter 11.5 subsections of the DCD, Rev. 1, Tier 2. The comments are keyed by RAI numbers as a function of technical or regulatory topics.

A. RAI 11.5-4

Section 11.5.1.1.1 - Radiation Monitors Required for Safety and Protection

The section identifies seven PRMS subsystems that provide or initiate automatic safety functions. A review of the listing indicates that three systems are missing: Offgas Post-treatment, Main Steam Line, and Liquid Radwaste Discharge. This is contrary to the discussion and listed systems addressing the implementation of GDC 60 in Section 11.5.5.2. Correct or clarify accordingly here and in Section 11.5.5.2, as needed.

B. RAI 11.5-5

Section 11.5.2.2 - Radiation Monitors Required for Plant Operation

The section does not identify provisions, systems, or procedures addressing the detection of radioactivity in non-radioactive systems to prevent unmonitored and uncontrolled releases of radioactive materials in the environment. Correct or clarify accordingly.

C. RAI 11.5-6

Section 11.5.3.1.5 - Isolation Condenser Vent Exhaust RMS

In its description and functions, the discussion does not indicate where discharges from the Isolation Condenser Vent Exhaust goes into. A review of Chapter 9.4 does not indicate how the Reactor Building HVAC Exhaust system capture discharges from the Isolation Condenser Vent Exhaust. Correct or clarify accordingly.

Section 11.5.3.1.6 - Fuel Building Main Area HVAC RMS

The description of the Fuel Building Main Area HVAC RMS is incomplete as it does not include a discussion about whether the associated radiation monitor initiates isolation and closure functions as part of automatic safety functions. Correct or clarify accordingly.

Section 11.5.3.2.2 - Offgas Pre-Treatment RMS

The dynamic response of the Offgas Pre-Treatment RMS is based on a gas release rate ranging from 3.7 MBq/sec to 3.7E+05 MBq/sec. Given the source term basis parameters of Chapter 11.1 (Tables 11.1-1 and 11.1-3) and SRP Chapter 11.3 guidance (3.7 MBq/sec per MWt), it is not clear how this dynamic range was derived. Provide the basis of this dynamic range in light of Chapter 11.1 assumptions. Confirm that the basis of this range is also consistent with the dynamic range given for the Offgas Post-Treatment RMS described in the

following subsection, 11.5.3.2.3.

Section 11.5.3.2.3 - Offgas Post-Treatment RMS

- a. Confirm and describe the functions of Skid A and Skid B, as is noted in Table 11.5-1.
- b. The fourth paragraph refers to an incorrect section of Part 20. Change "20.1203" to read "20.1302" instead. Note that this error appears throughout the chapter; check and correct accordingly.
- c. Although the system description refers to sampling in accordance with ANSI 13.1-1999, the supporting figure (Fig. 11.5-1) does not indicate the presence of an isokinetic probe on that part of the Offgas Post-Treatment System. Correct or clarify accordingly.

Section 11.5.3.2.7 - Reactor Component Cooling Water Intersystem Leakage RMS

- a. The description of the Reactor Component Cooling Water Intersystem Leakage RMS does not refer to separate trains, A and B, each with its own radiation monitor. Correct or clarify accordingly.
- b. The description of the Reactor Component Cooling Water Intersystem Leakage RMS does not refer to built-in radioactive check sources to check the operability of the system. Confirm that this feature is consistent with the description given in Section 11.5.6.1.

Section 11.5.3.2.12 - Drywell Fission Product RMS

The description of the Drywell Fission Product RMS does not refer to built-in radioactive check sources to check the operability of the system. Confirm that this feature is consistent with the description given in Section 11.5.6.1.

Section 11.5.3.2.14 - Plant Stack RMS

The description of the Plant Stack RMS does not refer to built-in radioactive check sources to check the operability of the system. Confirm that this feature is consistent with the description given in Section 11.5.6.1.

Section 11.5.3.2.15 - Fuel Building Ventilation Exhaust Air Handling Unit (AHU) RMS

The description of the radiation monitoring system refers to alternatively to two different number of channels for the same system. In the first instance, it states "... consists of a total of four channels that monitor the radiation level of the air entering the Fuel Handling Ventilation (FVH) unit area exhaust AHUs." In the second instance, it states "Two channels provide the monitoring." Correct or clarify accordingly.

Section 11.5.3.2.16 - Fuel Building Combined Ventilation Exhaust RMS

The description of the Fuel Building Combined Ventilation Exhaust RMS does not refer to built-in radioactive check sources to check the operability of the system. Confirm that this feature is consistent with the description given in Section 11.5.6.1.

D. RAI 11.5-22 (NEW RAI)

Section 11.5.4.3 - Instrumentation

The tables cited for where information on instrumentation can be found should be changed to include Table 11.5-8, as it is not included here.

E. RAI 11.5-18

Section 11.5.5.4 - Implementation of General Design Criteria 64

A review of the RMS system used to demonstrate compliance with GDC 64 indicates that: (i) the Liquid Radwaste Discharge RMS is omitted from the listing, and (ii) the Turbine Building Combined Ventilation Exhaust RMS is listed twice. Correct or clarify accordingly.

F. RAI 11.5-19

Section 11.5.6.1 - Inspection and Tests

The sentence introducing the second listing of monitoring systems (p.11.5-17) should note that these systems also include, in addition to check sources, provisions for using test signals in checking system operability. Correct or clarify accordingly.

