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. 18-46

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 5.4, “Review Criteria,” 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. Uncertainties in the analysis of time required are identified and assessed.” 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 4.3.1.2.3, “Task Characterization Time,” describes time that is added at the task/subtask level at the discretion of the SME for specific, given reasons. Because the TA IP does not describe any techniques to minimize bias, or outline a structured approach, this method may produce inconsistent results.

1. Describe a method and/or a structured approach that will be used to determine the weighting factors or fixed amounts of time that will account for the task characterization time such that consistent results will be obtained, bias will be minimized and uncertainties are identified and assessed.

2. Revise the submittal as necessary.

Response

Section 4.3.1.2.3 of the TA IP will be revised, as indicated in the attachment associated with this response.

For each task or subtask, the task analysis (TA) database captures the Task Characterization Time for each of the five factors listed in Section 4.3.1.2.3, “Task Characterization Time” of the Task Analysis Implementation Plan (TA IP), APR1400-E-I-NR-14004, Rev. 0. The SME considers those five factors when determining Task Characterization Time factors and values. Bias in Task Characterization Time factors is limited by implementation of the independent review process described in Section 4.3.3 of the TA IP. Uncertainties are identified and assessed via the independent review process as well.

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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4.3.1.2.3. Task Characterization Time TS

4.3.1.2.4. Administrative Time TS

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Question No. 18-47

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 4.3.1.2.4, “Administrative Time,” describes the time included which is not directly related to the task. As described in the TA IP, these times may be adjusted based on SME experience and judgment and an explanation of their basis is recorded. In order to verify the above review criteria, staff needs more than the time adjustment basis.

1. Describe a method and/or a structured approach that will be used by the SMEs to determine the administrative weighting factors such that consistent results will be obtained, bias will be minimized and uncertainties are identified and assessed.

2. Revise the submittal as necessary.

Response

The multiplying factor for each plant condition listed in Section 4.3.1.2.4 of the Task Analysis Implementation Plan (TA IP), and the unique multipliers which may be subsequently added for special circumstances, are developed by a consensus of multiple plant operations SMEs. When developing the multipliers, the plant operations SMEs use their experience in control rooms of U.S. operating plants, their understanding of the APR1400 design, knowledge of differences between the APR1400 design and operating plants, and the sources described Section 4.2.1 of the TA IP. The values of the multipliers are independently reviewed using the process described in Section 4.3.3 of the TA IP in order to minimize bias and to identify and assess uncertainties.

Section 4.3.1.2.4 of the TA IP will be revised to describe the process by which the plant operations SMEs develop the multipliers, 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,” Section 4.3.1.2.4 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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Question No. 18-54

The eighth bullet of Section 1.B., “Review Criteria,” in Appendix 18-A of NUREG-0800 states in part that “the analysis of the action sequence is conducted at a level of detail sufficient to identify…the associated performance shaping factors that affect time required and the potential for operator error.” Note that Appendix 18-A specifically applies to DIHAs identified from the CCF Coping Analysis.

Item 22, "Performance-shaping factors," in Section 4.2.1, "Task Narrative," of the TA IP provides the applicants directions in addressing the shaping factors that affect the time required to execute tasks; however, there is no direction to identify and document factors that could contribute to operator error during the performance of manual operator actions credited for a software CCF during an accident or transient.

Revise the submittal to ensure that any performance shaping factors that affect the potential for operator error are identified and documented (for DIHAs identified in the CCF Coping Analysis).

Response

Section 3.1.1 and Item 22 in Section 4.2.1 of the TA IP will be revised, as indicated in the attachment associated with this response, to direct SMEs to identify and include the performance shaping factors which can adversely affect the time required to execute tasks and the potential for operator error.

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 3.1.1 and 4.2.1 will be revised, as indicated in the attachment associated with this response.

3.1. Basic Task Analysis

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3.1.1. Task Narrative

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3.1.2. Human-System Interface Inventory

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4.2.2. Human-System Interface Inventory