REVISED 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.:	**416-8358**
SRP Section:	**SRP 19**
Application Section:	**19.1**
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Question No. 19-37

Item 11 of Section II, “Acceptance Criteria,” of the (Draft) Revision 3 SRP, states, “The PRAs that meet the applicable supporting requirements for Capability Category I and meet the high-level requirements as defined in the ASME PRA Standard (ASME/ANS RA-S-2008 and addenda ASME/ANS RA-Sa–2009) should generally be acceptable for DC and COL applications. Alternatively, the applicant may identify, and justify the acceptability of, alternative measures for addressing PRA quality and technical adequacy. The staff should specifically review the acceptability of these alternative measures in the context of the specific uses and applications of the PRA.”

The staff reviewed the APR1400 design control document (DCD) Section 19.1.4.1.1, “Description of Level 1 Internal Events PRA for Operations at Power,” and found insufficient information describing the accident sequence analysis performed. Specifically, the applicant did not identify and describe dependencies that can impact the ability of mitigating systems to operate and function (ASME/ANS PRA Standard – HLR-AS-B). Therefore, in order for the staff to reach an assurance finding on the conformance to SRP Chapter 19.0 regarding PRA technical adequacy, please revise the DCD accordingly with the information needed.

Response

Note that section 19.1.4.1.1 of the DCD already describes in numerous places the incorporation of dependencies into the mitigating system models. For example:

- Section 19.1.4.1.1.c item 3) states: “Fault trees are constructed for the systems represented in the top functional events in the event trees (the front-line systems) and various systems needed to support these systems (support systems). The system dependencies are explicitly considered.”

- Section 19,1,4,1,1,4 general assumption a. 4) states: “Models capture the impact of dependencies, including support systems …”

- Section 19,1,4,1,1,4 general assumption b. 2) states: “Models include contributions due to random component failures, outages for maintenance and test, support systems …”

In addition, in response to action item AI 19-39 (PRA-039), the updated DCD Section 19.1.4.1.1.4 under the dependency analysis sub-heading (top of DCD page 19.1-49) will include additional dependency Tables 19.1-11a and 19.1.11b. These two new tables identify the front line system dependencies on support systems, and support system dependencies on other support systems. Section 19.1.4.1.1.4 of the DCD will be revised as shown in Attachment.

Impact on DCD

The DCD will be revised as stated in the response as shown in Attachment.

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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Dependency Analysis

and system-to-system

The systems that are included in the systems analysis for internal events are provided in Table 19.1-9. Simplified diagrams of major systems are shown in Figures 19.1-1 through 19.1-14. Tables are provided to summarize the initiator-to-system dependencies.

a. Dependency between Initiating Events and Front Line Systems (Table 19.1-10)

b. Dependency between Initiating Events and Support Systems (Table 19.1-11)

19.1.4.1.1.5 Data Analysis

The purpose of the data analysis task is to tabulate estimates of the failure rates, demand failure probabilities, and unavailability data for basic events in the PRA model. The data developed during this task include:

a. Component unreliability data

b. Component unavailability data due to test and maintenance

c. CCF data

d. Special event data including recovery action failures

For each component type and failure mode identified in the system analysis, the failure rates are extracted from available generic data sources. Potential sources of generic failure data are:

a. NUREG/CR-6928, “Industry-Average Performance for Components and Initiating Events at U.S. Commercial Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, “Industry Average Parameter Estimates, 2010 Update.”

b. NUREG/CR-5500, Vol. 10, “Reliability Study: Combustion Engineering Reactor Protection System, 1984-1998,” U.S. Nuclear Regulatory Commission, November 2001 (Reference 13).

c. Dependency between Front Line System and Supporting Systems (Table 19.1-11a)
d. Dependency between Supporting System and Other Supporting Systems (Table 19.1-11b)