KHNPDCDRAIsPEm Resource

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Sent: Wednesday, May 18, 2016 1:21 PM
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Cc: Mott, Kenneth; Curtis, David; Ward, William; Williams, Donna
Subject: APR1400 Design Certification Application RAI 488-8617 (07.02 - Reactor Trip System)
Attachments: APR1400 DC RAI 488 ICE 8617.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 this RAI. We may adjust the schedule accordingly.

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

Thank you,

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Protecting People and the Environment

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REQUEST FOR ADDITIONAL INFORMATION 488-8617

Issue Date: 05/18/2016
Application Title: APR1400 Design Certification Review – 52-046
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.
Docket No. 52-046
Review Section: 07.02 - Reactor Trip System
Application Section:

QUESTIONS

07.02-17

This series of request for additional information (RAI) questions are requesting design details about the Core Protection Calculator System (CPCS) for the APR1400 design certification application. New APR1400 CPCS design information was provided during the January 20, 2016 and January 21, 2016, APR1400 Final Safety Analysis Report (FSAR) Chapter 4 (Reactor) audit, as well as the May 2, 2016 and May 3, 2016, APR1400 FSAR Chapter 7 (Instrumentation and Controls) public meeting.

a) Provide design details, design descriptions, functional, and logic diagrams that explain and discuss the actuation, execution, and operation of the CPCS auxiliary trips as listed in the APR1400 FSAR, Revision 0, Tier 2, Table 7.2-4, “Reactor Protection System Design Inputs,” Sheet 2.

   10 CFR Part, 50, Appendix A, General Design Criterion 20, “Protection system functions,” states in part, that the protection system shall be designed to initiate automatically the operation of appropriate systems, including the reactivity control systems. The guidance of the Standard Review Plan (SRP), Revision 5, Section 4, “Safety System Designation,” states, in part that for design basis completeness, information provided for each design basis item should be sufficient to enable the detailed design of the I&C system to be carried out. The NRC staff was not able to identify diagrams or figures that graphically describe the trip actuation output paths of the CPCS auxiliary outputs as described in the APR1400 application. At the May 3rd, 2016, APR1400 public meeting, the applicant stated that the CPCS auxiliary trips do not have separate output paths for each listed trip. The NRC staff was not able to identify design information that would describe how the CPCS auxiliary trips are performed and executed in the APR1400 FSAR or its referenced documents. At the May 3rd, 2016, public meeting, the applicant stated that the requested information was not included in the APR1400 application. Therefore, the NRC staff request the applicant to update APR1400 application to include design descriptions that would explain and describe the operation of the CPCS auxiliary trips execution. This design information should be updated in the APR1400 design certification application in the appropriate places, such as the APR1400 FSAR and applicable technical reports such as APR1400-F-C-NR-14003-P, “Functional Design Requirements for a Core Protection Calculator System for APR1400” and APR1400-Z-J-NR-14001-P, “Safety I&C System.”

b) Provide a consistent and unambiguous definition for the CPCS maximum penalty factor (PF) value when two CPCS control element assembly calculators (CEACs) become inoperable.

   10 CFR Part, 50, Appendix A, General Design Criterion 23, “Protection System Failure Modes,” states in part, that the protection system shall be designed to fail into a safe state or into a state demonstrated to be acceptable on some other defined basis. SRP Section 5.5, “System Integrity,’ states, in part, that computer-based safety systems should, upon detection of inoperable input instruments, automatically place the protective functions associated with the failed instrument(s) into a safe state (e.g., automatically place the affected channel(s) in trip) and that hardware or software failures detected by self-diagnostics should also place a protective function into a safe state. The maximum CPCS departure from nucleate boiling ratio (DNBR) and high local power

density (LPD) penalty factor utilized by the CPCS when both CEACs of a division become inoperable was defined in the response to RAI # 274-8277 (ADAMS Accession Number ML15363A340; Question# 07.01-38) as “pre-determined penalty factor” (PF). However, at the May 2, 2016, and May 3, 2016, public meeting, the applicant stated that several design descriptions used to define this maximum CPCS failure mode penalty factor will be replaced with the term “pre-selected PF” to describe the CPCS maximum penalty factor value utilized when both CEACs become inoperable. This new design information should be updated in the APR1400 design certification application in the appropriate places, such as the APR1400 FSAR and applicable technical reports such as APR1400-F-C-NR-14003-P, “Functional Design Requirements for a Core Protection Calculator System for APR1400” and APR1400-Z-J-NR-14001-P, “Safety I&C System.”

c) Identify in the APR1400 FSAR, Chapter 15 safety analysis, where the time delay that the core protection calculator (CPC) will utilize before reverting to the “predetermined penalty factor” (PFmax), as discussed in the response to RAI 274-8277 (ADAMS Accession Number ML15363A340; Question 07.01-37).

10 CFR 52.47(a)(2), “Contents of Applications; Technical Information,” states, in part, that the description shall be sufficient to permit understanding of the system designs and their relationship to the safety evaluations. SRP Section 4, “Safety System Designation,” states in part, that the information provided in the design basis should be analyzed to demonstrate its consistency with the plant safety analysis and the information provided for the design basis items should be technically accurate. At the January 21, 2016 audit and the May 2, 2016, and May 3, 2016, public meeting, the applicant stated that the CPC time delay is not considered in the APR1400 FSAR Chapter 15 safety analysis, as was originally stated in the response to RAI 274-8277 (ADAMS Accession Number ML15363A340; Question 07.01-37). Verify that the APR1400 FSAR, Tier 2, Chapter 15 safety analysis includes this time delay as stated in the response to RAI 274-8277, Question 07.01-37 and ensure consistency regarding this time delay in the APR1400 application.


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