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.:	**135-8001**
SRP Section:	**09.02.06 – Condensate Storage Facilities**
Application Section:	**9.2.6**
Date of RAI Issue:	**08/07/2015**

Question No. 09.02.06-1

GDC 2 establishes requirements with respect to the condensate storage facilities (CSF) design regarding protection against the effects of natural phenomena such as earthquakes, tornados, hurricanes and floods.

DCD Tier 2, Section 9.2.6.2, contains a description of the condensate storage and transfer system. The system includes three larges storage tanks (one 300,000 gallon demineralized water storage tank and two 255,000 gallon condensate storage tanks). These tanks are classified as seismic category III (non-seismic). As indicated in Section I of SRP 9.2.6, the staff's review of the condensate storage facilities includes the review of provisions for mitigating the environmental effects of system leakage or storage tank failure. Details on the provisions made to mitigate environmental effects from system leakage and storage tank failures are not included in the DCD.

The applicant is requested to provide a discussion of the provisions and CSF design features to ensure adequate protection against the effects of natural phenomena and adherence to Position C.2 of Regulatory Guide 1.29, "Seismic Design Classification." This information must be included in the DCD. The applicant is to provide a DCD markup of this response.

Response

GDC 2 states that "Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornados, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions."

DCD Tier 2, Section 9.2.6.2.2 states that "All condensate storage and transfer system components including the CST and piping are non-safety-related and designed in accordance with NRC RG 1.26, Quality Group D."

DCD Tier 2, Section 9.2.6.2.1 states that “All demineralized water system components are non-safety-related except for the containment isolation valves and associated piping, and designed in accordance with NRC RG 1.26 (Reference 11), Quality Group D. Containment isolation valves and associated piping are Seismic Category I.

The condensate storage facilities (CSF) are non-safety related systems and do not contain radioactive fluids. Therefore, these systems are not required to be designed to withstand natural phenomena. The tanks are not located near safety-related SSCs, referred in Tier 2, figure 1.2-1. If water was to flow towards any SSCs because of a tank rupture there are watertight doors in auxiliary building and emergency diesel generator building to prevent flooding inside the buildings. The external flooding evaluation by the failure of outside tanks is not governing case.

Condensate and demineralized water is uncontaminated water that has removed dissolved and suspended impurities from the filtered water. Therefore, CSF leakage or failure would not cause adverse effects the environment. In addtion, DCD Subsection 3.4 “Water Level (Flood) Design” states “All seismic Category I structures, systems, and components (SSCs) are designed to withstand the effects of flooding due to natural phenomena or onsite equipment failures without loss of the capability to perform their safety-related functions.”

Therefore, GDC 2 is not applicable for the CSTs and DWSTs because those tanks do not have a safety-function.

Impact on DCD

There is no impact on the DCD.

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.

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Question No. 09.02.06-2

Section 9.2.6.1 of the APR1400 DCD states that “The condensate storage facilities handle nonradioactive fluid. Therefore NRC RG 4.21 and GDC 60 are not applicable for the condensate storage facilities.”

The staff disagrees with the above statement. The condensate storage and transfer system is designed to maintain proper feedwater inventory in the secondary system during startup, shutdown, hot standby, and normal operation as indicated in DCD Section 9.2.6.1. During normal operation the hotwell level control maintains a normal level in the condenser hotwell by directing condensate flow to and from the condensate storage tank, as described in DCD Section 10.4.7.2. Since the steam and power conversion system may become contaminated through steam generator tube leakage, as indicated in DCD Section 10.1.1, the condensate exchanged between the condensate storage facilities and the condenser hotwell may result in the handling of radioactive fluids by the condensate storage facilities. It should be noted that DCD table 11.1-6 provides design basis radionuclide concentrations for the secondary system, which also suggest that the fluids handled by the condensate storage facility may be radioactive, which is opposite to what is claimed in DCD section 9.2.6.

