
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. 18-43

The first bullet of Criterion 9 in Section 5, “Task Analysis,” of NUREG-0711 states, “the analysis establishes the time available using an analysis method and acceptance criteria consistent with the regulatory guidance associated with the actions. The basis for the time available is documented.”

Field description Item 6, “HFE PE [Program Element] Reference,” of Section 4.2.1, “Task Narrative,” of the TA IP describes how to correlate the task narrative being developed with other PEs and analyses; however, for important human actions, there is not clear direction for the SME to specifically document the basis for the value of TmAv that is documented in the task narrative.

1. Provide direction to the SME to document the basis for the value of the time available.
2. Revise the submittal as necessary.

Response

Items 6c and 17 of Section 4.2.1 of the TA IP will be revised to direct the SME to identify the task as an important human action (IHA) and link the IHA to the associated basis (PRA, TAA, or D3CA), as indicated in the attachment associated with this response.

Impact on DCD

There is no impact on the DCD.

Impact on PRA

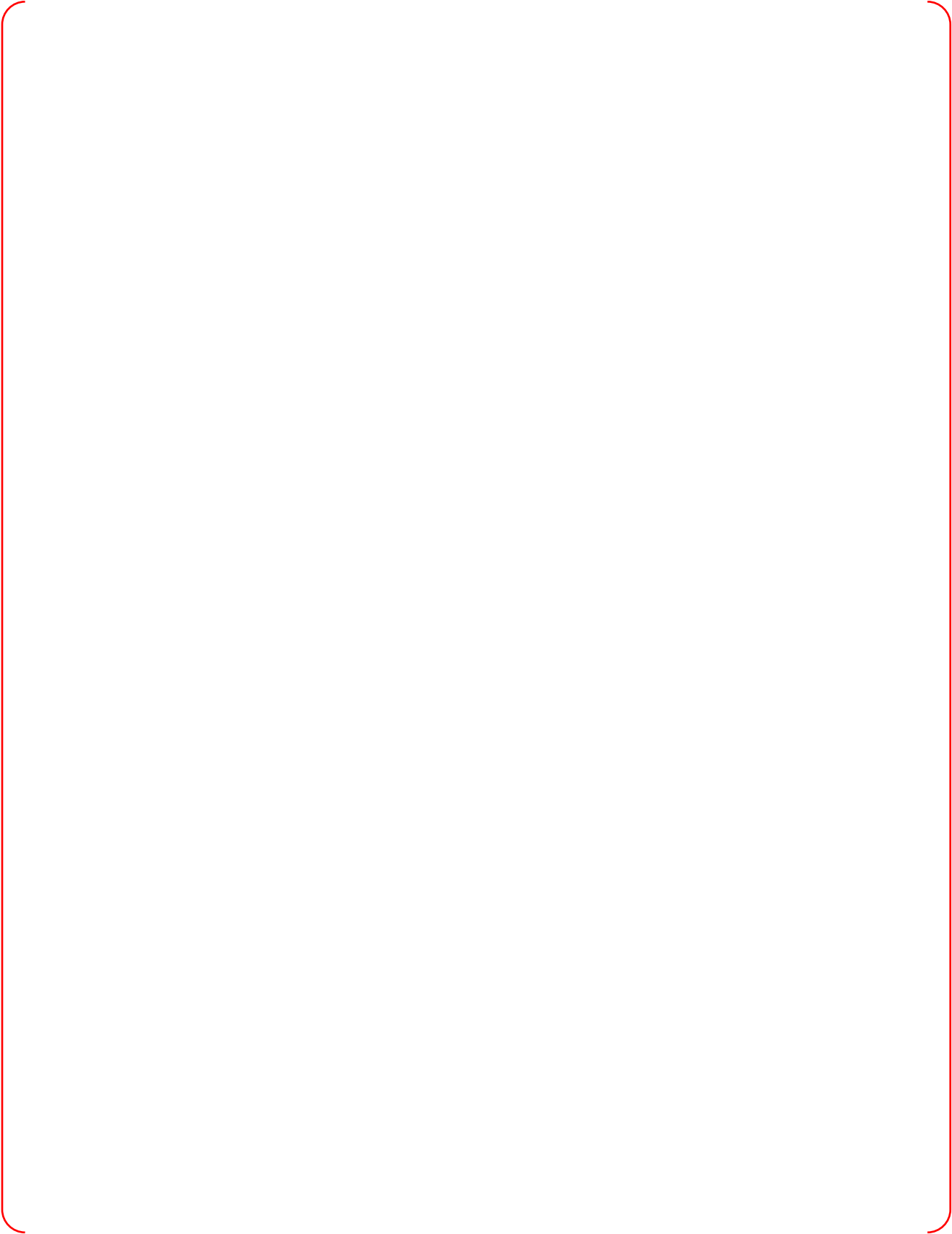
There is no impact on the PRA.

