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.:	**256-8321**
SRP Section:	**09.02.02 - Reactor Auxiliary Cooling Water Systems**
Application Section:	**9.2.2**
Date of RAI Issue:	**10/19/2015**

Question No. 09.02.02-9

10CFR 20.1406(b) requires that “Applicants for standard design certifications, standard design approvals, and manufacturing licenses under part 52 of this chapter, whose applications are submitted after August 20, 1997, shall describe in the application how facility design will minimize, to the extent practicable, contamination of the facility and the environment, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste.” Regulatory Guide 4.21 describes a method acceptable to the U.S. Nuclear Regulatory Commission (NRC) for use in the implementation of Title 10, Section 20.1406, ″Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning”

DCD Tier 2, Section 9.2.2.2.5 describes the design features for minimization of contamination. In item c and d, on page 9.2-37 of the DCD, it is stated that sloped floors with epoxy coatings will facilitate draining of radioactively contaminated or potentially contaminated fluids into local sumps, which will have level switched to facilitate pumping when levels reach a predetermined setpoint. However, no information has been included on where the contents of the sump is routed to, or the system (pipes, pumps, valves, etc.) through which it is being routed through. Therefore, staff request that the applicant,

a. Specify where the sump contents are routed to for treatment and/or storage

b. Discuss the measures taken to prevent potential contamination due to the potential for system leakage during the transfer of the sumps content to where it is ultimately treated and/or stored.

Response

a. The cubicles, where the CCWS SSCs are housed, are designed with sloped floors, epoxy coating to provide drainage and cleanable surfaces, and local sumps to collect leakage and overflows. Radioactive or potentially radioactive liquid collected by the

drains in the cubicles of the buildings, except for the CCW heat exchanger building, is to be routed to the nearest drain collection point, and is then transferred to the LWMS for treatment and release. The liquid collected in the local sump of the CCW heat exchangers building can be monitored for radioactive contamination using the radiation monitor. When the liquid is identified as containing radioactive contamination above a predetermined setpoint, the liquid is routed to the LWMS for treatment and release and non-radioactive liquid is routed to the non-radioactive wastewater treatment system for processing and release. The COL applicant is to provide the pipe routing information for the CCW heat exchanger building drain system.

DCD Subsection 9.2.2.2.5, sub-item c, will be revised to incorporate the above design information of the sump drain routing through the response to RAI 225-8254 Question 12.03-11.

b. The transfer of the sumps content to where it is ultimately treated and/or stored is performed by the equipment and floor drain system. The measures taken to prevent potential contamination due to the potential for system leakage during the transfer of the sumps content are discussed in DCD Subsection 9.3.3.2.6.

Impact on DCD

DCD Tier 2, Table 1.8-2 (15 of 29), Section 9.3.3.2.1, item c, on page 9.3-36 of Section 9.3.3.2.6, item d, on page 9.3-34 of Section 9.3.3.2.6 and Section 9.3.5 will be revised as indicated in the Attachment.

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 1.8-2 (15 of 29)

Item No.	Description
COL 9.3(2)	The COL applicant is to maintain complete documentation of system design, construction, design modifications, field changes, and operations.
COL 9.3(3)	The COL applicant is to prepare the site radiological environmental monitoring program.
COL 9.3(4)	The COL applicant is to provide the supply systems of the nitrogen gas subsystem, the hydrogen subsystem, the carbon dioxide subsystem, and the breathing air systems.
COL 9.4(1)	The COL applicant is to provide the capacities of heating coils in the safety-related air handling units and cooling and heating coils in the non safety-related air handling units affected by site-specific conditions.
COL 9.4(2)	The COL applicant is to provide the capacities of heating coils of electric duct heaters affected by site-specific conditions.
COL 9.4(3)	The COL applicant is to provide the system design information of ESW building and CCW heat exchanger building HVAC system including flow diagram, if the ESW building and CCW heat exchanger building require the HVAC system.
COL 9.4(4)	The COL applicant is to establish operational procedures and maintenance programs as related to leak detection and contamination control.
COL 9.5(1)	The COL applicant is to establish a fire protection program, including organization, training, and qualification of personnel, administrative controls of combustibles and ignition sources, firefighting procedures, and quality assurance.
COL 9.5(2)	The COL applicant is to address the design and fire protection aspects of the facilities, buildings and equipment, and a fire protection water supply system, which are site specific and/or are not a standard feature of the APR1400.
COL 9.5(3)	The COL applicant is to describe the provided apparatus for plant personnel and fire brigades such as portable fire extinguishers, self-contained breathing apparatus, and radio communication systems.
COL 9.5(4)	The COL applicant is to address the final FHA and FSSA based on the final plant design, including a detailed post-fire safe-shutdown circuit analysis.
COL 9.5(5)	The COL applicant is to provide a reliable starting method for the AAC GTG.
COL 9.5(6)	The COL applicant is to provide details of emergency response facilities and associated communication capabilities.