The technical rationale for GDC 60 being applicable to the condensate storage facilities is provided in Section 9.2.6, “Condensate Storage Facilities,” of NUREG-0800, “Standard Review Plan” which states “GDC 60 requires that nuclear power unit designs include a means to control the release of radioactive materials in liquid effluents produced during normal operation, including anticipated operational occurrences. The criteria in GDC 60 apply to all tanks that are located outside the reactor containment and include radioactive materials in liquids. These tanks have the potential for uncontrolled releases of radioactive materials attributed to spillage. Through its connections with the reactor coolant system (in boiling-water reactors) or secondary coolant system (in pressurized water reactors), the CSF potentially contains radioactive material. Meeting GDC 60 requirement ensures that radiation exposures for operating personnel and the general public are as low as reasonably achievable. Regulatory Guide 1.143 provides

guidance for implementing GDC 60. Following the regulatory guide provides assurance that the design of the CSF will include features to prevent uncontrolled releases of radioactive material. “

The current DCD does not indicate that the CSF meets the GDC 60 requirements, or that the design was developed using the guidance provided in Regulatory Guide 1.143.

The applicant is requested to describe how the APR1400 CSF meets the requirements of GDC 60 including design features for leakage detection, leakage prevention and leakage containment. This information must be included in the DCD. The applicant is to provide a DCD markup of this response including any table and/or diagram affected.

Response

DCD Tier 2, Subsection 9.2.6.1 states that “The condensate storage and transfer system is designed to:

b. provide makeup condensate by the hotwell level control system”

DCD Tier 2, Figure 9.2.6-2 shows that there are no supply lines to the condensate storage tanks (CSTs) except nitrogen and demineralized water lines.

DCD Tier 2, Figure 10.4.7-1 shows that there is a line to condensate overflow storage sump to control the condenser hotwell level at a hotwell level high condition, but there is not an overflow line that goes back to CSTs.

DCD Tier 2, Subsection 9.2.6.1 states that “The condensate storage facilities handle non-radioactive fluid. Therefore, NRC RG 4.21 and GDC 60 are not applicable for condensate storage facilities.”

So, DCD Tier 2, Subsection 10.4.7.2.1 will be revised to have a consistency with other DCD Sections as follows:

“The condenser hotwell level is maintained by receiving condensate from the condensate storage tank and directing condensate overflow to the condensate overflow storage sump.

Impact on DCD

DCD Tier 2, Subsection 10.4.7.2.1 will be revised as indicated on 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.

f. In conformance with GDC 46, the condensate and feedwater system is designed to permit appropriate functional testing of the system and components to provide reasonable assurance of structural integrity and leaktightness, operability, and performance of active components, and the capability of the integrated system to function as intended during normal, shutdown, and accident conditions.

g. The portion is designed to withstand loads arising from the various specified normal operating and design basis events (DBEs).

10.4.7.2 System Description

10.4.7.2.1 General Description

The condensate and feedwater system delivers feedwater from condenser hotwells to the SGs at the required temperature, pressure, and flow rate. Condensate and feedwater is heated through the LP feedwater heaters and HP feedwater heaters. The condensate and feedwater system is composed of a condensate system and feedwater system.

The condensate system consists of three condensate pumps, three stages of three parallel LP heaters, a deaerator, and two deaerator storage tanks. Three 50 percent capacity motor-driven condensate pumps (two operating and one standby) deliver condensate from the condenser hotwells to the deaerator through the condensate polisher, a steam packing exhauster, and three stages of LP feedwater heaters. Condensate is provided to the SG blowdown regenerative heat exchanger for cooling.

The deaerator storage tank level is controlled by two pneumatic valves. The condenser hotwell level is maintained by directing condensate flow to and from the condensate storage tank using makeup lines.

Drains from the LP feedwater heaters are cascaded to the next lower-pressure feedwater heaters with drains from the lowest-pressure feedwater heaters draining to the condenser.

The feedwater system consists of three main feedwater pumps, three feedwater booster pumps, a startup pump, three stages of two parallel HP heaters, main feedwater isolation valves (MFIVs), feedwater check valves, and feedwater control valves.

The condenser hotwell level is maintained by receiving condensate from condensate storage tank and directing condensate overflow to the condensate overflow storage sump.

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Application Section:	**9.2.6**
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Question No. 09.02.06-3

The DCD does not discuss how the condensate storage facilities (CSF) comply with 10 CFR 20.1406. In DCD section 9.2.6.1 the applicant states that NRC RG 4.21, which provides regulatory guidance on how to comply with 10 CFR 20.1406, is not applicable. The staff does not agree with the applicant position.

10 CFR 20.1406 requires, in part, that each design certification applicant describe how the facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, as well as the generation of radioactive waste. Since the condensate storage facilities interfaces with systems containing radioactive fluids, and can potentially contain radioactive fluids due to primary to secondary leakage (i.e., steam generator tube leakage), 10 CFR 20.1406 applies to the CSF for the APR1400. Regulatory Guide 4.21 provides guidance on meeting the requirements of 10 CFR 20.1406.

