# REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**APR1400 Design Certification**

**Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD**

**Docket No. 52-046**

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| **RAI No.:** | **132-8088** |
| **SRP Section:** | **11.05 - Process and Effluent Radiological Monitoring Instrumentation and Sampling System** |
| **Application Section:** | **11.05** |
| **Date of RAI Issue:** | **08/07/2015** |

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## Question No. 11.05-2

11.5 - SRP 11.5.2.2, Description of the PERMSS

Liquid PERMSS

Information contained in DCD section 11.5.2.3 does not include the level of detail SRP section 11.5 details in the description for the PERMSS. Inspection of Tier 1 Section 2.7.6.4 the staff observes that there are indications not described in Section 11.5 that are seen in Tier 1 Table 2.7.6.4-1. This Tier 1 table has a column to describe if there is a Display/Alarm in the MCR/ or RSR indication. Each detector in this table has a "Yes" marked down for all three indications, however DCD Section 11.5 does not fully include a description of all indications in either the text or DCD Tables 11.5-2.

As a result the staff requests that the applicant provide the following complete information:

- Each monitor should contain a description of its functions and safety related requirements in meeting redundancy or independence (where applicable)
- Each monitor should contain a discussion on radiation detection ranges
- Each monitor should contain a discussion on the process configuration of the detector
- Each monitor should contain a discussion on its specific location
- Discussions of applicable regulatory guides should be used
- Provide a discussion concerning the alarms and interlocks established for each detector.
- Each monitor should contain information on the associated sampling stations if applicable, especially effluent monitors.

- Provisions for purging of sample lines and minimizing process and effluent volumes should be indicated
- Each monitor should contain a discussion of the safety classification associated with the monitor
- There should be a discussion on the calibration and quality assurance for each detector

Please address these items and provide a mark up for the proposed DCD changes.

**Response – (Rev. 3)**

- Each monitor should contain a description of its functions and safety related requirements in meeting redundancy or independence (where applicable)

  Each monitor function will be described in the revised “Function and Remark” column of Tier 2 Table 11.5-2. All safety related radiation monitors are classified to the Safety Class 3 conforming to ANSI/ANS-51.1 and Electrical Class A/B/C/D per Class 1E separation division as identified in “Class” column of Tier 2 Table 11.5-2.These monitors are designed to meet the requirements of redundancy and independence in accordance with IEEE603 and IEEE 308 as described in the Tier 2 Section 3.2.3 “Safety Class”.

  Subsection 11.5.2.3.5 will be added to describe the function of each monitor and the redundancy of the safety related monitor.

- Additional Clarification on the Liquid PERMSS with relation to ODCM and REMP are discussed in the response to RAI 131-8087_Question 11.05-1.

- Each monitor should contain a discussion on radiation detection ranges

  The engineering unit(Bq/cc) provided as a radiation range will be changed to μCi/cc and the updated detection ranges of each monitors will be provided in the Table 11.5-2.

  In the newly added Subsection 11.5.2.3.5 a pointer is provided to state that the measuring range of each monitor is specified in Table 11.5-2.

  Each monitor should contain a discussion on the process configuration of the detector

  The liquid PERMS local unit extracts, transports, and retains a representative sample of the monitored process medium. Each local unit consists of off-line samplers, a local skid, and a local panel. The local skid contains detector sensors, sample pump, and associated piping/tubing and valves. Off-line samplers are connected in parallel with the monitored system piping. The differential head of the sampler inlet and outlet are designed on the basis of allowing flow of 3 to 4 gpm through the sampler. The sampler chamber is designed with sufficient volume of the sampled stream to meet the sensitivity requirements. Protective devices such as pressure relief and reverse flow check valves are provided to prevent damage to the detectors, pumps, and accessories. The sampler is designed to have the inlet arranged so that a swirling action occurs, the bottom portion is hemispherical, and the outlet is at the bottom so that a self-flushing minimizes deposition of contaminants.

Coolers are provided to cool down the off-line process samples if the process conditioning is required.