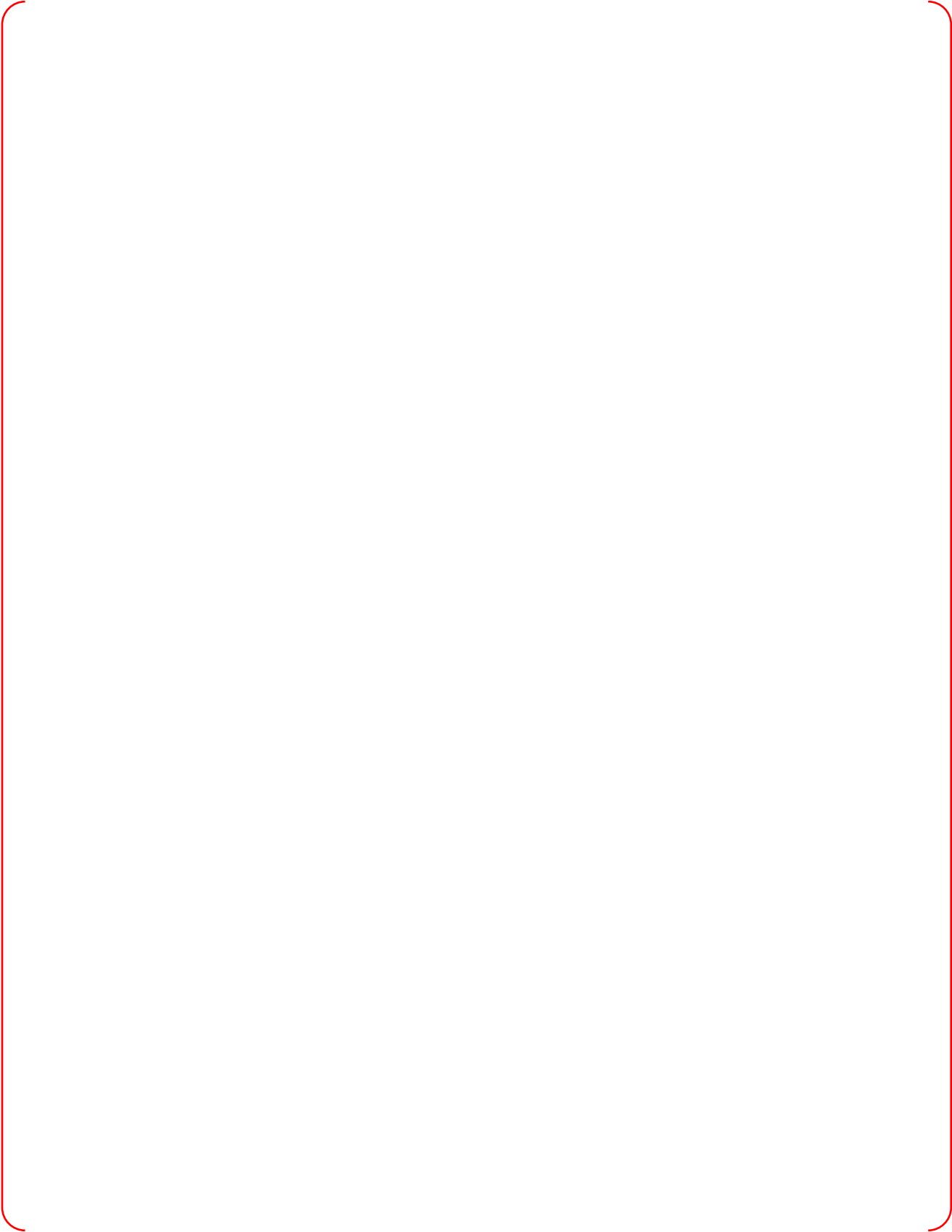
Impact on Technical Specifications

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





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Question No. 18-49

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.