~~COL 9.3(5) The COL applicant is to provide the flow diagram of turbine generator building drain system.~~

COL 9.3(5)
The COL applicant is to provide the flow diagram of turbine generator building drain system and the CCW heat exchanger building drain system.

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related equipment since the non-safety-related component in safety-related areas such as reactor containment building and auxiliary building is designed as seismic Category II.

The COL applicant is to provide the flow diagram of turbine generator building drain system and the CCW heat exchanger building drain system. (COL 9.3(5))

9.3.3.2 System Description

The EFDS collects radioactive and potentially radioactive liquid wastes at atmospheric pressure from drainage of the reactor containment building, the auxiliary building, the compound building, and the turbine generator building. The liquid wastes are segregated, depending upon water quality and/or building, into four groups: equipment drainage, floor drainage, chemical drainage, and detergent drainage. Such drainages are conveyed by gravity to their respective building sumps and pumped to the LWMS. Chemical wastes collected from equipment decontamination and potentially chemical contamination wastes are sent to the chemical waste tanks of LWMS.

The EFDS consists of collection sumps, sump pumps, valves, piping, and instrumentation.

9.3.3.2.1 General Description ~~The COL applicant is to provide the flow diagram of turbine generator building drain system. (COL 9.3(5)).~~

The EFDS consists of several subsystems, as described below. Areas of the plant are served by the appropriate EFDS, based on the potential source of leakage into the subject area. This allows segregation of radioactive and non-radioactive sources. The schematic diagram of radioactive drainage system (RDS) is shown in Figures 9.3.3-1.

9.3.3.2.2 Radioactive Drainage Areas

The RDS collects radioactive and potentially radioactive liquid wastes at atmospheric pressure from equipment and floor drainage of the containment building, auxiliary building, and compound building. Such drainage is conveyed by gravity to sumps and pumped from sumps to the LWMS.

Chemical wastes are collected from equipment decontamination and sent to the LWMS chemical waste tanks. Potentially radioactive wastes from personnel decontamination shower facilities are collected and pumped to the detergent waste tanks of LWMS. Potentially radioactive wastewater entering the sump located in the condensate polishing

for pumping nonradioactive floor and equipment drainage and condensate overflow to the [[WWTF]].

d. The discharge from TGB sump pumps are monitored for radiation contamination level. The auxiliary boiler blowdown and drains are routed to the local sump, from which the condensate is routed to the TGB sump for radiation monitoring. When contamination level is detected at or exceeding a predetermined setpoint, the drains are routed to the LWMS for processing and release via the condensate polishing area sump. This approach prevents unintended contamination of the [[WWTF]].

The CCW heat exchanger building drains are monitored for radiation contamination by radiation monitors.

Adequate and Early Leak Detection

a. In areas that are not normally accessible during power operation, such as the ICI cavity sump, the RCB drain sump, and the AB floor drain sumps, continual level indication is provided in the MCR and the RSR. In the event the sump liquid level reaches a preset limit, the level instrument initiates a signal to alarm in the MCR and the RSR for operator actions. This design approach, supplemented with operational procedures, provides adequate leak detection capability and minimizes the potential for the spread of contamination.

b. Radiation monitors are provided in the discharge piping from the TGB north and south pit sumps and the condensate polishing area sump to detect contamination levels of the drains.