The local panel contains local microprocessors, local operator controls and displays, and a local audible/visual alarm. Each local unit is designed to have stand-alone operation capability.

For purging provision, please refer to the discussion below.

Subsection 11.5.2.3.1 and Figure 11.5-3B will be added to describe the process configuration of the liquid PERMSS.

- Each monitor should contain a discussion on its specific location

  The locations of each monitor are described in Subsection 11.5.2.3 and the physical locations are shown in the Figure 11.5-2.

  The liquid PERMSS monitors listed in Table 11.5-2 have been thoroughly reviewed to correct the discrepancies and omissions of the monitor location.

  Figures 11.5-2 will be revised to show the correct location of the radiation detectors (RE) and the monitor electronics/displays (RT). In the figures, RE/RT means that the detector and electronic/display are installed together adjacent to each other. The location of some RE and RT have been changed to the correct location. Subsection 11.5.2.3.5 will be added to describe that the location of each monitor is shown in Figures 11.5-2.

  Condenser pit sump water monitor (RE-165 and RE-167) is newly added to Subsection 11.5.2.3.5.e and Table 11.5-2 to incorporate the design change described in the response to RAI 244-8326, Question 09.03.03-4.

  The Condenser Pit Sump (North/South) Monitor will be installed at Condenser Pit Sump (North/South) Pump Discharge line. However, the pump discharge line arrangement and the detailed location of sample lines for these monitors cannot be determined because the flow diagrams for these sumps will be provided by COL applicant (COL 9.3(4)), as described in the response to RAI 8326, Question 09.03.03-4. The Installed locations and safety class of RE-165 and RE-167 are to be determined by the COL applicant. (COL 11.5 (9))

- Discussions of applicable regulatory guides should be used

  The applicable regulatory guides in Section 11.5 are described in the Subsection 11.5.6 “References” as follows: RG 1.97 classification and related requirements are discussed and referenced in 11.5.2.1.

  - Regulatory Guide 1.21, “Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste,” U.S. Nuclear Regulatory Commission, June 2009 (Reference 5).

- Regulatory Guide 1.45, “Reactor Coolant Pressure Boundary Leakage Detection Systems,” Rev. 1, U.S. Nuclear Regulatory Commission, May 2008 (Reference 7).

- Regulatory Guide 1.97, “Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident,” Rev. 4, U.S. Nuclear Regulatory Commission, June 2006 (Reference 8).

- Regulatory Guide 1.143, “Design Guide for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants,” Rev. 2, U.S. Nuclear Regulatory Commission, November 2001(Reference 12).

- Regulatory Guide 1.109, “Calculation of Annual Doses to Man from Routine Release of Reactor Effluents for the Purpose of Evaluating Compliance with 10 Code of Federal Regulations Part 50, Appendix I,” Rev. 1, U.S. Nuclear Regulatory Commission, October 1977 (Reference 22).

- Regulatory Guide 1.111, “Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors,” Rev. 1, U.S. Nuclear Regulatory Commission, July 1977(Reference 23).

- Regulatory Guide 1.113, “Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I,” Rev. 1, U.S. Nuclear Regulatory Commission, April 1997(Reference 24).

- Regulatory Guide 1.33, “Quality Assurance Program Requirements (Operation),” U.S. Nuclear Regulatory Commission, February 1978(Reference 25).

- Regulatory Guide 4.15, “Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination) - Effluent Streams and the environment,” Rev. 2, U.S. Nuclear Regulatory Commission, July 2007(Reference 26).

- Regulatory Guide 8.8, “Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as Is Reasonably Achievable,” Rev. 3, U.S. Nuclear Regulatory Commission, June 1978 (Reference 28).

- Regulatory Guide 8.10, “Operating Philosophy for Maintaining Occupational Radiation Exposures as low as Is Reasonably Achievable,” Rev. 1, U.S. Nuclear Regulatory Commission, May 1977 (Reference 29).

- Regulatory Guide 4.21, “Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning,” U.S. Nuclear Regulatory Commission, June 2008 (Reference 31).

