
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. 18-42

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." Also, Section 1.2.2, "Review Elements," of NUREG-0711 states in part that the NRC staff accepts implementation plans for review when the results for an HFE element are not available for the review. Additionally, this section states, "to determine whether an implementation plan (IP) is acceptable, the NRC staff evaluates whether the IP is:... detailed, i.e., the IP describes the methodology in a step-by-step format to ensure that the applicant's design personnel can reliably use the IP, and that knowledgeable engineers will obtain consistent results from executing the methodology..."

Section 4.2.1, "Task Narrative", of the Task Analysis (TA) Implementation Plan (IP), APR1400-EI-NR-14004, Rev. 0, discusses the information sources used to create the task narrative. Item 17 specifically discusses determining the "Time Available" (TmAv) and the importance of defining time zero for the event.

Section 4.3.1.1, "Time Available," discusses the time available as part of the "Task Timing Analysis" and how to identify the point in time when time available begins.

The information in these two sections is contradictory: it isn't clear if the SME should determine the "time available" from event initiation or from the HSI prompt. Note that Section 4.2, "Deterministically-Important Human Actions Analyses," of APR1400-E-I-NR-14006-P, "Treatment of Important Actions Implementation Plan" (TIHA IP), Rev. 0, Item 4 similarly discusses when the "time available" period should begin.

The "time available" information required to be documented in the TIHA results summary report is also extracted from the plant analyses in the DCD, which evaluates the time available from the event initiation.

Also, the qualifications of the “plant analyst” are not defined in APR1400-E-I-NR-14001-P, “Human Factors Engineering Program Plan.”

1. Clarify whether or not the TmAv is determined from the event initiation, which is used in the plant analyses, or from the time of the HSI prompt.
2. If TmAv will be determined from the HSI prompt, provide detailed directions to the SME about how to determine this (e.g., state any documents that should be reviewed and any other resources that could be used).
3. If TmAv will be determined from the HSI prompt, clarify the qualifications and role of the “plant analyst.”
4. Revise the submittal as necessary.

Response

TmAv is determined from the time of the HSI prompt. The TmAv is defined as the time from the presentation of a cue for a human action to the time the human action must be completed. If the TmAv is expressed in terms of operation time from the event initiation, and not from the cue for a human action, it will be annotated in the database entry.

The TmAv determined from the HSI prompt is defined by the diversity and defense-in-depth coping analysis, transient and accident analysis, or probabilistic risk assessment in DCD Chapter 7, 15, and 19 respectively, and other APR1400 plant documentation. The plant operations SME will work with the systems safety engineer and estimate the time from the event initiation to the HSI prompt if the data is not available in plant document.

The qualification of the “plant analyst” is listed in Section 5, “Implementation Team,” of APR1400-E-I-NR-14001-P/NP, “Human Factors Engineering Program Plan,” as the qualification of the “systems safety engineer.” The term “plant analyst” will be revised to “systems safety engineer,” 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," and APR1400-E-I-NR-14006-NP, Rev.0, "Treatment of Important Human Actions Implementation Plan," will be revised, as indicated in attachment to this response.

Page intentionally blank

TS

4.3.1. Workload

TS

4.3.1.1. Time Available

TS

4.3.1.2. Time Engaged

TS

TS

Table 4-2 TIHA Output for DIHAs

TS

TS

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. 18-53

The eighth bullet of Criterion 9 states, “the analysis identifies a time margin to be added to the time required and the basis for the adequacy of the margin.” Additionally, Appendix 18-A, “Crediting Manual Operator Actions in Diversity and Defense-In-Depth Analyses,” of NUREG-0800 also includes specific guidance for evaluating the time margin associated with manual operator actions that are credited in the coping analysis. Section 1.A, “Method,” states in part, “the basis for the specific time margin used in the analysis should be justified and documented. Insights from the HFE program, especially the OER and human reliability analysis, should be used. The identification of potential errors, error detection methods, and error recovery paths in event trees may be used to provide estimates of how much margin should be added to the operator response time estimates.”

Section 4.3.2, “Time Margin,” of the TA IP describes how the “Time Margin” is calculated using the “Time Available” and the “Time Engaged”. It also provides an arbitrary acceptable Time Margin without sufficient justification. Also, the guidance in Appendix 18-A of NUREG-0800 was not addressed for the time margin associated with deterministically important human actions credited in the CCF coping analysis submitted as part of DCD Chapter 7.

1. Provide some basis to support the statements made in the last paragraph of this section regarding an acceptable Time Margin.
2. Describe how the guidance of Section 1.A in Appendix 18-A of NUREG-0800 regarding time margin for manual operator actions credited in the CCF Coping Analysis is satisfied.
3. Revise the submittal as necessary.

Response

To address the statement in Appendix 18-A of NUREG-0800 that “One acceptable method is for the time margin to equal the maximum recovery time for any single credible operator error”, the last paragraph of Section 4.3.2 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,” Section 4.3.2 will be revised, as indicated in the attachment associated with this response.

4.3.2. Time Margin

TS

4.3.3. Independent Review

TS