Section 4.3.2, "Time Margin," of the TA IP describes how the "Time Margin" is calculated including one time input which may not be available. When this occurs, the section states that SME's reach consensus on what to use. It is not clear how the SMEs reach this consensus, or why it would be necessary, considering that information about plant processes should be available in the APR1400 or reference plant documentation.

1. Describe why the analysis of PdTm would need to depend on SME judgment. If there is a reason for this, then describe how the SMEs will reach this consensus (for example, what information will they use) and how consistent results will be obtained.
2. Revise the submittal as necessary..

Response

Section 4.3.2 of the TA IP will be revised as indicated in the attachment associated with this response.

For process delay times which have no critical system performance time constraint, the process delay times might not be specified in the system design documentation. As a result, the SMEs are to estimate the process delay times by considering documented process delay times of SSCs which are similar to the subject SSE. For example, when considering the stroke time of a valve whose stroke time is not documented, the SMEs will consider the stroke times of valves of similar size and type.

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 4.3.2 will be revised, as indicated in the attachment associated with this response.

4.3.2. Time Margin

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4.3.3. Independent Review

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Question No. 18-51

The fourth bullet under Criterion 9 in Section 5, “Task Analysis,” of NUREG-0711 states, “the sequence of actions uses only alarms, controls, and displays that would be available and operable during the assumed scenario(s).” Also, the fourth bullet under Section 1.B., “Review Criteria,” in Appendix 18-A of NUREG-0800 states further that, for DIHAs identified from DCD Tier 2 Chapter 7, “operable means the main control room equipment that would still be available based on the defense-in-depth analysis of the postulated CCF associated with each event that is evaluated in the accident analysis section of the safety analysis report.” Additionally, 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.

Although Section 4.3, “Task Timing Analysis,” contains a statement that aligns with the fourth bullet under Criterion 9 in Section 5 of NUREG-0711, the sections of the TA IP that tell the SME how to develop the task narrative and the HSI inventory for tasks related to important human actions do not contain any direction to consider this constraint. Furthermore, Table 4-1, “Key Available Information for Operators for DBEs with a CCF in Digital Safety I&C Systems,” of the CCF Coping Analysis (APR1400-Z-ANR-14019, Rev. 0) lists the alarms, controls, and indications that are available to the operator during a software CCF that occurs during an accident or transient. Additional information is also found in the DCD Tier 2, Chapter 15 analyses. The TA IP does not contain any direction to use these documents when the task narrative and HSI inventory are generated for tasks associated with important human actions.

1. Provide clear direction to the SMEs to only include the alarms, controls, and displays that would be available and operable when the task will be performed.
2. Include any resources (e.g., the CCF Coping Analysis and DCD Tier 2, Chapter 15) that the SMEs can use to make sure that only the alarms, controls, and displays that would be available and operable during task performance are documented in the task analysis.

3. Revise the submittal as necessary.

Response

The HSI inventory requirements developed during TA may require a change to the I&C design. To make this clear, Section 3.6, Item 9 of Section 4.2.1, Item 15 of Section 4.2.2.1, Item 13 of Section 4.2.2.2, the last paragraph of Section 4.2.2.2 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 3.6, 4.2.1, 4.2.2.1, and 4.2.2.2 will be revised, as indicated in the attachment associated with this response.

