

## 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.: 315-8091  
SRP Section: 18 – Human Factors Engineering  
Application Section: 18.4  
Date of RAI Issue: 11/16/2015

### **Question No. 18-44**

The seventh bullet of Criterion 9 in Section 5, “Task Analysis,” of NUREG-0711 states, “the analysis of the action sequence is conducted at a level of detail sufficient to identify individual task components, including cognitive elements such as diagnosis...” Additionally, it says, “the applicant should establish time estimates for individual task components and the basis for the estimates...”

Section 4.3.1.2.1, “Task Initiation Time,” discusses determination of the time period between operator awareness of a plant condition to initiating response tasks. The first two paragraphs end with discussions of short task initiation times. The third period begins with a different, conservative task initiation time. The basis for these times is not documented in the TA IP.

1. Provide the basis for the task initiation times listed in the TA IP.
2. Revise the submittal as necessary.

### **Response**

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**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**

Technical report APR1400-E-I-NR-14004-NP, Rev.0, "Task Analysis Implementation Plan," Section 4.3.1.2.1 will be revised, as indicated in the attachment associated with this response.

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4.3.1.2.1. Task Initiation Time

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4.3.1.2.2. Subtask Time

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### **Question No. 18-45**

Section 1.2.2, “Review Elements,” of NUREG-0711 states in part that an acceptable implementation plan ensures that knowledgeable engineers will obtain consistent results from executing the methodology. Also, the third bullet of Criterion 9 in NUREG-0711 states that “techniques to minimize bias are used when estimates of time required are derived using methods that are dependent on expert judgment.”

Section 4.3.1.2.2, “Subtask Time,” describes determining the time required to complete all subtasks necessary to complete a specific task. The second to last paragraph discusses the process to determine the subtask time for non-standard, or unique subtasks, which may involve using SME judgments.

Using judgment may produce less consistent results than an empirical method. Additionally, information may be available from the reference plants or the predecessor plants.

1. Describe any conditions that may require judgment to be used instead of an empirical method, and describe how bias will be minimized when SME judgment is used.
2. Revise the submittal as necessary.

### **Response**

The second to last paragraph of Section 4.3.1.2.2 of the TA IP will be revised, as indicated in the attachment associated with this response.

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**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**

Technical report APR1400-E-I-NR-14004-NP, Rev.0, "Task Analysis Implementation Plan," Section 4.3.1.2.2 will be revised, as indicated in the attachment associated with this response.

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4.3.1.2.3. Task Characterization Time

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4.3.1.2.4. Administrative Time

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### **Question No. 18-48**

Section 1.2.2, "Review Elements," of NUREG-0711 states in part that an acceptable implementation plan ensures that knowledgeable engineers will obtain consistent results from executing the methodology. Also, the third bullet of Criterion 9 in Section 5, "Task Analysis," in NUREG-0711 states that "techniques to minimize bias are used when estimates of time required are derived using methods that are dependent on expert judgment." Appendix 18-A, "Crediting Manual Operator Actions in Diversity and Defense-In-Depth Analyses," of NUREG-0800 provides additional guidance that specifically addresses DIHAs identified from DCD Tier 2 Chapter 7. Section 1.A, "Method," of Appendix 18-A states in part:

*Methods that are dependent on expert judgment to derive time estimates for task components are potentially subject to bias. In addition, the uncertainties associated with estimates derived through these methods are difficult to quantify. Accordingly, these methods should be employed using structured approaches that minimize bias and help identify and assess uncertainties...Prior experience with tasks or subtasks similar to the actions...may provide valuable insights for the analysis/estimates of operator response times.*

Section 4.3.1.2.5, "Critical Function Time," describes the time spent maintaining situational awareness independent of and concurrent with performing specific tasks and how it is determined. The second paragraph describes specific factors used in this determination. The described time determination processes discuss the use of SME judgment.

1. Describe a method and/or a structured approach that will be used by the SMEs to establish the factors described in this section such that consistent results will be obtained, bias will be minimized and uncertainties are identified and assessed.
2. Revise the submittal as necessary.



