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.: **402-8477**

SRP Section: **10.04.01 – Main Condensers**

Application Section: **10.4.1**

Date of RAI Issue: **02/10/2016**

Question No. 10.04.01-6

In accordance with GDC 2 and 4, flood waters from a failed main condenser (MC) or its components, due to natural phenomena (GDC 2) or dynamic effects (GDC 4), that drain from the turbine building to the exterior should not present an adverse effect on safety-related SSCs located in other buildings (e.g., auxiliary building). This statement meets the guidance of Item 3.A in SRP Section 10.4.1.III (SRP Review Procedures), as it relates to flood protection of the safety-related structures, systems, and components.

DCD Tier 2, Section 10.4.1.3, “Safety Evaluation,” states that the failure of the APR1400 MC and any resultant flooding does not prevent safe shutdown of the reactor since the flood water from the turbine building does not enter the safety-related building. The DCD states that the opening or access door between the turbine building and auxiliary building is located at a higher level than the basic grade of the turbine building. DCD Tier 2, Section 3.4.1 further describes the flood protection from internal sources.

DCD Tier 2, Section 3.4.1.2, “Flood Protection from External Sources,” states under item (b) that seismic category I structures are designed to protect against flooding because the finished yard grade adjacent to the safety-related structures (including the auxiliary building) is maintained at least 0.41m below the ground floor elevation.

In response to RAI 10.4.1-3, the applicant describes that there are no openings (or non-watertight openings) within the TB-AB interfacing wall, below the expected flood level of the TB. However, the applicant did not provide any information regarding getting any drainage away from structures containing safety-related equipment. The staff is still unclear as to whether flood waters exiting the TB will not enter into the auxiliary building (or any other safety-related building) from the exterior.

The applicant is requested to provide additional information in the DCD regarding flood effects due to failure of the MC and its components. Specially, the staff requests the applicant to specify additional information regarding the drainage away from all sides of structures containing safety-

related equipment (e.g., auxiliary building, emergency diesel building, fuel tanks for safety-related diesel generators, etc.). A description of the grade slope surrounding these structures should be described in the DCD and conclude that water levels will be drained away from these structures.

Response

There are no openings on TGB and AB interface wall that are below the flood height below of EL.104ft. Only an access door is installed at EL.137'-6" of TGB as shown in Figure 1. All penetrations in exterior walls up to flood level are sealed as described in Subsection 3.4.1.2. The emergency flood relief opening (flood relief panel) are located on the south exterior walls at EL.100ft of TGB as shown in Figure 2. They are operated by passive actuation and allow the flood water from the circulating water system to be directed outside of TGB. In the response to RAI 89-8052, Question 10.4.5-1 COL Item 10.4(11) was added to the DCD to direct the COL applicant to provide the system design information to satisfy GDC 4 in regard to the design provisions that are implemented to accommodate the effects of discharging water that could result from a malfunction or failure of a component or piping in the system.

TS

Figure1. General Arrangement Drawing of Turbine Generator Building El. 136'-6"

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Figure2. General Arrangement Drawing of Turbine Generator Building El.100'-0"

The site-specific design of plant grading and drainage will be provided by the COL applicant as described in COL 3.4(5) which is provided in a response submitted on October 28, 2015 (Transmittal # MKDNW-15-0111). Also in the response to RAI 135-8001 Question 09.02.06-1 (Transmittal # MKDNW-16-0088L dated January 28, 2016), watertight doors are installed at the exterior entrances of the safety-related buildings in order to prevent flood source from entering into the safety-related SSCs.

Since the flood water is drained away from the plant structures due to plant grading and drainage, and in addition watertight doors are installed in entrances of safety-related buildings, the flood water due to a failure of CWS in TGB would not impact any safety related SSCs. DCD Tier 2, Subsection 10.4.1.3 will be revised to describe the drainage and watertight doors.

Impact on DCD

DCD Tier 2, Subsection 10.4.1.3 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 Environment Report.

The condenser is normally used to remove residual heat from the reactor coolant system (RCS) during the initial cooling period after plant shutdown when the main steam is bypassed to the condenser through the turbine bypass system. The condenser is also used to condense the main steam bypassed to the condenser in the event of sudden load rejection by the T/G or a turbine trip.

In the event of load rejection, the condenser condenses 55 percent of full-load main steam flow from the turbine bypass system without tripping the reactor. If the main condenser is not available during normal plant shutdown, sudden load rejection, or turbine trip, the spring-loaded main steam safety valves (MSSVs) can discharge full main steam flow to the atmosphere to protect the main steam system (MSS) from overpressure. Safe reactor shutdown can then be achieved by use of the main steam atmospheric dump valves (MSADVs). Unavailability of the main condenser considered here includes failure of the circulating water pumps to supply cooling water or loss of condenser vacuum for any reason.

During normal operation and shutdown, the main condenser does not have radioactive contaminants. Radioactive contaminants are only through primary-to-secondary system leakage due to steam generator (SG) tube leaks. The radiological aspects of primary-to-secondary leakage, including operating concentrations of radioactive contaminants, are addressed in Subsection 11.1.1.3. If high radiation is detected in the condenser vacuum system discharge, the off-gases are automatically diverted to containment drain sump area for removing the contaminants based on GDC 60. Detailed methods to preclude the accidental release of radioactive materials to the environment in excess of established limits are addressed in Subsection 10.4.2. There is no hydrogen buildup in non-condensable gas constituents in the main condenser. The non-condensable gases are removed by the mechanical vacuum pumps, which are addressed in Subsection 10.4.2. If there is a failure in one of the three vacuum pumps, a standby pump starts. The standby pump further decreases the buildup of hydrogen and explosive mixture in the main condenser shells.

Flooding due to failure of a condenser hotwell does not prevent safe shutdown of the reactor. Flooding from the T/G building does not enter the safety-related building because the opening or access door between the turbine building and auxiliary building is located at a higher level than the basic grade of turbine building. Because the T/G building contains non-safety-related equipment and other buildings are not affected by T/G building flooding, the impact of internal flooding from the T/G building is limited to non-safety-related

Also plant grading and drainage, as described COL 3.4(5), and watertight doors that are installed at the exterior entrances of the safety-related building as described in Subsection 3.4.1.4 will mitigate the T/G building flooding.