REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

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

Docket No. 52-046

RAI No.:	**219-8199**
SRP Section:	**11.03 - Gaseous Waste Management System**
Application Section:	**11.3**
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Question No. 11.03-7

In the description of the Inspection, Test Analysis for the following design commitments in Table 2.7.6.2-4 the applicant states the following:

- In design commitment 3 the applicant states “Tests will be conducted for the GRS discharge valve using simulated test signal.”

In review of “simulated test signal” the NRC staff believes that this implies that an electric signal will be used in place of a radiation source. NRC staff finds that this method does not test they system as a whole as it does not functionally test the radiation detector which is an essential component. Testing of this component is essential in verifying information that would be used to justify compliance with 10 CFR 50 Appendix I Dose Objectives, 10 CFR 20 Appendix B Table 2 limits, and 10 CFR 20.1301 and 1302 dose limits to a member of the public.

NRC staff requests that the applicant address the use of a radiation source in testing the GWMS in place of the currently cited simulated test signal.

Response – (Rev. 1)

The gaseous radiation monitors, PR-RE-080/083, are included in Process and Effluent Radiation Monitoring and Sampling System (PERMSS) which is described in DCD Tier 1, subsection 2.7.6.4 and functional test information for the radiation detectors is provided in that Section above. The subsection 2.7.6.2 describes the verification for GRS discharge valve operation upon receipt of a high radiation signal from the radiation detector.

A radiation check source is used to test each radiation monitor. The DCD Tier 1, Subsection 2.7.6.4.1 will be revised to include GWMS radiation monitors are tested using a radiation check source, as well.

In addition, the DCD Tier 1, Table 2.7.6.4-3 and Table 2.7.6.5-3, and DCD Tier 2, Subsection 11.5.2.1 will also be revised to use of the word “radiation check source” instead of integral activated check source.

Impact on DCD

DCD Tier 1, Subsection 2.7.6.4.1, Table 2.7.6.4-3 (1 of 2), Table 2.7.6.5-3, and DCD Tier 2, Subsection 11.5.2.1 will be revised as indicated in the attached markup.

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.

2.7.6.4 Process and Effluent Radiation Monitoring and Sampling System

2.7.6.4.1 Design Description

The process and effluent radiation monitoring and sampling system (PERMSS) provide components to monitor liquid and gaseous effluents prior to release to unrestricted areas, and to monitor in-plant radioactivity.

The PERMSS is non safety-related with the exception of the following, each of which is safety-related and Class 1E:

a. Main control room (MCR) air intake radiation monitors

b. Containment building operating area and upper operating area radiation monitors

c. Fuel handling area monitors

d. Containment air radiation monitors

Components of the PERMSS are located in the containment building, the auxiliary building, the compound building, and the turbine building.

1. The functional arrangement of the PERMSS is as described in the Design Description of Subsection 2.7.6.4.1 and in Table 2.7.6.4-1.

2. The PERMSS has components that provide radiation monitoring of gaseous and liquid processing systems.

3. All displays and alarms required by the design exist in the MCR and RSR as defined in Table 2.7.6.4-1.

4. Each ~~safety-related~~ radiation monitor channel monitors the radiation level in its assigned area, and indicates its respective MCR alarm and local audible and visual alarm when the radiation level reaches a preset level.

Table 2.7.6.4-3 (1 of 2)

Process and Effluent Radiation Monitoring and Sampling System ITAAC

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The functional arrangement of the PERMSS is as described in the Design Description of Subsection 2.7.6.4.1 and in Table 2.7.6.4-1.	1. Inspection of the as-built PERMSS will be conducted.	1. The as-built PERMSS conforms with the functional arrangement as described in the Design Description of Subsection 2.7.6.4.1 and in Table 2.7.6.4-1.
2. The PERMSS has components that provide radiation monitoring of gaseous and liquid processing systems.	2. Inspections will be performed to verify that the as-built gaseous and liquid processing systems are provided with radiation monitoring.	2. The components of radiation monitoring exist in gaseous and liquid processing systems of the as-built PERMSS.
3. All displays and alarms required by the design exist in the MCR and RSR as defined in Table 2.7.6.4-1.	3. Tests will be performed on the displays and alarms in the MCR and RSR.	3. All displays and alarms exist and can be retrieved in the as-built MCR and RSR as defined in Table 2.7.6.4-1.
4. Each ~~safety-related~~ radiation monitor channel monitors the radiation level in its assigned area, and indicates its respective MCR alarm and local audible and visual alarm when the radiation level reaches a preset level.	4. Testing of each channel of the ~~safety-related~~ radiation monitors will be conducted using ~~an integral activated check source~~. a radiation check source	4. MCR and local alarms are initiated when the radiation level of ~~integral activated check source~~ reaches a preset limit. radiation check source
5. The safety-related divisional cabinet (SRDC) of the PERMSS provides an automatic ESF initiation signals, as shown on Table 2.7.6.4-2.	5. A testing of the as-built SRDC will be performed using ~~an integral activated check source~~. a radiation check source	5. Each as-built ESF initiation signals are sent to ESF-CCS group control cabinet upon detection of high radiation of the MCR intake defined in Table 2.7.6.4-2, if plant's radiation monitors exceed predetermined setpoints for control room emergency ventilation actuation signal (CREVAS).