• Provide a discussion concerning the alarms and interlocks established for each detector.

The updated information of the alarms will be provided in the Table 11.5-2. The interlock function can be divided into isolation and diversion functions. These are tabulated in the Table 11.5-2. Two functions for each detector are described in note 3 of the same Table as applicable.

Subsection 11.5.2.3.5 will be added to describe the alarms and interlocks of each monitor.

- Each monitor should contain information on the associated sampling stations if applicable, especially effluent monitors.

  Subsection 11.5.2.3.3 will be added to describe the equipment and instrument for the liquid effluent monitoring and process monitoring.

- Provisions for purging of sample lines and minimizing process and effluent volumes should be indicated

  Each local skid has a provision for purging the sample line with demineralized water for liquid monitors. Each stainless steel sample chamber is designed to be decontaminated by flushing with demineralized water without removal from the process or sample line. Solenoid valves are provided at the sampler inlet so that flushing operation can be performed locally from the local unit or remotely from the Operator Interface Unit (OIU) keyboard. The sample chamber liner is designed to be easily replaced in the field.

  Demineralized water used in purging the sample line will be returned back to the sample line, which will be rerouted to the Liquid Radwaste System, when high radiation is detected, thus minimizing the amount of liquid effluent discharged to the environment.

  Subsection 11.5.2.3.2 will be added to describe the purging of sample lines.

- Each monitor should contain a discussion of the safety classification associated with the monitor

  The safety classification in accordance with ANSI/ANS-51.1-1983 (Reference 32) is provided in the “Class” column of Table 11.5-2 and the details of each classification is given in note 1 at the end of the table.

  Subsection 11.5.2.3.5 will be added to describe the safety classification of each monitor.

- There should be a discussion on the calibration and quality assurance for each detector

  The calibration procedures are developed in accordance with NRC RG 1.33 (Reference 25) and NRC RG 4.15 (Reference 26) (COL 11.5 (6)) as described in the Subsection 11.5.1.2 “Design Criteria”. The methodology to determine the calibration methods and frequency of the PERMSS and ARMS is provided by the offsite dose calculation manual (ODCM) based on plant procedures as described in the Subsection 12.3.4.1.7 “Calibration Methods and Frequency”.

  The quality assurance (QA) program for the design, installation, procurement, and fabrication of PERMSS components conforms to Regulatory Position C.7 of NRC RG 1.143 (Reference 12) as described in the Subsection 11.5.1.2 “Design Criteria”.

  Post-accident radiation monitors conform to NRC RG 1.97 including equipment qualification, quality assurance testing and calibration as described in the Subsection 11.5.2.1 “Monitor Design and Configuration”.

- The CCW heat exchanger building sump monitor (RE-166 and RE-168) is added for consistency with DCD Chapter 9.

  The CCW HX BLDG Sump Monitor will be installed at the CCW HX BLDG Sump Pump Discharge line. However, the pump discharge line arrangement and the detailed location of sample lines for these monitors cannot be determined because the flow diagrams for these sumps will be provided by COL applicant (COL 9.3(4)), as described in the response to RAI 8326, Question 09.03.03-4. The Installed locations and safety class of RE-166 and RE-168 are to be determined by the COL applicant (COL 11.5 (9))

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**Impact on DCD**

DCD Revision 1 incorporated changes that were to the following Subsections, table and Figure that were included in the initial response to this RAI.

DCD Tier 1, Table 2.7.6.4-1 will be revised.

DCD Tier 2, Subsections 11.5.2.3, 11.5.5, Table 11.5-2, Figures 11.5-2B, 11.5-2C, 11.5-2D, 11.5-2E, 11.5-2R, 11.5-2S, 11.5-2X, 11.5-2Y, and 11.5-2AA will be revised.

The markup for Figure 11.5-2E is not attached to this response because the markup is included in the revised response to RAI 131-8087, Question 11.05-1.

Figure 11.5-3B will be added.

The following DCD Revision 1 Subsections, Tables, and Figure will be revised as a result of this revised response.