3.5.8. Human Factors Verification and Validation

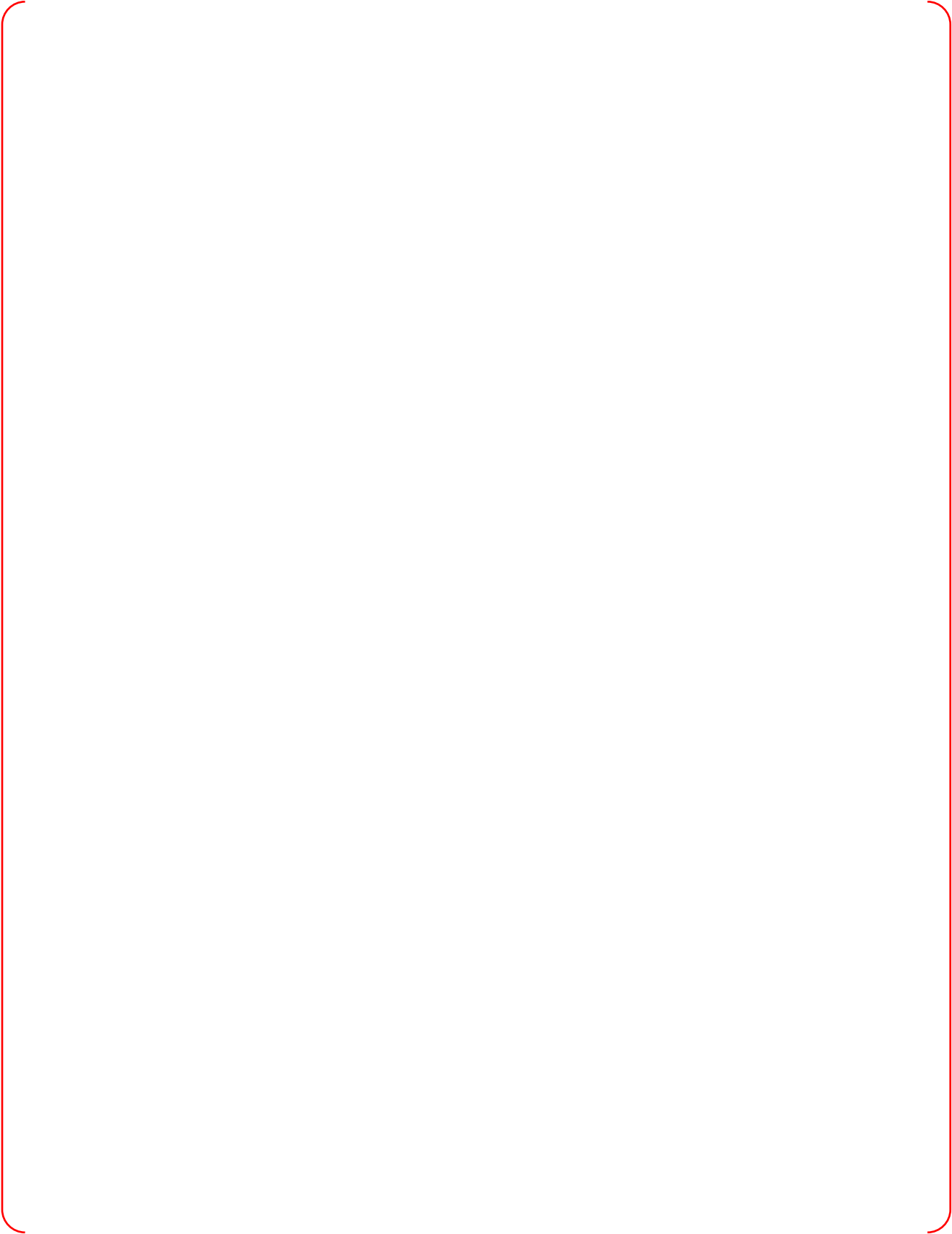
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3.6. Task Analysis Interface with the APR1400 Plant Design

