GE Energy

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MFN 05-153

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U.S. Nuclear Regulatory Commission
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Subject: **Response to NRC Request for Additional Information Letter No. 1 Related to ESBWR Design Certification Application – Chapters 11 and 12 – Radiation Protection**

Enclosure 1 contains GE's responses to the NRC RAIs transmitted via the Reference 1 letter. Associated DCD markups of Chapter 11 are contained in Enclosure 2. These revised DCD sections will be incorporated into DCD, Revision 1.

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

Sincerely,

for

David H. Hinds
Manager, ESBWR

Reference:

1. MFN 05-152, Letter from U. S. Nuclear Regulatory Commission to David Hinds, Request *for Additional Information Letter No. 1 Related to ESBWR Design Certification Application,* November 23, 2005

D068

Enclosures:

1. MFN 05-153 – GE Responses to NRC Request for Additional Information Letter No. 1 Related to ESBWR Design Certification Application – Chapters 11 and 12 – Radiation Protection
2. MFN 05-153 – GE Responses to NRC Request for Additional Information Letter No. 1 Related to ESBWR Design Certification Application – DCD Chapter 11 Markups

cc: WD Beckner USNRC (w/o enclosures)
AE Cubbage USNRC (with enclosures)
LA Dudes USNRC (w/o enclosures)
GB Stramback GE/San Jose (with enclosures)
eDRFs 0000-0031-5955, 0000-0031-5955 and 0000-0039-0461

ENCLOSURE 1

MFN 05-153

GE Responses to NRC Request for Additional Information

Letter No. 1 Related to ESBWR Design Certification

Application – Chapters 11 and 12 – Radiation Protection

ENCLOSURE 2

MFN 05-153

GE Responses to NRC Request for Additional Information

Letter No. 1 Related to ESBWR Design Certification

Application – DCD Chapter 11 Markups

The parameters and assumptions used to calculate releases of radioactive materials in liquid effluents and their bases are provided in Chapter 12.

Expected releases of radioactive materials by radionuclides in liquid effluents resulting from normal operation, including anticipated operational occurrences and from design basis fuel leakage are provided in Chapter 12.

A tabulation of the releases by radionuclides can be found in Chapter 12. The tabulation is for the total system and for each and includes indication of the effluent concentrations. The calculated concentrations in the effluents were within the concentration limits of 10 CFR 20; the doses resulting from the effluents are within the numerical design objectives of Appendix I to 10 CFR 50 and the dose limits of 10 CFR 20 as set forth in Chapter 12.

Dilution Factors

Refer to Section 12.2 for dilution factors used in evaluating the release of liquid effluents.

11.2.4 Testing and Inspection Requirements

The LWMS is given a pre-operational test as discussed in Chapter 14. Thereafter, portions of the systems are tested as needed.

During initial testing of the system, the pumps and mobile systems are performance tested to demonstrate conformance with design flows and process capabilities. An integrity test is performed on the system upon completion.

Provisions are made for periodic inspection of major components to ensure capability and integrity of the systems. Local display devices are provided to indicate all vital parameters required in routine testing and inspection.

11.2.5 Instrumentation Requirements

The LWMS is operated and monitored from the Radwaste Building Control Room. Major system parameters, i.e., tank levels, process flow rates, filter and ion exchanger differential pressure, ion exchanger effluent conductivity, etc., are indicated and alarmed as required to provide operational information and performance assessment. A continuous radiation detector is provided to monitor the discharge of radioactivity to the environs. Key system alarms are repeated in the main control room.

Requirements for sampling are set forth in Subsection 9.3.2.

11.2.6 COL Information

None.

11.2.7 References

None.

Table 11.2-3

Decontamination Factors

Subsystems*	Filter	Reverse Osmosis	Ion-Exchanger	Total DF
Equipment (low conductivity)				
Drain Subsystem:				
Halogens	1	-	100 (10)**	1,000
Cs, Rb	1	-	10 (10)**	100
Other nuclides	1	-	100 (10)**	1,000
Floor (high conductivity)				
Drain Subsystem:				
Halogens	1	10	100 (10)**	10,000
Cs, Rb	1	10	2 (10)**	200
Other nuclides	1	10	100 (10)**	10,000
A DF of 1 is used for tritium.				
Chemical Drain Subsystem:				
Chemical drain is processed in Floor Drain Subsystem.				
Detergent Drain Subsystem:				
A DF of 1 is used for the detergent drain filter for all radionuclides.				