The applicant is requested to describe how the CSF comply with 10 CFR 20.1406, including information describing design features for leakage prevention and early leak detection. Also to be identified is whether the system uses any buried piping and how monitoring and inspection will be performed for those portions of the system. The applicant is requested to include the information in the DCD and provide a markup of the DCD text as well as any table and/or diagram affected.

Response

The condensate storage facilities (CSF) consists of the demineralized water (DM) system and the condensate storage and transfer (CT) system. The DM system provides demineralized water to the condensate storage tanks (CSTs) and CT system supplies condensate to hotwell.

There is no overflow from the hotwell back to the CSTs and the CSF has no system interfaces with other systems that may contain radioactive fluids.

Therefore, the CSF does not have any potential for containing contaminated water and the CSF would not need facility design features and procedures for operation to minimize the contamination of the facility and the environment in accordance with 10 CFR 20.1406.

Impact on DCD

There is no impact on the DCD.

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.

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Application Section:	**9.2.6**
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Question No. 09.02.06-4

DCD Tier 2 Table 1.9-2 under the heading “Conformance or Summary Description of Deviation” states that SRP Section 9.2.6 is not applicable because “Condensate storage facilities have no safety-related functions and handle non-radioactive fluid, and that the APR1400 is not multiunit.”

Although not all portions of SRP 9.2.6 are applicable to the APR1400, the staff finds that SRP 9.2.6 is still partially applicable since GDCs 2 and 60 apply to all CSFs.

The applicant is requested to revise and update the FSAR to correctly show the applicability of SRP 9.2.6 to the APR1400 CSF designs. The applicant is to provide a DCD markup of this response including any table and/or diagram affected.

Response

The condensate storage facilities (CSF) have no safety-related functions, except the containment isolation valves and associated piping of the demineralized water system that is described in DCD Subsection 6.2.4. The CSF contains only nonradioactive fluid.

The APR 1400 design is not a multi-unit design.

Therefore, DCD Tier 2, Table 1.9-2 (19 of 33) under “Conformance or Summary Descriptions of Deviation” will be revised as follows:

> ″The APR1400 conforms with this SRP, except for the safety function of safety related systems, GDC 60, and 10 CFR 50.63.”

Impact on DCD

DCD Tier 2, Table 1.9-2 (19 of 33) will be revised as indicated on 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.

APR1400 DCD TIER 2

Table 1.9-2 (19 of 33)

SRP Section/Title	Revision / Issue Date	Conformance or Summary Description of Deviation	DCD Tier 2 Section
9.2.1 – Station Service Water System	Rev. 5 03/2007	The APR1400 conforms with this SRP.	9.2.1
9.2.2 – Reactor Auxiliary Cooling Water System	Rev. 4 03/2007	The APR1400 conforms with this SRP.	9.2.2
9.2.4 – Potable and Sanitary Water Systems	Rev. 3 03/2007	The APR1400 conforms with this SRP.	9.2.4
9.2.5 – Ultimate Heat Sink	Rev. 3 03/2007	The APR1400 conforms with this SRP.	9.2.5
9.2.6 – Condensate Storage Facilities	Rev. 3 03/2007	Not applicable. Condensate storage facilities have no safety-related functions and handle nonradioactive fluid. The APR1400 is not multi-unit.	9.2.6
9.3.1 – Compressed Air System	Rev. 2 03/2007	The APR1400 conforms with this SRP.	9.3.1
9.3.2 – Process and Post-Accident Sampling Systems	Rev. 3 03/2007	The APR1400 conforms with this SRP.	9.3.2
9.3.3 – Equipment and Floor Drainage System	Rev. 3 03/2007	The APR1400 conforms with this SRP.	9.3.3
9.3.4 – Chemical and Volume Control System (PWR) (Including Boron Recovery System)	Rev. 3 03/2007	The APR1400 conforms with this SRP.	9.3.4
9.3.5 – Standby Liquid Control System (BWR)	Rev. 3 03/2007	Not applicable (BWR)	N/A
9.4.1 – Control Room Area Ventilation System	Rev. 3 03/2007	The APR1400 conforms with this SRP.	9.4.1

The APR1400 conforms with this SRP except for the safety function of safety related systems, GDC 60, and 10 CFR 50.63.