DCD Tier 1

Table 2.7.6.4-1

DCD Tier 2

Table 1.8-2, 11.5-2
Subsections 11.5.2.3.1, 11.5.2.3.4, 11.5.2.3.5.e, 11.5.2.3.5.j, 11.5.3.

**Impact on PRA**

There is no impact on the PRA.

**Impact on Technical Specifications**

There is no impact on the Technical Specifications.

**Impact on Technical/Topical/Environmental Reports**

There is no impact on any Technical, Topical, or Environmental Report.

Table 2.7.6.4-1 (4 of 4)

| Description | Tag No | Monitor Type (2) | Location | Class (3) | | | Range (μC/cc) (4) | | | | Display & Alarm at MCR/RSR /Local |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | S | SE | E | Particulate Gross β | I-131 γ | Gas Gross β | Liquid Gross γ | |
| Collective Sewage treatment sump | PR-RE-190 | Liquid | Waste Water Treatment Building | N | III | N | N/A | N/A | N/A | $1.0 \times 10^{-7}$ to $1.0 \times 10^{-1}$ | Yes/Yes/Yes |
| Main Steam Line | PR-RE-217 | Gas (1) | Auxiliary Building | N | II | N | N/A | N/A | N/A | $2.7 \times 10^{-9}$ to $2.7 \times 10^{-3}$ | Yes/Yes/Yes |
| | PR-RE-218 | Gas (1) | Auxiliary Building | N | II | N | N/A | N/A | N/A | $2.7 \times 10^{-9}$ to 2.7 × 10-3 | Yes/Yes/Yes |
| | PR-RE-219 | Gas (1) | Auxiliary Building | N | II | N | N/A | N/A | N/A | $2.7 \times 10^{-9}$ to $2.7 \times 10^{-3}$ | Yes/Yes/Yes |
| | PR-RE-220 | Gas (1) | Auxiliary Building | N | II | N | N/A | N/A | N/A | $2.7 \times 10^{-9}$ to $2.7 \times 10^{-3}$ | Yes/Yes/Yes |
| Condenser pit sump water | PR-RE-165 PR-RE-167 | Liquid | Turbine Building | (5) | (5) | (5) | N/A | N/A | N/A | $1.0 \times 10^{-6}$ to $1.0 \times 10^{-1}$ | Yes/Yes/Yes |
| CCW heat exchanger building sump | PR-RE-166 PR-RE-168 | Liquid | CCW HX Building | (5) | (5) | (5) | N/A | N/A | N/A | $1.0 \times 10^{-6}$ to $1.0 \times 10^{-1}$ | Yes/Yes/Yes |

add monitor

(1) N-16 monitoring function is embedded in the Main Steam Line Area Radiation Monitor.

(2) Monitor Type

P: Particulate, I : Iodine, G: Noble gas, Liquid

(3) S = Safety Class per ANSI/ANS 51.1 (Reference 32): 1 = SC-1, 2 = SC-2, 3 = SC-3, N = NNS

SE = Seismic Category: I, II, III

E = Electrical Class: A, B, C, D = Class 1E Separation Division, N = Non-Class 1E

(4) Detector type and calibration nuclide for each measurement:

Particulate Gross β = β scintillator with Cs-137

Gas Gross β = β scintillator with Kr-85

Liquid Gross γ = γ scintillator with Cs-137

Iodine γ = γ scintillator with Ba-133

(5) The COL applicant is to determine the safety class (COL 11.5(9)).

