

KHNPDCDRAIsPEm Resource

From: Ciocco, Jeff
Sent: Tuesday, November 10, 2015 1:54 PM
To: apr1400rai@khnp.co.kr; KHNPDCDRAIsPEm Resource; Harry (Hyun Seung) Chang; Andy Jiyong Oh; Christopher Tyree
Cc: Drzewiecki, Timothy; McKirgan, John; Steckel, James; Lee, Samuel
Subject: APR1400 Design Certification Application RAI 302-8341 (15.05.01-15.05.02 - Inadvertent Operation of ECCS and Chemical and Volume Control System Malfunction that Increases Reactor Coolant Inventory)
Attachments: APR1400 DC RAI 302 SRSB 8341.pdf

KHNP,

The attachment contains the subject request for additional information (RAI). This RAI was sent to you in draft form. Your licensing review schedule assumes technically correct and complete responses within 30 days of receipt of RAIs. However, KHNP requests, and we grant, 45 days to respond to RAI question 15.05.01-1. We may adjust the schedule accordingly.

Please submit your RAI response to the NRC Document Control Desk.

Thank you,

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U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

REQUEST FOR ADDITIONAL INFORMATION 302-8341

Issue Date: 11/10/2015

Application Title: APR1400 Design Certification Review – 52-046

Operating Company: Korea Hydro & Nuclear Power Co. Ltd.

Docket No. 52-046

Review Section: 15.05.01-15.05.02 - Inadvertent Operation of ECCS and Chemical and Volume Control System Malfunction that Increases Reactor Coolant Inventory

Application Section:

QUESTIONS

15.05.01-1

GDC 15 requires that the reactor coolant system (RCS) and its associated auxiliary control and protection systems be designed with sufficient margin to assure that the design conditions of the reactor coolant pressure boundary are not exceeded during any condition of normal operation, including anticipated operational occurrences (AOOs). Additionally, sections 15.5.1-15.5.2 of the Standard Review Plan (NUREG-0800) state that the parameters used in the analytical model should be suitably conservative.

The Chemical and Volume Control System (CVCS) malfunction that increases RCS inventory event, analyzed in DCD Section 15.5.2, credits use of the pressurizer pilot operated safety relief valves (POSRVs) and main steam safety valves (MSSVs) to limit overpressure in the RCS and main steam system. Design parameters for the POSRVs and MSSVs are available in DCD Table 5.5.14-1 and DCD Table 10.3.2-1, respectively. However, it is not clear that the modeling of these valves in the safety analyses is suitably conservative with respect to the design parameters. NRC staff requests the following additional information:

1. Open and close pressures, open and close dead times, and relief capacity for the POSRVs and MSSVs as assumed in the safety analyses (CESECC-III)
2. Explain why each parameter is suitably conservative

15.05.01-2

GDC 15 requires that the reactor coolant system (RCS) and its associated auxiliary control and protection systems be designed with sufficient margin to assure that the design conditions of the reactor coolant pressure boundary are not exceeded during any condition of normal operation, including anticipated operational occurrences (AOOs). Additionally, sections 15.5.1-15.5.2 of the Standard Review Plan (NUREG-0800) state that the parameters used in the analytical model should be suitably conservative.

REQUEST FOR ADDITIONAL INFORMATION 302-8341

The Chemical and Volume Control System (CVCS) malfunction that increases RCS inventory event, analyzed in DCD Section 15.5.2, considers the impact of single failures. Based on the discussion provided in DCD Section 15.5.2, it is not clear if the pressurizer heaters were considered in the analysis. NRC staff requests DCD Section 15.5.2 be updated to describe the behavior of the pressurizer heaters during the event and describe how the assumed behavior is suitably conservative.

15.05.01-3

GDC 15 requires that the reactor coolant system (RCS) and its associated auxiliary control and protection systems be designed with sufficient margin to assure that the design conditions of the reactor coolant pressure boundary are not exceeded during any condition of normal operation, including anticipated operational occurrences (AOOs). Additionally, acceptance criteria identified in sections 15.5.1-15.5.2 of the Standard Review Plan (NUREG-0800) prohibit the escalation of an AOO to a more serious incident without other incidents occurring independently. Additional background on the non-escalation criteria is available in Regulatory Information Summary (RIS) 2005-29 "Anticipated Transient that Could Develop into More Serious Events."

The Chemical and Volume Control System (CVCS) malfunction that increases RCS inventory event, analyzed in DCD Section 15.5.2, has the potential to fill the pressurizer causing liquid to pass through the POSRVs, damaging the valves and preventing their closure. DCD Section 15.5.2 does not discuss the potential for pressurizer overfill caused by CVCS malfunction. Additionally, DCD Figures 15.5.2-1 through 15.5.2-12 do not present letdown/charging flows. Based on the relatively stable RCS temperature there is no change in the RCS fluid volume due to thermal expansion/contraction. Therefore, NRC staff expects the pressurizer volume to continue to increase until charging flow is isolated. However, the application lacks sufficient information for NRC staff to determine the behavior of the charging/letdown flow during the CVCS malfunction event. NRC staff, therefore, cannot determine if the analysis presented in DCD Section 15.5.2 is sufficient to address the non-escalation criteria of the standard review plan. NRC staff requests that DCD Section 15.5.2 be updated with appropriate language and figures, and Table 15.5.2-1 be updated as appropriate, to address the non-escalation criteria.