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MFN 08-279

Docket No. 52-010

April 1, 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. 134 Related to ESBWR Design Certification Application, RAI Number 14.3-391**

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 January 14, 2008 (Reference 1), regarding the ESBWR main steam line radiation monitor. The associated GEH response to RAI Number 14.3-391 is in Enclosure 1. Also, please reference our response to RAI 14.3-158 (MFN 08-086 Suppl 19, dated March 28, 2008).

Verified DCD changes associated with this RAI response are identified in the attached 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.

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

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

D068
NRO

References:

1. MFN 08-033. Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 134 Related To ESBWR Design Certification Application*, January 14, 2008.
2. MFN 08-086 Supplement 19, Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application, RAI Number 14.3-158.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 134 Related to ESBWR Design Certification Application, Main Steam Line Radiation Monitor, RAI Number 14.3-391.

cc: AE Cubbage USNRC (with enclosure)
GB Stramback GEH/San Jose (with enclosure)
RE Brown GEH/Wilmington (with enclosure)
DH Hinds GEH/Wilmington (with enclosure)
eDRF 0000-0081-8340

Enclosure 1

MFN 08-279

Response to Portion of NRC Request for Additional Information Letter No. 134 Related to ESBWR Design Certification Application*

Main Steam Line Radiation Monitor

RAI Number 14.3-391

*Verified DCD changes associated with this RAI response are identified in the attached 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.

NRC RAI 14.3-391

NRC Summary:

DCD Tier 2, Revision 4, Section 14.3.2 on ITAAC design descriptions and selection criteria against DCD Tier 2, Revision 4, Section 11.5.1 and DCD Tier 1, Revision 4, Section 2.3.1 indicates an inconsistent approach in applying ITAACs to the main steam line radiation monitor.

NRC Full Text:

DCD Tier 2, Revision 4, Section 14.3.2 on ITAAC design descriptions and selection criteria against DCD Tier 2, Revision 4, Section 11.5.1 and DCD Tier 1, Revision 4, Section 2.3.1 indicates an inconsistent approach in applying ITAACs to the main steam line radiation monitor. Specifically, DCD Tier 1, Revision 4, Section 2.3.1, Table 2.3.1-1 states that the main steam line radiation monitor is safety related, but DCD Tier 2, Revision 4, Sections 11.5.1 and 11.5.3.1.1 identify the same monitor as non-safety related. Accordingly, revise DCD Tier 1, Section 2.3.1 to change the safety and ITAAC status of the main steam line radiation monitor in Tables 2.3.1-1 and 2.3.1-2.

GEH Response

The Main Steam Line (MSL) radiation monitors do not perform any safety-related functions within the ESBWR design.

DCD Tier 2, Revision 4, Section 7.1.3.2.4.3, Process Radiation Monitoring System, will be revised to remove the MSL radiation monitors from the list of safety-related monitors.

DCD Tier 2, Revision 4, Section 11.5 will be revised to clearly indicate that the MSL radiation monitors perform no safety-related functions.

DCD Tier 2, Revision 4, Table 11.5-1, Table 11.5-2, and Table 11.5-9, will be revised to remove the MSL radiation monitors from Group A, Safety-Related Monitors, and to place this channel in Group B, Monitors Required for Plant Operation. The phrase "Performs no safety-related closure function" in the double asterisk note below Table 11.5-1 will be removed. The quadruple asterisk note below Table 11.5-2 will be removed. No changes to functional requirements or instrument ranges will be made by this change.

DCD Tier 1, Revision 4, Table 2.3.1-1, will be revised to indicate that the MSL radiation monitors are not safety-related. Since the MSL radiation monitors will be required to meet nonsafety-related requirements, no changes to ITAAC Table 2.3.1-2 are required.

Also, please reference our response to RAI 14.3-158, which adds ITAAC requirements for nonsafety-related radiation monitoring channels.

DCD Impact

DCD Tier 2, Revision 4, Section 7.1.3.2.4.3, Process Radiation Monitoring System, will be revised to remove the MSL radiation monitors from the list of safety-related monitors.