Table 2.7.6.5-3 (1 of 2)

Area Radiation Monitoring System ITAAC

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The functional arrangement of the ARMS is as described in the Design Description of Subsection 2.7.6.5.1 and in Table 2.7.6.5-1.	1. Inspection of the as-built ARMS will be conducted.	1. The as-built ARMS conforms with the functional arrangement as described in the Design Description of Subsection 2.7.6.5.1 and in Table 2.7.6.5-1.
2. The ARMS provides operating personnel with an indication and record of radiation levels in the MCR.	2. Inspection of the ARMS components will be performed.	2. It provides operating personnel with an indication and record of radiation levels at selected locations within the various plant buildings to warn of excessive gamma radiation levels in areas where nuclear fuel is stored or handled.
3. The monitors provide local readout and alarm units at the detector locations.	3. Testing of local readout and alarm units at the detectors will be conducted. radiation check source	3. Local alarms are initiated when the radiation level of ~~integral activated check source~~ reaches a preset limit. Both audible and visual alarms are included for each local readout/alarm unit.
4. Separation is provided between Class 1E division, and between Class 1E division and non-Class 1E division.	4. Inspection of the as-built Class 1E divisions will be performed.	4. Physical separation or electrical isolation exists in accordance with NRC RG 1.75 between these Class 1E divisions, and also between Class 1E division and non-Class 1E division.

Table 2.7.6.5-3 (2 of 2)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. The seismic Category I monitors of the ARMS identified in Table 2.7.6.5-1 can withstand seismic design basis loads without loss of safety function.	5.a. Inspections will be performed to verify that the as-built seismic Category I monitor identified in Table 2.7.6.5-1 is located in a seismic Category I structure(s).	5.a. The as-built seismic Category I monitor identified in Table 2.7.6.5-1 is located in a seismic Category I structure(s).
	5.b. Type test, analyses, or a combination of type tests and analyses of seismic Category I monitor identified in Table 2.7.6.5-1 will be performed.	5.b. A report exists and concludes that the seismic Category I monitor identified in Table 2.7.6.5-1 withstands seismic design basis loads without loss of safety function.
	5.c. Inspections and analyses will be performed to verify that the as-built seismic Category I monitor identified in Table 2.7.6.5-1 including anchorages is seismically bounded by the tested or analyzed conditions.	5.c. A report exists and concludes that the seismic Category I monitor identified in Table 2.7.6.5-1 including anchorages is seismically bounded by the tested or analyzed conditions.
6. The safety-related divisional cabinet (SRDC) of the ARMS provides an automatic ESF initiation signals, as shown in Table 2.7.6.5-2.	6. A Testing of the as-built SRDC will be performed using ~~an integral activated check source~~. a radiation check source	6. Each as-built ESF initiation signal is sent to ESF-CCS group control cabinet upon detection of high radiation of containment operating area and fuel handling area defined in Table 2.7.6.5-2, if plant's radiation monitors exceed predetermined setpoints for containment purge isolation actuation signal (CPIAS) and fuel handling area emergency ventilation actuation signal (FHEVAS).

11.5.2 System Description

11.5.2.1 Monitor Design and Configuration

Process, effluent, and airborne radiation monitors typically consist of components such as a microprocessor, one or more detectors, a shielded detection chamber, a sample pump, flow instrumentation, and associated tubing and cabling.

Each process, effluent, and airborne radiation monitor is located in an easily accessible area and has sufficient shielding to provide reasonable assurance that the required sensitivity is achieved at the design background radiation level for the area. This approach is consistent with NRC RG 8.8 (Reference 28) and NRC RG 8.10 (Reference 29). Instrumentation and sensors are provided to detect component failures such as loss of power, loss of sample flow, check source response failure, and loss of detector signal.

Radiation level signals, alarms, and operation status alarms are generated by each monitor microprocessor and are transmitted to IPS, QIAS, and other interfacing systems. Alarm relay contacts are provided for alert-radiation, high-radiation, and operation status alarms.

For some monitors, the high-radiation alarm contacts are used to initiate control functions to terminate batch releases or to divert flow from one location to another. The operation status alarm is initiated by the microprocessor if conditions indicate that the monitor is not operating properly.

Radiation monitoring equipment is designed for service based on expected environmental conditions during normal operation and AOOs. These conditions include temperature, pressure, humidity, chemical spray (where applicable), and radiation exposure. Post-accident radiation monitors conform with NRC RG 1.97 including equipment qualification, redundancy, power source, channel availability, quality assurance, display and recording, range, interfaces, testing, calibration, and human factors engineering recommendations. Further description of conformance with NRC RG 1.97 is contained in Subsections 7.1.2.44 and 7.5.2.1.

a radiation check source

The RMS has ~~an integral activated check source~~ similar to the sample isotope to be detected to monitor proper system response automatically.