Reduction of Cross-Contamination, Decontamination, and Waste Generation

a. he sumps in the reactor containment building, the auxiliary building, the compound building and the turbine generator building that handle contaminated or potentially contaminated fluids are designed to minimize the spread of contamination through the use of liners, coatings, and seals. This design approach is nuclear-industry proven and is compatible with the chemical, physical, and radiological environment, thus minimizing waste generation.

b. The EFDS sumps are strategically located to collect floor and equipment drainage. Drains are segregated for different handling and processing requirements to

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Operations and Documentation

a. The EFDS is designed for automated operation. The sumps are designed with dual-level instruments to provide reasonable assurance of a safe operation. A high level signal initiates liquid transfer with one pump. If the liquid level continues to rise, a high-high signal initiates additional liquid transfer with the secondary pump. Level signals are transmitted to the MCR for monitoring and operator response.

b. Adequate space is provided in the vicinity of the sumps to enable prompt assessment and responses when required.

c. The TGB sumps are designed with radiation monitors that are interlocked with the discharge valves to provide the proper routing of the contaminated fluid.

~~The COL applicant is to provide the flow diagram of turbine generator building drain system (COL 9.3(5)).~~

d. The COL applicant is to provide operational procedures and maintenance programs as related to leak detection and contamination control (COL 9.3 (1)). Procedures and maintenance programs are to be completed before fuel is loaded for commissioning.

e. The COL applicant is to maintain complete documentation of the system design, construction, design modifications, field changes, and operations (COL 9.3 (2)). Documentation requirements are included as a COL information item.

Site Radiological Environmental Monitoring

a. Fluids collected in non-radioactive drainage areas generally have low potential for radioactive contamination as condensate and feedwater are continuously polished by ion exchange to keep radiation contamination low. The turbine generator building and miscellaneous building drainage systems are designed to provide continuous monitoring of drain routing and to prevent the spread of contamination. As the contamination level is low, environmental radiation monitoring for the nonradioactive drainage systems is not effective.

b. The RDS is designed to handle radioactive fluids, and the sumps are located at lower elevations to facilitate drainage collection. The RDS is part of the overall

The COL applicant is to provide the flow diagram of turbine generator building drain system and the CCW heat exchanger building drain system. (COL 9.3(5))

activity. The process radiation monitor serves only as a trending device to alert the operator of possible fuel cladding failure.

9.3.4.5.6 Boronometer

The boronometer provides indication and a continuous recording in the MCR of reactor coolant boron concentration. High and low alarms warn the operator of deviations from the required boron concentration in the reactor coolant. The principle of operation is neutron absorption. The unit is provided with shielding as required to limit the maximum external radiation level from its source to a low value. All portions of the unit that contact reactor coolant are constructed of austenitic stainless steel. Refer to Subsection 7.7.1.1 for further information on the boron control system.

9.3.5 Combined License Information

COL 9.3(1) The COL applicant is to prepare operational procedures and maintenance programs as related to leak detection and contamination control.

COL 9.3(2) The COL applicant is to maintain complete documentation of system design, construction, design modifications, field changes, and operations.

COL 9.3(3) The COL applicant is to prepare the site radiological environmental monitoring program.

COL 9.3(4) The COL applicant is to provide the supply systems of the nitrogen gas subsystem, the hydrogen subsystem, the carbon dioxide subsystem, and the breathing air systems.

9.3.6 References

1. 10 CFR 50.63, “Station Blackout Rule,” U.S. Nuclear Regulatory Commission.

2. ANSI/ISA 7.0.01-1996, “Quality Standard for Instrument Air,” International Society of Automation, 1996.

~~COL 9.3(5) The COL applicant is to provide the flow diagram of turbine generator building drain system.~~

COL 9.3(5) The COL applicant is to provide the flow diagram of turbine generator building drain system and the CCW heat exchanger building drain system.