DCD Tier 2, Revision 4, Section 11.5.3.1.1, will be revised to remove the MSL radiation monitor from the list of monitors performing safety functions.

A new Section 11.5.3.2.15 will be added to place MSL functions within the group of monitors required for plant operation.

Table 11.5-1 will be revised to remove the MSL radiation monitors from Group A, Safety-Related Monitors, and place them in Group B, Monitors Required for Plant Operation.

Table 11.5-2 will be revised to remove the MSL radiation monitors from Group A, Safety-Related Monitors, and place them in Group B, Monitors Required for Plant Operation.

Table 11.5-9 will be revised to remove the MSL radiation monitors from Group A, Safety-Related Monitors, and place them in Group B, Monitors Required for Plant Operation.

DCD Tier 1, Revision 4, Table 2.3.1-1, Process Radiation Monitors, will be revised to indicate that the MSL radiation monitors are not safety-related.

DCD Tier 1 and Tier 2 sections will be revised as noted in the attached markup.

7.1.3.2.4.1 Post-Accident Monitoring Instrumentation

The ~~Post-Accident Monitoring (~~PAM~~)~~ instrumentation monitors variables and systems under accident conditions to ensure plant and personnel safety. An assessment of conformance with RG 1.97 is presented in Subsection 7.5.1.

7.1.3.2.4.2 Containment Monitoring System

The CMS instrumentation measures and records radiation levels and the oxygen/hydrogen concentration levels in the primary containment under post-accident conditions. The CMS is designed to operate continuously during normal operation and is automatically put in service upon detection of LOCA conditions. Refer to Subsection 7.5.2 for additional information.

7.1.3.2.4.3 Process Radiation Monitoring System

Safety-related (for nonsafety-related, refer to Subsection 7.1.5.2.2.1) PRMS instrumentation monitors the following for radioactive materials: ~~main steam lines,~~ the drywell, discharges from the ICS, vent discharges, and liquid and gaseous effluent streams. The MCR display, recording, and alarm capabilities are provided along with controls that provide automatic trip inputs to the respective systems to prevent further radiation release. Refer to Subsection 7.5.3 for additional information.

7.1.3.2.5 Interlock Systems

The interlock functions are embedded in the DCIS logic, so that a separate interlock system is not required. Refer to Section 7.6 for additional information.

A reactor pressure interlock embedded in logic is provided to the GDCS to prohibit inadvertent manual initiation of the system during normal reactor operation.

Normally closed isolation valves are provided on the FAPCS Low Pressure Core Injection (LPCI) line to protect its low pressure piping from over-pressurization during reactor power operation and high-pressure transients and accidents. Redundant reactor pressure instruments provide a high-pressure signal to the FAPCS LPCI logic to prevent opening or to close, if open, the FAPCS injection valves when the reactor pressure exceeds the FAPCS low pressure setpoint. A HP/LP interlock is provided to prevent opening of the isolation valve when the reactor pressure is higher than the FAPCS design pressure.

Other than the isolation valves, the design does not have logic that isolates safety-related from nonsafety-related piping during a LOCA. It is not necessary because there are no piping interfaces separating the safety-related and nonsafety-related portions of piping systems.

7.1.3.2.6 Nuclear Boiler System Instrumentation

Redundant NBS safety-related instrumentation provides ~~reactor vessel~~RPV water level and reactor vessel pressure data for operator monitoring. The NBS instrumentation also provides inputs to safety-related systems during normal, transient, and accident conditions. Refer to Subsection 7.7.1 for additional information.

also feeds the signals to the Nonsafety-Related Distributed Control and Information System (N-DCIS) for display, alarm, and data recording functions.