Table 1.8-2 (26 of 38)

| Item No. | Description |
|---|---|
| COL 11.5(8) | The COL applicant is to develop detailed locations, tubing installations, and provide the sampling method including the sampling frequency and time to acquire representative sampling. |
| COL 11.5(9) | The COL applicant is to determine the ~~monitor type,~~ safety class~~, measuring range,~~ and installed location of the RE-165 ~~and RE-166.~~ , RE-166, RE-167, and RE-168. |
| COL 11.5(10) | The COL applicant is to provide operational procedures and maintenance programs related to leak detection and contamination control. |
| COL 12.1(1) | The COL applicant is to provide the organizational structure to effectively implement the radiation protection policy, training, and reviews consistent with operational and maintenance requirements, while satisfying the applicable regulations and Regulatory Guides including NRC RGs 1.33, 1.8, 8.8, and 8.10. |
| COL 12.1(2) | The COL applicant is to describe the operational radiation protection program to provide reasonable assurance that occupational and public radiation exposures are ALARA. |
| COL 12.1(3) | The COL applicant is to describe how the plant follows the guidance provided in NRC RGs 8.2, 8.4, 8.7, 8.9, 8.13, 8.15, 8.20, 8.25, 8.26, 8.27, 8.28, 8.29, 8.34, 8.35, 8.36, and 8.38. |
| COL 12.2(1) | The COL applicant is to provide any additional contained radiation sources, such as instrument calibration radiation sources, that are not identified in Subsection 12.2.1. |
| COL 12.3(1) | The COL applicant is to determine the areas that will require either electro or mechanical polishing. |
| COL 12.3(2) | The COL applicant is to establish how the water chemistry pH control reduces radiation fields. |
| COL 12.3(3) | The COL applicant is to provide the material composition and shielding properties of the following doors/hatches, and these thicknesses equivalent to the minimum required concrete shield thicknesses.<br>- Personnel Air Lock between Containment Annulus Area (100-C01) and Personnel Air Lock Entrance (100-A14A)<br>- Personnel Air Lock between Operating Area (156-C01) and Containment Entrance Area (156-A04B)<br>- Equipment Hatch between Operating Area (156-C01) and Equipment Hatch Access Room (156-A10A)<br>- Door between Equipment Hatch Access Room (156-A10A) and the building exterior<br>- Doors between Truck Bay (100-P08) and the building exterior<br>Also, the COL applicant is to provide the service life of these doors/hatches and perform periodic in-service inspection and maintenance for these doors/hatches to provide reasonable assurance of functionality throughout the life of the plant. |
| COL 12.3(4) | The COL applicant is to provide portable instruments and the associated training and procedures in accordance with 10 CFR 50.34(f)(2)(xxvii) and the criteria in Item III.D.3.3 of NUREG-0737 as well as the guidelines of RG 8.8. |
| COL 12.3(5) | The COL applicant is to determine the ARM setpoints for WARN, ALARM, and the containment purge isolation and fuel handling area emergency ventilation actuation signals, based on the site-specific conditions and operational requirements. |
| COL 11.5 (11) | The COL applicant is to design the sample nozzle location, sample line size, line routing/configuration/length, and monitor location to minimize the line loss in accordance with ANSI/HPS N13.1. |

The local panel contains local microprocessors, local operator controls and displays, and a local audible/visual alarm. Each local unit is designed to have stand-alone operation capability.

Generic process configuration for the liquid PERMSS is shown in Figure 11.5-3B.

11.5.2.3.2 Purging of sample lines

Each local skid has a provision for purging the sample line with demineralized water for liquid monitors. Each stainless steel sample chamber is designed to be decontaminated by flushing with demineralized water without removal from the process or sample line. Solenoid valves are provided at the sampler inlet so that flushing operation can be performed locally from the local unit or remotely from the Operator Interface Unit (OIU) keyboard. The sample chamber liner is designed to be easily replaced in the field.

Demineralized water used in purging the sample line will be returned back to the sample return line, which will be rerouted to the Liquid Radwaste System, when high radiation is detected, thus minimizing the amount of liquid effluent discharged to the environment.

11.5.2.3.3 Monitoring of liquid effluent discharge and process stream

Monitoring provision for liquid PERMSS is similar to the monitoring provision for the gaseous PERMSS which is described in Subsection 11.5.2.2.3.