* From NUREG-0016 Revision 1, Table 1-5.
** For two ion exchangers in series, the DF for the second unit is given in parenthesis

Table 11.5-1

Process and Effluent Radiation Monitoring Systems

Monitored Process	No. of Channels	Sample Line or Detector Location	Displayed Channel Range
A. Safety-Related Monitors			
Main Steam Line Tunnel Area	4	Immediately downstream of plant main steam line isolation valve	1E-2 to 1E4 mSv/h
Reactor Building Ventilation Exhaust	4	Exhaust duct upstream of exhaust ventilation isolation valve	1E-4 to 1E0 mSv/h
Refuel Handling Area Air Ventilation Exhaust	4	Exhaust duct upstream of exhaust ventilation isolation valve	1E-4 to 1E0 mSv/h
Control Building Air Intake	8	Intake duct upstream of intake ventilation isolation valve	1E-4 to 1E0 mSv/h
Drywell Sumps LCW/HCW Discharge	2	Drain line from LCW & HCW sumps	1E-2 to 1E4 mSv/h
Fuel Building Main Area HVAC	4	Exhaust duct upstream of exhaust ventilation isolation valve	1E-4 to 1E0 mSv/h
Isolation Condenser Vent Discharge	16	Exhaust of isolation condensers	1E-4 to 1E0 mSv/h
B. Monitors Required for Plant Operation			
Stack	3	On Stack exhaust	1E -3 to 1E 10 MBq/m^3 (gaseous) 1E -6 to 1E 7 MBq/m^3 (particulate & halogen)
Turbine Building Vent exhaust (Normal Ventilation & Area Exhausts)	4	Exhaust duct	1E-4 to 1E0 mSv/h
Turbine Building HVAC Vent	3	On Turbine Building exhaust line	1E-3 to 1E3 MBq/m3 (gaseous) 1E-7 to 1E-1 MBq/m3 (particulate and iodine)

Table 11.5-2

Process Radiation Monitoring System (Gaseous and Airborne Monitors)

Radiation Monitor	Configuration	Dynamic Detection Range *	Principal Radionuclides Measured	Expected Activity **	Alarms and Trips
Offgas Pre-Treatment	Offline (adjacent to sample chamber)	≈ 1.7 E 2 to 1.7 E 8 MBq/m^3 ≈ 1.0 E 2 to 1.0 E 8 MBq/m^3	Xe-138 Kr-88	≈ 1.8 E 5 MBq/m^3 ≈ 9.8 E 4 MBq/m^3	DNSC/INOP High High-High
Main Turbine Gland Seal Steam Condenser Exhaust	Offline	≈ 8 E -3to 8E 3 MBq/m^3 ≈ 2.6 E -3 to 2.6E 3 MBq/m^3	Xe-133 Kr-85	0 0	Abnormal Flow DNSC/INOP High High-High
Charcoal Vault Ventilation Exhaust	Inline (adjacent to vent duct)	≈ 5.1E 2 to 5.1E 8 MBq/m^3 ≈1 E 2 to 1 E 8 MBq/m^3	Xe-133 Kr-85	0 0	DNSC/INOP High
Turbine Building HVAC Exhaust (Normal)	Inline (adjacent to vent duct)	≈ 1E-4 to 1E0 mSv/h	Co-60	Negligible 0	DNSC/INOP High
Turbine Building Compartment Area Exhaust	Inline (adjacent to vent duct)	≈ 1E-4 to 1E0 mSv/h	Co-60	Negligible 0	DNSC/INOP High
Turbine Building Ventilation Stack	Offline	≈ 8 E -3to 8 E 3 MBq/m^3 ≈ 2.6 E -3 to 2.6 E 3 MBq/m^3 ≈ 7.4E -7 to 7.4 E -1 MBq/m^3 ≈ 7.4E -7 to 7.4E-1 MBq/m^3	Xe-133 Kr-85 Cs-137 I-131	Negligible Negligible Negligible Negligible	Abnormal Flow DNSC/INOP High High-High
Stack	Offline	≈ 1 E –3 to 1 E 10 MBq/m3 ≈ 1 E –3 to 1 E 10 MBq/m3 ≈ 1 E –6 to 1 E 7 MBq/m3 ≈ 1 E –6 to 1 E 7 MBq/m3	Xe-133 Kr-85 Cs-137 I-131	≈ 1.5 E -6 MBq/m3 ≈ 2.1 E -7 MBq/m3 ≈ 1.4 E -11 MBq/m3 ≈ 4.1 E -10 MBq/m3	Abnormal Flow DNSC/INOP High High-High