11.5.3.1.1 ~~Main Steamline (MSL) RMS~~(Deleted)

~~This subsystem monitors the gross gamma radiation level of the steam transported by the MSLs in the MSL tunnel. The normal radiation level is produced primarily by coolant activation gases plus smaller quantities of fission gases being transported with the steam.~~

~~The MSL radiation monitors consist of four instrument channels, one for each steam line. Each channel consists of a local gamma-sensitive detector and a radiation monitor located in the main control room.~~

~~The detectors are physically located near the MSLs just downstream of the outboard MSL isolation valves (MSIVs) in the steam tunnel. These detectors are arranged so that they are capable of detecting significant increases in radiation level with any number of the MSLs in operation.~~

~~The subsystem initiates shutdown and isolation of the main turbine condenser mechanical vacuum pump (MVP) upon detection of high radiation. Channel trips are annunciated in the MCR. Although the subsystem is qualified as safety-related, its function is nonsafety-related.~~

~~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 detection from normal background radiation at zero percent reactor power up to, and including, gross releases of fission products from reactor fuel into the reactor vessel and its subsequent transport to the MSLs.~~

11.5.3.1.2 Reactor Building HVAC Exhaust Radiation Monitoring Subsystem (RMS)

This subsystem monitors the gross radiation level in the exhaust duct of the RB. The principal path that this subsystem monitors is exhaust from the contaminated area, which is served by Reactor Building Contaminated Area HVAC Subsystem (CONAVS). A high activity level in the ductwork could be due to fission gases from a leak or an accident.

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

The detectors are located adjacent to the exhaust ducting upstream of the ventilating system isolation valves and monitor the Reactor Building HVAC exhausts. The detectors are physically located upstream of the ventilation exhaust duct isolation dampers such that closure of the dampers can be accomplished prior to exceeding radioactive effluent limits imposed by 10 CFR 20, Appendix B.

The 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 the RB ventilating exhaust ventilation dampers and stoppage of the Reactor Building HVAC exhaust fans.

Trip circuits initiate their respective alarms in the MCR.

11.5.3.2.15 Main SteamLine (MSL) RMS

This subsystem monitors the gross gamma radiation level of the steam transported by the MSLs in the MSL tunnel. The normal radiation level is produced primarily by coolant activation gases plus smaller quantities of fission gases being transported with the steam.

The MSL radiation monitors consist of four instrument channels, one for each steam line. Each channel consists of a local gamma-sensitive detector and a radiation monitor located in the main control room.

The detectors are physically located near the MSLs just downstream of the outboard MSL isolation valves (MSIVs) in the steam tunnel. These detectors are arranged so that they are capable of detecting significant increases in radiation level with any number of the MSLs in operation.

The subsystem initiates shutdown and isolation of the main turbine condenser mechanical vacuum pump (MVP) upon detection of high radiation. Channel trips are annunciated 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 detection from normal background radiation at zero percent reactor power up to, and including, gross releases of fission products from reactor fuel into the reactor vessel and its subsequent transport to the MSLs.

11.5.4 Regulatory Evaluation

The system design for radiation monitoring is in conformance with the relevant requirements and criteria that are stipulated in the codes and standards that are identified in Subsection 11.5.2. Radiation monitoring is provided during reactor operation and under post-accident conditions. Specifically, the following requirements are evaluated for compliance.

11.5.4.1 Basis for Monitor Location Selection

The detector locations are selected, per Regulatory Guide 1.21 (Reference 11.5-9) and Standard Review Plan 11.5, to monitor the major and potentially significant paths for release of radioactive material during normal reactor operation including anticipated operational occurrences, and to provide alarms and necessary isolations. The radioactivity levels in liquid and gaseous effluent releases are monitored, measured, displayed and recorded.

11.5.4.2 Expected Radiation Levels

Expected radiation levels are provided in Tables 11.5-1 and 11.5-2.

