# 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.:** **99-7836**

**SRP Section:** **10.04.01 – Main Condensers**

**Application Section:** **10.4.1**

**Date of RAI Issued:** **07/22/2015**

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## Question No. 10.04.01-3

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.

While reviewing DCD Tier 2, Section 10.4.1, the staff could not identify enough information for the staff to confirm with reasonable assurance that the MC flood water does not reach any safety-related equipment.

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 the flood analysis height compared to the height of the bottom of the non-watertight openings. In addition, the staff is seeking additional information regarding the drainage away from the structures containing safety-related equipment (e.g., auxiliary building).

## Response

The floodwater due to the failure of the main condenser in the turbine generator building is bounded by a postulated circulating water (CW) pump discharge piping break and when six CW pumps are operating with runout conditions. The flood height due to the postulated CW piping

failure in the turbine generator (T/G) building is determined to be 4.0 ft from El. 100 ft 0 in of the T/G building. The floodwater is drained to the outside of T/G building through the emergency flood relief opening (flood relief panel) which is installed at El. 100 ft-0 in of the building. Flooding of the T/G building does not affect the auxiliary building because there is no opening on the auxiliary building wall that connects to the T/G building below the El. 104 ft 0 in. The DCD will be revised to include additional information regarding flood height and the drainage of the turbine generator building.

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**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 Environmental Reports.

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

The flood height due to the failure of the main condenser in the T/G building is determined as 4.0 ft from El. 100 ft 0 in of the T/G building. Floodwater is drained to the outside of the T/G building through the emergency flood relief opening (flood relief panel), which is installed at El. 100 ft-0 in of the building.

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.

the flood height of the T/G building.

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

equipment in the T/G building. ~~Flood protection from internal sources is described in Subsection 3.4.1.~~

10.4.1.4 Inspection and Testing Requirements

The condenser is tested in accordance with the HEI "Standards for Steam Surface Condensers". The condenser is designed to be capable of being filled with water for hydrostatic tests. The condenser shells, hotwells, and waterboxes are provided with access openings to permit inspection and repairs; periodic visual inspections of and preventive maintenance on condenser components are conducted according to normal industrial practice.

10.4.1.5 Instrumentation Requirements

All of the instrumentation for the condenser is for normal power operation, and is not required for safe shutdown of the reactor. Sufficient instrumentation is provided throughout the plant power generation systems to facilitate an accurate heat energy balance of the plant.

Hotwell level and pressure indications are provided locally, and associated alarms are provided in the main control room (MCR) for each condenser shell. The condensate level in the hotwell is maintained within proper limits by automatically transferring condensate to or from the condensate storage system. Condensate temperature (measured in the condensate system), condenser pressure, circulating water temperature and pressure, and differential pressure from waterbox-to-waterbox are monitored and used to verify main condenser operation.

Turbine trip is activated by pressure transmitters located in the condenser shells upon a loss of condenser vacuum when the condenser pressure reaches or exceeds the setpoint [[0.26 $kg/cm^2$ A(7.5 in HgA)]].

Refer to Subsection 7.7.1.1 for a description of the process component control system, which provides the applicable non-safety remote monitoring and controls from the MCR.