11.5.2.3.4 Calibration

The calibration procedures are developed in accordance with NRC RG 1.33 (Reference 25) and NRC RG 4.15 (Reference 26) (COL 11.5 (6))

~~Calibration procedure is described in Subsection 11.5.1.2.m.~~

11.5.2.3.5 Liquid PERMSS monitor component description

Liquid PERMSS are classified as non-safety-related. Table 11.5-2 lists the measuring range, safety class, seismic category, quality class, electrical class, and other associated design information for each monitor. Liquid PERMSS monitor takes a direct sample without a sample probe. After passing through the monitor, the sample is returned to the system sampled.

Liquid PERMSS does not use inline type detector.

a. Component cooling water supply header monitors (RE-111 and 112)

This offline monitor has a gamma scintillation detector. The monitor has measuring range specified in Table 11.5-2 and provides indication and alarm to the MCR, RSR, and local RMS skid.

Upon detection of a high-radiation signal, the operating condensate polishing area sump pump is stopped automatically. The discharge valve to the waste water treatment facility (WWTF) is closed, and the discharge valve to the liquid waste management system (LWMS) is opened simultaneously. Then, the sump pump is manually started. The flow is then diverted to the LWMS.

The monitor is designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

The monitor is located in Turbine Generator Building as shown in Figure 11.5-2Y.

e. Condenser pit sump water monitor (RE-165) and RE-167

The sample line inlet of ~~RE-165~~ RE-165 and RE-167 is located at the discharge of condenser pit sump pump.

The monitor provides indication and alarm to the MCR, RSR, and local RMS skid.

Upon detection of a high-radiation signal, the operating sump pumps are stopped automatically. The discharge valve to the WWTF is closed, and the discharge valve to condensate polishing area sump is opened simultaneously. Then, the sump pump is manually started. The flow is then diverted to the LWMS.

The monitor is designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

~~The monitor type, measuring range, and installed location of the RE-165 are~~ The installed locations of RE-165 and RE-167 are to be determined by the COL applicant (COL 11.5(9)).

f. Condensate receiver tank monitor (RE-103)

The sample line inlet of RE-103 is located at the outlet of the condensate receiver tank in the auxiliary steam system.

However, the pump discharge line arrangement and the detailed location of sample lines for these monitors cannot be determined because the flow diagrams for these sumps will be provided by COL applicant (COL 9.3(4)).

113 and RE-114. Activity detected above background is indicative of a leak into the essential service water system from the component cooling water system.

The monitors are located in CCW HX Building as shown in Figure 11.5-2X.

j. CCW heat exchanger building sump monitor (RE-166 and RE-168)

The sample line inlet of ~~RE-166~~ RE-166 and RE-168 is located at the discharge of ~~condenser pit sump pump.~~ CCW heat exchanger building sump.

The monitor provides indication and alarm to the MCR, RSR, and local RMS skid.

Upon detection of a high-radiation signal, the discharge valve of the CCW heat exchange building sump pump to non-radioactive liquid release is closed and the discharge valve to the LWMS is opened simultaneously. The flow is then diverted to the LWMS.

The monitor is designed to provide alarm to operator not to exceed the dose limits in 10 CFR 50, Appendix I and the effluent concentration limits in 10 CFR 20, Appendix B.

~~The monitor type, measuring range, and installed location of the RE-166 are~~ The installed location of RE-166 and RE-168 are to be determined by the COL applicant (COL 11.5(9)).

### 11.5.2.4 Design Features for Minimization of Contamination

The APR1400 is designed with specific features to meet the requirements of 10 CFR 20.1406 (Reference 30) and Regulatory Guide 4.21 (Reference 31). The basic principles of RG 4.21, and the methods of control suggested in the regulations, are specifically delineated in four design objectives and two operational objectives described in Subsection 12.4.2 of this DCD. The following evaluation summarizes the primary features to address the design and operational objectives for the RMS.

The RMS has been evaluated for leak identification from the SSCs that contain radioactive or potentially radioactive materials, the areas and pathways where probable leak may occur, and methods of control incorporated in the design of the system. The leak identification evaluation indicated that the RMS is designed to facilitate the identification of leaks, provide prompt assessment and evaluation, and initiate responses to isolate and mitigate leaked areas. Thus unintended contamination of the facility and the environment is

However, the pump discharge line arrangement and the detailed location of sample lines for these monitors cannot be determined because the flow diagrams for these sumps will be provided by COL applicant (COL 9.3(4)).

