
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
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Question No. 09.02.02-4

General Design Criterion (GDC) 44 provides requirements for the transfer of heat from systems, structures and components (SSCs) important to safety to a heat sink during both normal and accident conditions assuming a single active failure. The component cooling water system (CCWS) provides cooling to the reactor coolant pump (RCP) thermal barrier. Because there is a large pressure differential between the reactor coolant system (RCS) and the CCWS, cooling of the pumps seals is important in preventing excessive thermal barrier leakage. SRP 9.2.2, Section I, Item 12 identifies, as a specific area of review for the CCWS, the systems capability for adequately cooling all RCP seals and bearing. Section I, Item 7 of the SRP states the following is to be reviewed with respect to the RCP seal cooling:

- controls to ensure that the component cooling water loop to the RCP seal does not automatically isolate, and
- provisions for the control room operators to isolate the RCP seal coolant line by remote manual means.

In DCD Tier 2, Section 9.2.2.3, "Safety Evaluation," it is stated that "The CCW supply to the RCP coolers is isolated on a low-low surge tank level signal. However, this isolation signal can be overridden by manual operations from the MCR to protect the RCP seal".

The staff finds that the automatic isolation of the CCW supply and return lines are not consistent with the guidance provide in SRP 9.2.2. Based on the guidance, cooling design provisions should be made for isolation of component cooling water supply and return lines to the RCP by remote manual means only. Also, design provisions should be made for the control room operator to have the necessary information to determine when it is appropriate to isolate the lines by remote manual means and how soon the lines should be isolated if they become release paths from the containment during a LOCA.

Since RCP seals generally requires continuous cooling, and automatic isolation of the CCWS supply and return lines to the RCP coolers will occur should a low-low surge tank level signal be received, the applicant is requested to discuss how the proposed design and operation of the CCWS either adhere to SRP 9.2.2 subsection III.4.F (in regards to the isolation of CCWS flow to the RCP seal cooling by remote manual means only) or if an alternative approach is used to provide an acceptable method for assuring adequate cooling of the RCP seals in support of compliance with GDC 44.

Response

CCW cooling lines to the RCP coolers are designed to Quality Group D and Seismic Category II (non-seismic Category I) based on SRP 9.2.2, Section II, Item 4.G.i and the CCWS is designed to isolate the CCW cooling lines to the RCP coolers on a low-low surge tank level signal in accordance with SRP 9.2.2, Section II, item 4.C. It is to provide the isolation capability to protect the safety portion of the CCWS from failure of the non-seismic RCP coolers cooling lines.

Even though the RCP coolers isolation valves are automatically closed on a low-low surge tank level signal the isolation valves can be overridden in the MCR, and therefore adequate cooling of RCP coolers is possible with the operator's prompt action within 30 minutes. The RCP can operate for at least 30 minutes without bearing seizure, which could affect normal RCP coastdown, if seal injection water is available to the seals, as described in DCD Subsections 5.4.1.2 and 5.4.1.3. Additional information on RCP seal injection during 30 minute period in case of a loss of CCW was provided in response to RAI 443-8555 Question 05.04-2.

For isolation of the CCW cooling lines to the RCP coolers on a low-low surge tank level signal, the surge tank level indication, low-low surge tank level alarm, the RCP coolers flow indication, and the high and low flow alarm of RCP coolers are provided in the MCR. Thus the inadvertent isolation of the CCW cooling lines to the RCP coolers is covered by the operator's prompt action with the various indications and alarms in MCR. This operator's action is considered to be better than the operator's action for remote manual isolation to provide the isolation capability to protect the safety portion of the CCWS from failure of the non-seismic RCP coolers cooling lines.

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.