11.5.4.3 Instrumentation

Grab samples are analyzed to identify and quantify the specific radionuclides in effluents. The results from the sample analysis are used to establish relationships between the gross gamma monitor readings and concentrations or release rates of radionuclides in continuous effluent releases. Tables 11.5-4 through 11.5-8 provide summary information concerning the frequency, analysis, sensitivity and purpose for both liquid and gaseous process and effluent extracted

Table 11.5-1

Process and Effluent Radiation Monitoring Systems

Monitored Process	No. of Channels	Sample Line or Detector Location	Displayed Channel Range* and **
A. Safety-Related Monitors			
~~MSL~~	~~4~~	~~Immediately downstream of plant MSL isolation valve~~	~~1E-2 to 1E4 mSv/h~~
Reactor Building HVAC Exhaust	4	Exhaust duct upstream of exhaust ventilation isolation valve	1E-4 to 1E0 mSv/h (1E-2 to 1E2mRem/h)
Refuel Handling Area HVAC Exhaust	4	Exhaust duct upstream of exhaust ventilation isolation valve	1E-4 to 1E0 mSv/h (1E-2 to 1E2 mRem/h)
Control Building Air Intake HVAC	8	Intake duct upstream of intake ventilation isolation valve	1E-4 to 1E0 mSv/h (1E-2 to 1E2 mRem/h)
LCW Drywell Sump Discharge	1	Drain line from LCW sump	1E-2 to 1E4 mSv/h (1E0 to 1E6 mRem/h)
HCW Drywell Sump Discharge	1	Drain line from HCW sump	1E-2 to 1E4 mSv/h (1E0 to 1E6 mRem/h)
FB General Area HVAC	4	Exhaust duct upstream of exhaust ventilation isolation valve	1E-4 to 1E0 mSv/h (1E-2 to 1E2 mRem/h)
Isolation Condenser Vent Exhaust	16	Exhaust of air space surrounding isolation condensers	1E-4 to 1E0 mSv/h (1E-2 to 1E2 mRem/h)
Containment Purge Exhaust	4	Exhaust duct upstream of exhaust ventilation isolation valve	1E-4 to 1E0 mSv/h (1E-2 to 1E2 mRem/h)
FB Fuel Pool HVAC	4	On HVAC duct leaving Fuel Pool Area	1E-4 to 1E0 mSv/h (1E-2 to 1E2 mRem/h)
B. Monitors Required for Plant Operation			
MSL	4	Immediately downstream of plant MSL isolation valve	1E-2 to 1E4 mSv/h (1E0 to 1E6 mRem/h)

Table 11.5-1

Process and Effluent Radiation Monitoring Systems

Monitored Process	No. of Channels	Sample Line or Detector Location	Displayed Channel Range* and **
Offgas Post-treatment Skid A	3	Sample line after Charcoal treatment beds	1E0 to 1E7 MBq/m^3 (2.7E1 to 2.7E8 µCi/m^3) (gaseous) 1E-7 to 1E1 MBq/m^3 (2.7E-6 to 2.7E2 µCi/m^3) (particulate) 1E-7 to 1E1 MBq/m^3 (2.7E-6 to 2.7E2 µCi/m^3) (iodine)
Offgas Post-treatment Skid B	1	Sample Line after Charcoal treatment beds	1E0 to 1E7 MBq/m^3 (2.7E1 to 2.7E8 µCi/m^3) (gaseous)
Charcoal Vault Ventilation	1	On charcoal vault HVAC exhaust line	1E-2 to 1E4 mSv/h (1E0 to 1E6 mRem/h)
Reactor Component Cooling Water Intersystem Leakage	2	Each RCCW heat exchanger line exit	1E-1 to 1E5 MBq/m^3 (2.7E0 to 2.7E6 µCi/m^3)
TSC HVAC Air Intake	1	Intake HVAC duct	1E4 to 1E0 mSv/h (1E6 to 1E2 mRem/h)
Drywell Fission Product (Particulate)	1	Sample line from drywell atmosphere	1E-7 to 1E-1 MBq/m^3 (2.7E-6 to 2.7E0 µCi/m^3)
Drywell Fission Product (Gaseous)	1	Sample line from drywell atmosphere	1E-1 to 1E4 MBq/m^3 (2.7E0 to 2.7E5 µCi/m^3)
FB Combined Ventilation Exhaust	3	Sample Line from HVAC exhaust leaving FB	1E-3 to 1E3 MBq/m^3 (2.7E-2 to 2.7E4 µCi/m^3) (gaseous) 1E-7 to 1E-1 MBq/m^3 (2.7E-6 to 2.7E0 µCi/m^3) (particulate) 1E-7 to 1E-1 MBq/m^3 (2.7E-6 to 2.7E0 µCi/m^3) (iodine)