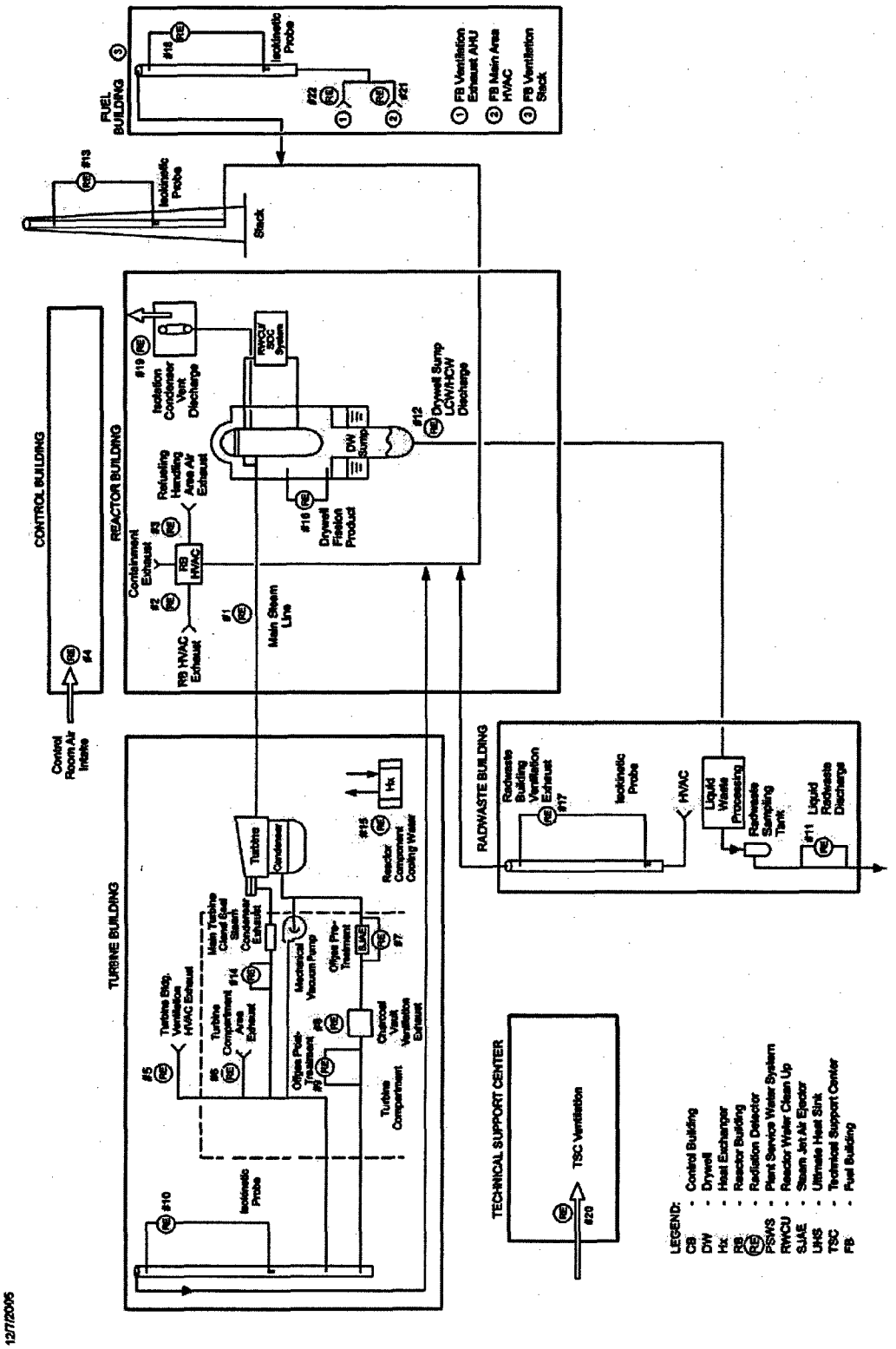

Figure 11.5-1. Location of Radiation Monitors