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## 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.: 410-8357  
SRP Section: SRP 19  
Application Section: 19.1  
Date of RAI Issue: 02/22/2016

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### **Question No. 19-30**

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 initiating event analysis performed. Specifically, the applicant did not describe the structured and systematic approach used to group initiating events (ASME/ANS PRA Standard supporting requirements – IE-B2). Therefore, in order for the staff to reach an assurance finding on the conformance to Standard Review Plan (SRP) Chapter 19.0 regarding PRA technical adequacy, please revise the DCD with a description of the approach used to group initiating events.

### **Response – (Rev. 1)**

The grouping of initiating events is one of the tasks for initiating events analysis, and the details are documented in the Initiating Event Analysis Notebook (APR1400-K-P-NR-013101-P, Rev. 0A).

The impact of initiating events on the core protection functions is a major consideration in the grouping process. The grouping task primarily focuses on the impact of initiating events and subsequent system failures upon the core protection functions, and the impact of initiating events upon plant system performance. Thus, this yields groups of initiators expected to have a

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common core damage accident sequence progression and, accordingly, a common set of success criteria.

Table 2 in the Initiating Event Analysis Notebook (APR1400-K-P-NR-013101-P, Rev. 0A) presents an initial categorization of initiating event types with respect to the impacts on the core protection functions. Consistent with the initial identification of initiators, the initiating events are organized into either a LOCA, secondary piping break, or transient (including special initiators) category. In addition, there is an ATWS category for transients that are followed by a subsequent failure of the reactor protection system (RPS). ATWS is not caused by any single initiator; it is the combination of initiator occurrence and RPS failure that leads to ATWS sequences. Therefore, all failures of reactivity control, whether the initiating event was a transient or a special initiator, are placed into the ATWS category.

Grouping of events into such higher-level classifications is performed when the events can be considered similar in terms of plant response, success criteria, or timing, or are bounded by the impacts of the higher-level event.

Table 3 in the Initiating Event Analysis Notebook (APR1400-K-P-NR-013101-P, Rev. 0A), which shows the results of grouping the specific initiating events with respect to the impacts noted in Table 2, provides the summary dispositions of the initiating events.

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#### **Impact on DCD**

[DCD 19.1.4.1.1 will be revised to reflect the response of this RAI 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 Environment Report.

**APR1400 DCD TIER 2**19.1.4 Safety Insights from the Internal Events PRA for Operations at Power

The internal events PRA for operations at power, including its results, is described in this subsection. The Level 1 PRA is described in Subsection 19.1.4.1 and the Level 2 PRA is described in Subsection 19.1.4.2.

19.1.4.1 Level 1 Internal Events PRA for Operations at Power

A description of the Level 1 internal events PRA for operations at power, including results, is provided in the following subsections.

19.1.4.1.1 Description of Level 1 Internal Events PRA for Operations at Power

The Level 1 PRA uses a small event tree method supported by a linked fault tree approach. The major steps of the methodology are defined below:

- a. Identification of potential accident-initiating events:
  - 1) Plant initiating events are identified based on previous industry experience, supplemented with a system failure modes and effects analysis (FMEA), which is focused on the identification of plant-specific initiators.
  - ~~2) Plant initiating events with similar accident mitigation requirements are grouped together.~~
  - 3) The annual frequency is estimated for each initiating event or initiating event group.
- b. Accident sequence analysis:
  - 1) An evaluation of the plant response is developed for each type of initiating event, by identifying the key safety functions that are necessary to reach a safe and stable state and to prevent core damage.
  - 2) Systems and operator actions that affect the key safety functions are identified.
  - 3) Event trees are developed as a graphical representation of the potential core damage accident sequences for each initiating event. The top functional

Initiating events are grouped based on similarities in plant mitigation requirements, including the demands placed on systems and the operator actions needed to achieve a safe, stable condition, and prevent core damage.