* MBq/m^3 = mega-becquerel per cubic meter; mSv/h = milli-Sieverts per hour

** ~~Performs no safety-related closure function~~ The "MBq/m^3" displayed channel range measurement unit is utilized to present to the operator the relationship between an acceptable regulatory offsite dose concentration and the actual concentration, measured at the point of interest, in comparable scientific units. Display units for all other channels not indicating "MBq/m^3" use other scientific units, such as "mSv/hr", that are comparable with their intended use. The units are not directly used to present to the operator any information concerning

Table 11.5-2

Process Radiation Monitoring System (Gaseous and Airborne Monitors)

Radiation Monitor	Configuration	Dynamic Detection Range*	Principal Radionuclides Measured	Expected Activity **	Alarms*** & Trips
A. Safety-Related Monitors					
~~MSL~~	~~Offline (adjacent to MSLs)~~	~~≈ 1.4E2 to 1.4E8 MBq/m^3 (3.78E3 to 3.78E9 µCi/m^3)~~	~~N-16, O-19 & Coolant activation~~	~~**~~	~~DNSC INOP High High-High~~
Reactor Building HVAC Exhaust	Inline (adjacent and external to HVAC duct)	≈ 1.5E3 to 1.5E7 MBq/m^3 (4.05E4 to 4.05E8 µCi/m^3)	Xe-133	**	DNSC/INOP High High-High
Refuel Handling Area HVAC Exhaust	Inline (adjacent and external to HVAC duct)	≈ 7.3E2 to 7.3E6 MBq/m^3 (1.97E4 to 1.97E8 µCi/m^3)	Xe-133	**	DNSC/INOP High High-High
Control Building Air Intake HVAC	Inline (adjacent and external to HVAC air intake duct)	≈ 8E1 to 8E5 MBq/m^3 (2.16E3 to 2.16E7 µCi/m^3)	Xe-133	**	DNSC/INOP High High-High
FB General Area HVAC	Inline (adjacent and external to HVAC duct)	≈ 7.4E1 to 7.4E5 MBq/m^3 (2.0E3 to 2.0E7 µCi/m^3)	Xe-133	**	DNSC/INOP High High-High
Isolation Condenser Vent Exhaust	Inline (adjacent to vent duct)	≈ 1.5E3 to 1.5E7 MBq/m^3 (4.05E4 to 4.05E8 µCi/m^3)	Xe-133	**	DNSC/INOP High High-High
Containment Purge Exhaust	Inline (adjacent and external to HVAC duct)	≈ 1.5E3 to 1.5E7 MBq/m^3 (4.05E4 to 4.05E8 µCi/m^3)	Xe-133	**	DNSC/INOP High High-High

Table 11.5-2

Process Radiation Monitoring System (Gaseous and Airborne Monitors)

Radiation Monitor	Configuration	Dynamic Detection Range*	Principal Radionuclides Measured	Expected Activity **	Alarms*** & Trips
FB Fuel Pool HVAC	Inline and internal to HVAC duct	≈ 5.5E0 to 5.5E4 MBq/m^3 (1.49E2 to 1.49E6 µCi/m^3) ≈ 1E2 to 1E6 MBq/m^3 (2.7E3 to 2.7E7 µCi/m^3)	Xe-133 Kr-85	0** 0**	DNSC/INOP High
B. Monitors Required for Plant Operation					
MSL	Offline (adjacent to MSLs)	≈ 1.4E2 to 1.4E8 MBq/m^3 (3.78E3 to 3.78E9 µCi/m^3)	N-16, O-19 & Coolant activation	**	DNSC INOP High High-High
Offgas Post-treatment	Offline	≈ 8E-3 to 8E3 MBq/m^3 (2.16E-1 to 2.16E5 µCi/m^3) ≈ 2.6E-3 to 2.6E3 MBq/m^3 (7.03E-2 to 7.03E4 µCi/m^3) ≈ 3.7E-7 to 3.7E-1 MBq/m^3 (1.0E-5 to 1.0E1 µCi/m^3) ≈ 7.4E-7 to 7.4E-1 MBq/m^3 (2.0E-5 to 2.0E1 µCi/m^3)	Xe-133 Kr-85 Cs-137 I-131	** ** ** **	Abnormal Flow DNSC/INOP High High-High High-High-High
Offgas Pre-treatment	Offline (adjacent to sample chamber)	≈ 1.7E2 to 1.7E8 MBq/m^3 (4.59E3 to 4.59E9 µCi/m^3) ≈ 1.0E2 to 1.0E8 MBq/m^3 (2.7E3 to 2.7E9 µCi/m^3)	Xe-138 Kr-88	** **	DNSC/INOP High High-High