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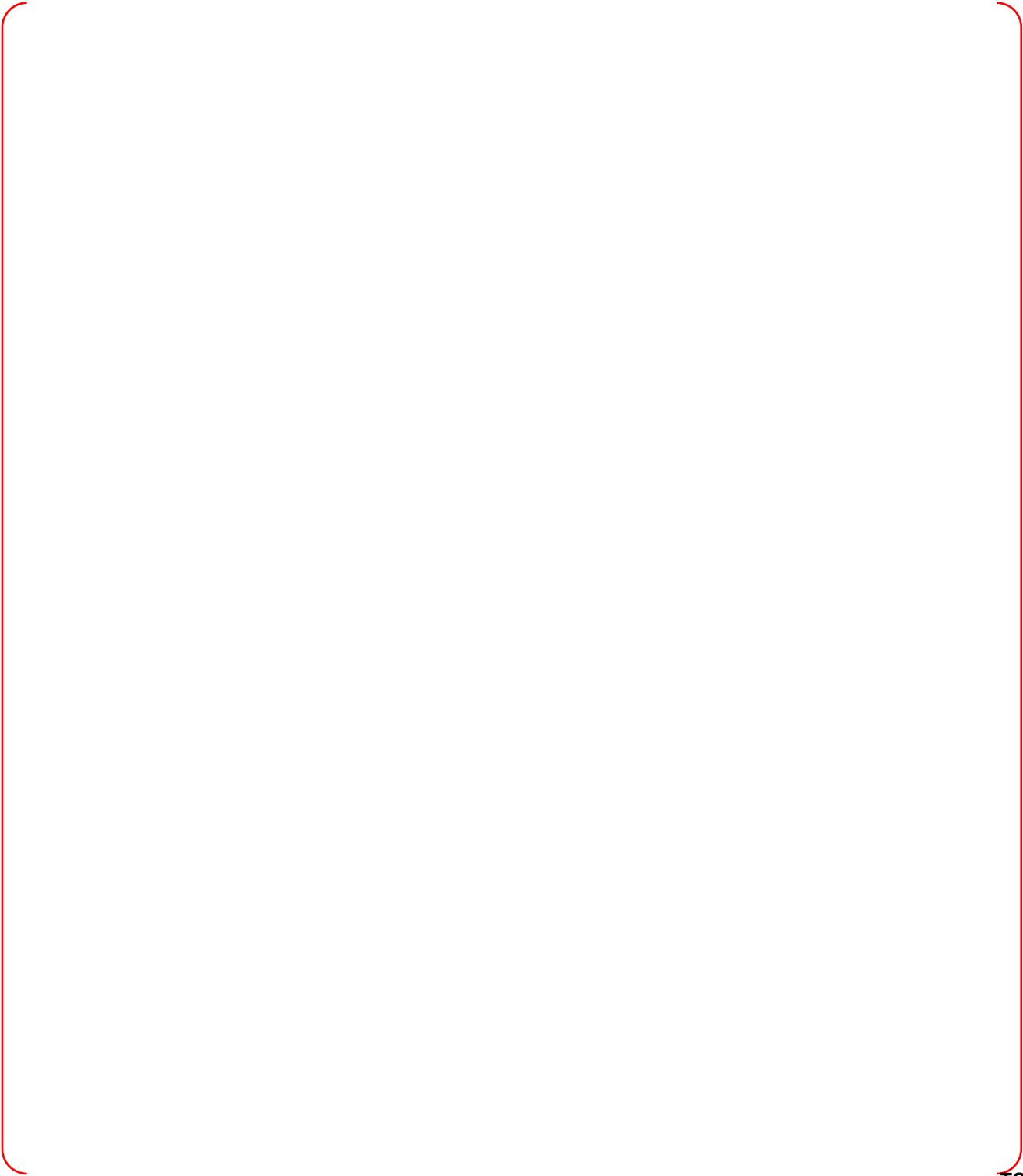


4.2.2.2. Component Control

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4.2.3. Task Evaluation

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Question No. 18-55

The sixth bullet in Section 1.B., “Review Criteria,” in Appendix 18-A of NUREG-0800 states, “The initial MCR operating staff size and composition assumed for the analysis of time required is the same as the minimum MCR staff defined in the Technical Specifications.” This guidance is applicable to DIHAs identified from the CCF Coping Analysis.

Item 18, "Staff," in Section 4.2.1 of the TA IP describes how staff requirements are addressed in developing the Task Narrative. However, there is no direction for the SME to verify that the required number and qualification of operators aligns with the minimum number of staff defined in the Technical Specifications.

1. Provide direction to the SME to ensure that the initial MCR operating staff size and composition assumed for the analysis of time required is the same as the minimum MCR staff defined in the Technical Specifications.
2. Revise the submittal as necessary.

Response

As stated in Item 2 of Section 1, “An HED is generated if the TA concludes that a task cannot be supported by the staffing available at the plant location designated to perform the task. Minimum and maximum staffing for certain locations are according to the design constraints defined in the human factors engineering program plan (HFEPP) (Reference 1).”

Section 4.1 of the HFEPP defines the staffing constraint as “The MCR staffing meets the regulatory requirements of 10 CFR 50.54(m)(2)(iii)” which is the basis of the APR1400 Technical Specifications.

Section 3.5.4 of the TA IP states, “HEDs are generated when the TA result is not consistent with the staffing constraint defined in the HFEPP....The S&Q resolves any staffing-related HEDs from the TA.

Section 3.2.1 and Section 4.3 of the TA IP will be revised to indicate that changes in staffing are to be bounded by the staffing constraints defined in the HFEPP, 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 3.2.1 and 4.3 will be revised, as indicated in the attachment associated with this response.

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3.1.3. Task Evaluation

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3.2. Task Timing Analysis

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3.2.1. Workload

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4.3. Task Timing Analysis

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