G. RAI 11.5-8

Table 11.5-1 - Process and Effluent Radiation Monitoring Systems

- a. The radiological units used to express display channel ranges are inconsistent with those presented in Table 11.5-2 for the same systems and functions. This table uses mSv/h while the other uses MBq/m³. Also, some of the stated ranges are inconsistent with expected activity levels under accident or abnormal plant conditions, e.g., up to 1 mSv/h for the Isolation Condenser Vent Exhaust, among other systems. Check all listed monitoring systems and correct or clarify all display channels accordingly in both tables.
- b. There are two entries for the Turbine Building Combined Ventilation Exhaust, with one showing the sampling line coming from the drywell. Check all listed systems and correct or clarify accordingly.
- c. Confirm the number of channels and values stated for the display channel ranges between Skid A and Skid B of the Offgas Post-treatment and Offgas Pre-Treatment monitoring systems in light of the information provided in Sections 11.5.3.2.2 and 11.5.3.2.3. Correct or clarify accordingly.

- d. Confirm the number of channels for the display channel ranges for the Fuel Building Ventilation Exhaust AHU in light of the information provided in Section 11.5.3.2.15. Correct or clarify accordingly.

H. RAI 11.5-8

Table 11.5-2 - Process Radiation Monitoring System (Gaseous and Airborne Monitors)

- a. The radiological units used to express detection ranges are inconsistent with those presented in Table 11.5-1 for the same systems and functions. This table uses MBq/m³ while the other uses mSv/h. Also, this table uses units of MBq/m³ in describing the response range of the Main Steam Line RMS. Check all listed monitoring systems and correct or clarify accordingly throughout in both set of tables.
- b. Confirm that all stated detection ranges are correctly estimated in light of the potential for radioactivity for each system. For example, the upper range given for the Refuel Handling Area HVAC Exhaust is "7.3E+06 Bq/m³" versus a value of "8.0E+05 Mbq/m³" for the Control Building Air Intake HVAC RMS. Review and correct all effluent concentration detection ranges (MBq/m³ vs Bq/m³).
- c. Provide the basis of the estimates given for the dynamic detection ranges.

I. RAI 11.5-10

Table 11.5-3 - Key to Radiation Monitors Shown in Figure 11.5-1

- a. Confirm and update Table 11.5-3 to indicate that the Reactor Component Cooling Water Intersystem Leakage has two trains, A and B.
- b. Confirm and update Table 11.5-3 to indicate that the Offgas Post-Treatment RMS is equipped with two skids, Skid A and Skid B.

J. RAI 11.5-11

Table 11.5-4 - Process Radiation Monitoring System (Liquid Monitors)

- a. Confirm and correct the stated dynamic detection range for the Liquid Radwaste Discharge RMS. The lower and upper ranges have the same values, "2.1E+03 MBq/m³".
- b. Provide the basis of the estimates given for the dynamic detection ranges.

K. RAI 11.5-12

Table 11.5-5 - Radiological Analysis Summary of Liquid Process Samples

- a. The listed types of analysis are not consistent with SRP Chapter 11.5, Table 2.

For example, the analyses listed for the LCW and HCW tanks do not include all required analyses, such as "S&A" and "H-3" are not listed as part of the suite of radiological analyses described in Table 11.5-5. The suite of analyses defined in SRP Table 2 as "S&A" in the SRP includes "Sampling and analysis of radionuclides, to include gross radioactivity, identification and concentration of principal radionuclides and concentration of alpha emitters." The requirements for tritium (H-3) are addressed separately in SRP Table 2. Check all entries and correct or clarify accordingly for all listed systems.

- b. The table does not provide any explanation as to the basis of the stated instrumentation sensitivity. Check entries and correct or clarify accordingly.
- c. One line entry on the second page of the table lists an unidentified system collection and sample tanks with no details being provided for gas sample frequency, analysis, sensitivity, and purpose. Check and correct accordingly.
- d. The table does not include sample collection criteria for the Chemical Drain Subsystem. Correct or clarify accordingly.

L. RAI 11.5-16

Table 11.5-6 - Radiological Analysis Summary of Gaseous Process samples

The listed types of analysis are not consistent with SRP Chapter 11.5, Table 1. For example, the Containment Atmosphere Drywell does not include iodines and noble gases. The types of analyses identified as "NG" (noble gases) and "I" of SRP Table 1 are not included as part of the suite of radiological analyses described in Table 11.5-6. The suite of analyses defined by "I" in the SRP includes "Iodine radioactivity, radioactivity of other radionuclides in particulate form, and alpha emitters." The requirements for tritium (H-3) are addressed separately in SRP Table 1. Check all entries and correct or clarify accordingly.

M. RAI 11.5-14

Table 11.5-7 - Radiological Analysis Summary of Liquid effluent Samples

- a. The table does not provide any explanation as to the basis of the stated instrumentation sensitivity. Clarify accordingly.
- b. One line table entry after the "Plant Stack" has no details. Insert system or delete entry if extraneous.

N. RAI 11.5-16

Table 11.5-8 Radiological Analysis Summary of Gaseous Effluent Samples

- a. The table does not provide any explanation as to the basis of the stated instrumentation sensitivity. Clarify accordingly.

- b. One line entry after the "Plant Stack" has no details. Clarify accordingly.

O. RAI 11.5-3-3

Figure 11.5-1 - Location of Radiation Monitors

- a. Provide an explanation (footnote) as to how and where do discharges from the Isolation Condenser Vent Exhaust system tie into the Reactor Building HVAC system.
- b. Update drawing to show that the Offgas Post-Treatment RMS is equipped with an isokinetic probe - such as shown for the Turbine Building, Fuel Building, Radwaste Building, and Plant Stack.