Table 11.5-2

Process Radiation Monitoring System (Gaseous and Airborne Monitors)

Radiation Monitor	Configuration	Dynamic Detection Range*	Principal Radionuclides Measured	Expected Activity **	Alarms*** & Trips
Radwaste Building Ventilation Exhaust	Offline	≈ 8E-3 to 8E3 MBq/m^3 (2.16E-1 to 2.16E5 μCi/m^3) ≈ 2.6E-3 to 2.6E3 MBq/m^3 (7.0E-2 to 7.0E4 μCi/m^3) ≈ 7.4E-7 to 7.4E-1 MBq/m^3 (2.0E-5 to 2.0E1 μCi/m^3) ≈ 7.4E-7 to 7.4E-1 MBq/m^3 (2.0E-5 to 2.0E1 μCi/m^3)	Xe-133 Kr-85 Cs-137 I-131	** ** ** **	Abnormal Flow DNSC/INOP High High-High
FB Combined Ventilation Exhaust	Offline	≈ 8E-3 to 8E3 MBq/m^3 (2.16E-1 to 2.16E5 μCi/m^3) ≈ 2.6E-3 to 2.6E3 MBq/m^3 (7.0E-2 to7.0E4 μCi/m^3) ≈ 7.4E-7 to 7.4E-1 MBq/m^3 (2.0E-5 to 2.0E1 μCi/m^3) ≈ 7.4E-7 to 7.4E-1 MBq/m^3 (2.0E-5 to 2.0E1 μCi/m^3)	Xe-133 Kr-85 Cs-137 I-131	** ** ** **	Abnormal Flow DNSC/INOP High High-High
TSC HVAC Air Intake	Inline and internal to HVAC intake duct	≈ 8E0 to 8E4 MBq/m^3 (2.16E2 to 2.16E6 μCi/m^3) ≈ 1.7E2 to 1.7E6 MBq/m^3 (4.6E3 to 4.6E7 μCi/m^3)	Xe-133 Kr-85	** **	DNSC/INOP High High-High

* Dynamic detection ranges are estimated and will be adjusted according to plant unique configurations and radiation background.

** Activity levels are expected to be at the subsystem's lower limit of detection (LLD). The derivation of each LLD is to be determined by the COL based on site-specific conditions and operating characteristics of each installed effluent radiation monitoring subsystem and included in the plant specific Offsite Dose Calculation Manual. See Section 12.2 for expected activity of various processes and effluents (COL 11.5-2-A).

*** Bq/ m^3 = Becquerels per cubic meter, MBq/m^3 = Mega Becquerels per cubic meter; DNSC/INOP = downscale/inoperative; Abnormal Flow = High or Low flow in the sampling system outside system limits