COL 11.5(2) The COL applicant is to develop an annual report that specifies the quantity of each principal radionuclide released to unrestricted areas in liquid and gaseous effluents.

COL 11.5(3) The COL applicant is to provide site-specific procedures that conform with the numerical guides of 10 CFR 50.34a and 10 CFR 50, Appendix I.

COL 11.5(4) The COL applicant is to prepare an offsite dose calculation manual (ODCM) that contains a description of the methodology and parameters for the calculation of the offsite doses for the gaseous and liquid effluents.

COL 11.5(5) The COL applicant is to provide analytical procedures and sensitivity for selected radio-analytical methods and types of sampling media for site - specific applications.

COL 11.5(6) The COL applicant is also to develop operational procedures in accordance with NRC RG 1.33 and NRC RG 4.15.

COL 11.5(7) The COL applicant is to develop a radiological and environmental monitoring program (REMP) in accordance with NUREG-1301 and NUREG-0133, and NRC RG 4.1, which describes the scope of the program, taking into account local and land use census data in identifying all potential radiation exposure pathways, associated radioactive materials present in liquid and gaseous effluent, and direct external radiation from SSCs.

COL 11.5(8) The COL applicant is to develop detailed locations, tubing installations, and provide the sampling method including the sampling frequency and time to acquire representative sampling.

COL 11.5(9) The COL applicant is to determine the ~~monitor type,~~ safety class~~,~~ ~~measuring range,~~ and installed location of the RE-165 ~~and RE-166.~~ , RE-166, RE-167, and RE-168.

COL 11.5(10) The COL applicant is to provide operational procedures and maintenance programs related to leak detection and contamination control.

COL 11.5 (11) The COL applicant is to design the sample nozzle location, sample line size, line routing/configuration/length, and monitor location to minimize the line loss in accordance with ANSI/HPS N13.1.

Table 11.5-2 (2 of 2)

| Location | Tag No. | Class(1) | | | Range (μCi/cc) (2) | | | | | Function and Remarks (3) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | S | SE | E | Particulate Gross β | I-131 γ | Gas Gross β | Liquid Gross γ | Area | Display & Alarm at MCR/RSR/Local |
| CPP area sump water | RE-164 | N | III | N | N/A | N/A | N/A | $1.0 \times 10^{-6}$ to $1.0 \times 10^{-1}$ | N/A | Pump stop signal Yes/Yes/Yes |
| Liquid radwaste system effluent | RE-183 RE-184 | N | III | N | N/A | N/A | N/A | $1.0 \times 10^{-6}$ to $1.0 \times 10^{-1}$ | N/A | Isolation interlock(5) Yes/Yes/Yes |
| Fire pump and water/wastewater treatment building | RE-190 | N | III | N | N/A | N/A | N/A | $1.0 \times 10^{-7}$ to $1.0 \times 10^{-1}$ | N/A | Pump stop signal Yes/Yes/Yes |
| Condenser pit sump water RE-167 | RE-165 | (4) | (4) | (4) | (4) | (4) | (4) | (4) | (4) | Yes/Yes/Yes, pump stop signal |
| CCW heat exchanger building sump RE-168 | RE-166 | (4) | (4) | (4) | (4) | (4) | (4) | (4) | (4) | Yes/Yes/Yes, pump stop signal |

N/A

1.0 x $10^{-6}$ to 1.0 x $10^{-1}$

N/A

(1) S = Safety Class per ANSI/ANS 51.1 (Reference 32): 1 = SC-1, 2 = SC-2, 3 = SC-3, N = NNS

SE = Seismic Category: I, II, III

E = Electrical Class: A, B, C, D = Class 1E Separation Division, N = Non-Class 1E

(2) Detector type and calibration nuclide for each measurement:

