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.:	**172-8196**
SRP Section:	**09.04.02 – Spent Fuel Pool Area Ventilation System**
Application Section:	**Spent Fuel Pool Area Ventilation System**
Date of RAI Issue:	**08/25/2015**

Question No. 09.04.02-1

There are two questions related to Fuel Handling Area HVAC System:

1. GDC 61 requires that the fuel storage and handling, radioactive waste, and other systems that may contain radioactive materials be designed to ensure adequate safety under normal and postulated accident conditions. This criterion specifies that such facilities be designed to include appropriate containment, confinement, and filtering systems. In order to ensure appropriate containment, confinement, and filtering during accident conditions, the fuel handling area emergency HVAC subsystem should be designed to maintain a slight negative pressure between the potentially radioactive areas and the non-radioactive areas. The staff reviewed APR1400 DCD Tier 2, Figure 9.4.2-1, “Fuel Handling Area HVAC System Flow Diagram,” and it does not appear to have ductwork that connects the two spent fuel pool (SFP) cooling heat exchanger (HX) rooms to the two fuel handling area emergency exhaust air cleaning units (ACUs). Therefore, there is no way to maintain a slightly negative pressure during accident conditions. Please provide clarification and appropriate markups to Figure 9.4.2-1 in the DCD.

2. GDC 61 requires that the fuel storage and handling, radioactive waste, and other systems that may contain radioactive materials be designed to ensure adequate safety under normal and postulated accident conditions. This criterion specifies that such facilities be designed to include appropriate containment, confinement, and filtering systems. RG 1.52, “Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants,” Regulatory Position C.4, “Component Design Criteria and Qualification Testing,” states that air heaters should be designed, constructed, and tested in accordance with Section CA of ASME AG-1-2009 with addenda. DCD Tier 2, Section 9.4.2.2 states that the safety-related fuel handling area emergency exhaust ACUs contain an electric heating coil that is located upstream of the carbon adsorber to maintain the relative humidity of air entering the carbon

adsorber below 70 percent to provide reasonable assurance of the carbon adsorber efficiency. According to APR1400 DCD Tier 2, Section 9.4.2.1, the design and construction of the fuel handling area emergency exhaust ACUs conform to American Society of Mechanical Engineers (ASME) AG-1, “Code on Nuclear Air and Gas Treatment.” ASME AG-1 specifies that heating coils should be inspected and tested per AG-1, CA-5400. However, DCD Tier 2, Section 9.4.2.4, “Inspection and Testing Requirements,” does not discuss inspection and testing requirements for the heating coils inside AU02A and AU02B. Please provide clarification and appropriate markups to Section 9.4.2.4 in the DCD.

Response

1. During normal operation, the spent fuel pool (SFP) cooling heat exchanger (HX) rooms are maintained at slightly negative pressure to prevent spreading of airborne radioactive materials. During the design basis accident condition, which is a fuel handling accident (FHA) inside the fuel handling area, as described in DCD Tier 2, Subsection 15.7.4, most radioactive releases arise from breached fuel assemblies in the SFP to the atmosphere above the SFP. Therefore, the safety-related fuel handling area emergency ventilation system covers this area above the SFP. This approach is consistent with the guidance in Appendix B to RG 1.183, which takes into account only the release path from the SFP to the fuel handling area above the SFP. Consideration of additional release paths, such as leakage from the spent fuel pool cooling and cleanup system, is not required by RG 1.183 or SRP 15.7.4.

   Even if the release path for leakage from the SFP HX is considered, it is believed that the radioactive release to the environment would be negligible because most of the volatile nuclides, such as noble gases and organic iodines, from the breached fuel in the SFP would not be transferred to the SFP HX and the partitioning of other iodines and particulates in the leaked fluid would be very low due to the low temperature of the SFP water. Therefore, it is not necessary to maintain the SFP HX room at negative pressure during the design basis accident.

2. DCD, Tier 2 Subsection 9.4.2.4 will be revised to include inspection and testing requirements for the heating coils in the two fuel handling area emergency exhaust air cleaning units (AU02A and AU02B).

Impact on DCD

DCD Tier 2, Subsection 9.4.2.4 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 Reports.

Indication of radioactivity above allowable limits automatically diverts the flow of air from the normal ACU through the emergency ACUs prior to discharge into the atmosphere.

The system is protected against external missiles and instantaneous pressure changes caused by tornadoes.

Fire dampers are installed in the ductwork that penetrates fire-rated barriers in the fuel handling area and have the same fire-resistance rating as the fire barrier.

9.4.2.4 Inspection and Testing Requirements

The major components of the fuel handling area HVAC system are checked and tested periodically to provide reasonable assurance of design operation and performance.

The fuel handling area HVAC system is provided with proper instrumentation and devices capable of checking the design properties such as pressure drop, flow rate, and temperature. Controls, interlocks, and safety devices on the system are functionally checked, adjusted, and tested to provide reasonable assurance of the proper sequence of operation.

Preoperational testing of the fuel handling area HVAC system is performed as described in Section 14.2 to demonstrate that systems and components operate in accordance with applicable test programs and specifications.

ACUs are factory inspected and tested for housing leakage, filter bypass leakage, and airflow performance. Periodically and subsequent to each filter or carbon adsorber replacement, the unit is inspected and tested in-place in accordance with the requirements of ASME N511, ASME AG-1, and NRC RG 1.52 (for safety-related ACUs) or NRC RG 1.140 (for non-safety related ACUs). The HEPA filters are checked periodically, and carbon adsorber samples are tested for iodine removal efficiency in an independent laboratory in accordance with NRC RG 1.52, NRC RG 1.140, and ASTM D 3803.

Add

AHUs and cubicle coolers are factory inspected and tested in accordance with AMCA standards (References 11 and 12). Filters are inspected and tested in accordance with ASHRAE standards (Reference 10). Cooling coils are hydrostatically tested in accordance with ASME AG-1 for safety-related equipment and ASME Section VIII (Reference 6) for non-safety-related equipment. The cooling coil performance rating is developed in accordance with AHRI standards (References 13, 14, and 15).

The electric heating coils in the fuel handling area emergency exhaust ACUs are inspected and tested in accordance with section CA of ASME AG-1.