~~**** Performs no safety-related closure function.~~

Table 11.5-9

Process Radiation Monitoring System Estimated Dynamic Ranges

Radiation Monitor	Estimated Dynamic Detection Range	Principal Radionuclides Measured	Basis for Dynamic Range
A. Safety-Related Monitors			
~~MSL~~	~~≈ 1.4E2 to 1.4E8 MBq/m^3 (3.78E3 to 3.78E9 µCi/m^3)~~	~~N-16, O-19 & Coolant activation gases~~	~~The dynamic range has been selected so that sufficient coverage is provided to detect both the radiation dose rates associated with releases of activation gases and fission products from low reactor power and those that would be associated with a major release of fission products from the reactor core.~~
Reactor Building HVAC Exhaust	≈ 1.5 E3 to 1.5E7 MBq/m^3 (4.05E4 to 4.05E8 µCi/m^3)	Xe-133	The dynamic range has been selected to provide sufficient coverage to detect both the radiation dose rates associated with normal RB ventilation releases up to the dose rate expected in the ventilation system resulting from a Fuel Handling Accident (FUHA).
Refuel Handling Area HVAC Exhaust	≈ 7.3E2 to 7.3E6 MBq/m^3 (1.97E4 to 1.97E8 µCi/m^3)	Xe-133	The dynamic range has been selected to provide sufficient coverage to detect the radiation dose rates associated with normal RB ventilation releases up to the dose rate expected in the ventilation system resulting from a FUHA.
Control Building Air Intake HVAC	≈ 8E1 to 8E5 MBq/m^3 (2.16E3 to 2.16E7 µCi/m^3)	Xe-133	The dynamic range has been selected to provide sufficient coverage to detect a radiation dose rate associated with noble gas concentrations, during a LOCA, estimated for the Main Control Room ventilation intake. Additional decades were utilized to cover the lower range to provide indication prior to exceeding 10 CFR 50 GDC 19 dose limits.

Table 11.5-9

Process Radiation Monitoring System Estimated Dynamic Ranges

Radiation Monitor	Estimated Dynamic Detection Range	Principal Radionuclides Measured	Basis for Dynamic Range
B. Monitors Required for Plant Operation			
MSL	≈ 1.4E2 to 1.4E8 MBq/m^3 (3.78E3 to 3.78E9 µCi/m^3)	N-16, O-19 & Coolant activation gases	The dynamic range has been selected so that sufficient coverage is provided to detect both the radiation dose rates associated with releases of activation gases and fission products from low reactor power and those that would be associated with a major release of fission products from the reactor core.
Offgas Post-treatment	≈ 8E-3 to 8E3 MBq/m^3 (2.16E-1 to 2.16E5 µCi/m^3) ≈ 2.6E-3 to 2.6E3 MBq/m^3 (7.0E-2 to 7.0E4 µCi/m^3) ≈ 3.7E-7 to 3.7E-1 MBq/m^3 (1.0E-5 to 1.0E1 µCi/m^3) ≈ 7.4E-7 to 7.4E-1 MBq/m^3 (2.0E-5 to 2.0E1 µCi/m^3)	Xe-133 Kr-85 Cs-137 I-131	The dynamic ranges for the indicated isotopes have been selected in order to provide sufficient coverage for the OGS release rates and parameters found in Chapter 11.3 and to of effluent concentrations based on 10 CFR 20 values for releases to unrestricted areas.

Table 2.3.1-1

Process Radiation Monitors (Shown on Figure 2.3.1-1)

ID on Figure 2.3.1-1	Safety-Related	Description	Safety Function
1	~~Yes~~No	MSL	~~Performs no safety-related closure function~~N/A
2	Yes	Reactor Building HVAC Exhaust	Continuously monitors gross gamma quantity of radioactivity being exhausted from the contaminated area served by Reactor Building Contaminated Area (HVAC) Subsystem. The discharge point from duct is monitored with four physically and electrically independent and redundant divisions. In the event of radioactive releases due to system failures in the Reactor Building, or due to a fuel handling accident, RBVS dampers are closed, and exhaust fans are stopped.
3	Yes	Refuel Handling Area HVAC Exhaust	Continuously monitors gamma radiation levels in exhaust plenum of HVAC exhaust ducts in Refuel Handling Area of Reactor Building with four divisions of Radiation Detection Assemblies and channels. In the event of a radioactive release due to an accident while handling spent fuel, Reactor Building HVAC (RBVS) dampers are closed and exhaust fans are stopped.