Particulate Gross β = β scintillator with Cs-137

Gas Gross β = β scintillator with Kr-85

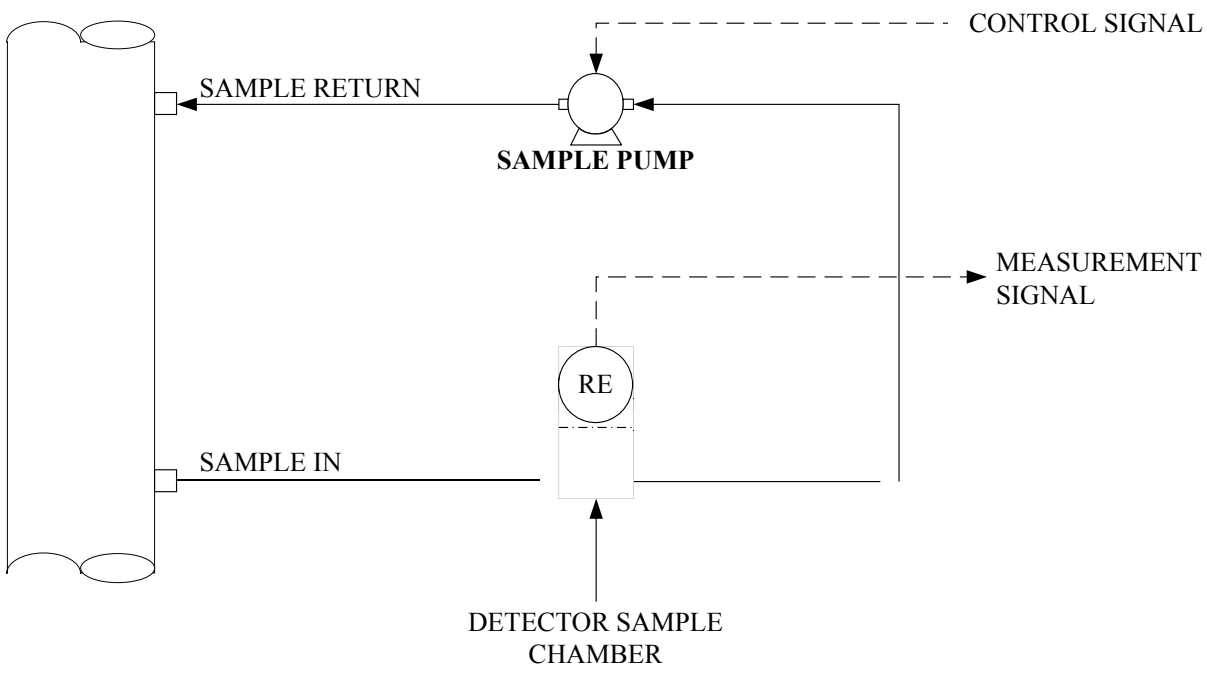
Liquid Gross γ = γ scintillator with Cs-137

Iodine γ = γ scintillator with Ba-133

(3) The detector with the isolation function isolates the effluent discharge function when the discharge reaches a preset setpoint value, thus terminating the discharge. The detector with the diversion interlock function diverts the effluent discharge to a safe hold-up storage or further processing for decontamination when a setpoint is reached. Certain detectors could have both isolation and diversion interlock function depending on the application.

(4) The COL applicant is to determine the safety class ~~and measuring range~~ (COL 11.5(9)) .

(5) The liquid effluent radiation monitors shall be inspected, calibrated, and tested in accordance with the methodology and criteria specified in the ODCM. The COL applicant may follow NEI 07-09A (Reference 21) as guidance for the preparation of the ODCM (COL 11.5(4)).




Notes:

1. Depending on the temperature of the liquid sample, a sample cooler may be placed upstream of the detector chamber with cooling water supplied from the plant component cooling water.

2. The detector type of the liquid monitor is typically gamma scintillation detector.

3. The liquid monitor local skid is typically provided with demineralized water supply purge provision.

**Figure 11.5-3B ~~Typical~~ Liquid Monitor**

Offline