**Response**

TS

**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**

Technical report APR1400-E-I-NR-14004-NP, Rev.0, "Task Analysis Implementation Plan," Section 4.3.1.2.3 will be revised, as indicated in the attachment associated with this response.

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4.3.1.2.5. Critical Function Time

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4.3.2. Time Margin

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4.3.3. Independent Review

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### **Question No. 18-50**

The seventh bullet of Criterion 9 in Section 5, "Task Analysis," in NUREG-0711 states in part that the analysis of the action sequence is conducted at a level of detail sufficient to identify individual task components, including cognitive elements such as diagnosis and selection of appropriate response. Also, Section 1.2.2, "Review Elements," of NUREG-0711 states in part that to determine whether or not an implementation plan (IP) is acceptable, the staff evaluates whether the IP is detailed; i.e., the IP describes the methodology in a step-by-step format to ensure the applicant's design personnel can reliably use the IP.

Section 4.3, "Task Timing Analysis," of the TA IP says that, "[t]he analysis of the subtask sequences is conducted at a level of detail sufficient to identify individual task components..." as Criterion 9 expects. However, the TA IP lacks clear guidance to the SMEs performing the task analysis to incorporate any relevant standard or unique subtasks into the sequence of operator actions documented in the task narrative.

1. Provide a method, and/or step-by-step instructions for the SMEs to ensure that the subtasks and the subtask sequence documented in the task narrative will be analyzed at a level of detail sufficient to identify individual task components.
2. Additionally, describe how the SME should incorporate standard and unique subtasks into the subtask sequence for each task.
3. Revise the submittal as necessary.

### **Response**

Section 4.2.1 "Task Narrative" Item 4 of the Task Analysis Implementation Plan (TA IP), APR1400-E-I-NR14004, Rev. 0, requires an overview of the task and key subtasks and sequences. Task Narrative Item 12 requires a description of all subtasks, with each given a unique sequence number for cross reference within the TTA.

Section 4.3 of the TA IP will be revised, as indicated in the attachment associated with this response.

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**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**

Technical report APR1400-E-I-NR-14004-NP, Rev.0, "Task Analysis Implementation Plan," Section 4.3 will be revised, as indicated in the attachment associated with this response.



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4.3. Task Timing Analysis

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### **Question No. 18-52**

The sixth bullet of Criterion 9 in Section 5, “Task Analysis,” of NUREG-0711 states that “staffing for analysis is justified, and if credited manual actions require additional operators beyond the assumed staffing, the justification for timely availability of the additional staffing is provided and the estimate of time required includes any time needed for calling in additional personnel.” Also, Section 1.2.2, “Review Elements,” of NUREG-0711 states in part that an acceptable implementation plan is detailed to ensure that knowledgeable engineers will obtain consistent results from executing the methodology.

Section 4.3.1.2.2, “Subtask Time,” in the TA IP describes the determination of the time required to complete subtasks. Item 7 of section 4.3.1.2.2 discusses physical transitions between two operator locations.

1. Item 7.a., Clarify if “from offsite” means the furthest distance an operator could be from the main control room while at the plant or if it means the furthest distance that an operator could be while off duty (for example, the operator is at home and needs to be called in).
2. If “from offsite” could mean “from home,” then it would not be possible to obtain information about the associated transition time from a plant walkthrough. Describe how this time will be determined.
3. Describe how the SMEs will identify whether or not additional operators need to be called in to perform a task, and describe how the time required will account for the time for these operators to travel to the site.
4. Describe any assumptions that the SMEs should use to determine transition times and the basis for those assumptions, if applicable (e.g., assumptions about how long it would take for off-shift personnel to arrive at the plant if needed).



5. Revise the submittal as necessary.

**Response**

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Section 4.3.1.2.2 and Item 18 in Section 4.2.1 of the TA IP will be revised, as indicated in the attachment associated with this response.

**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**

Technical report APR1400-E-I-NR-14004-NP, Rev.0, "Task Analysis Implementation Plan," Sections 4.3.1.2.2 and 4.2.1 will be revised, as indicated in the attachment associated with this response.



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4.2.2. Human-System Interface Inventory