
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

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Question No. 18-23

Title 10, Section 50.34(f)(2)(iii) requires that a reactor design applicant provide a control room design that reflects state-of-the-art human factor principles prior to committing to fabrication...control room panels and layouts. NUREG--0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Chapter 18, "Human Factors Engineering," provides guidance for NRC staff to perform a review of the human factors engineering design portion of a reactor design. NUREG-0711, provides additional details, including detailing the review criteria to assist the staff in performing its design review.

NUREG-0711, Rev. 3, Section 4.4, Criterion 4, 5th bullet, states that for each high-level function, the applicant should identify requirements related to parameters indicating that the high-level function is achieving its purpose (e.g., reactor vessel level returning to normal).

The technical report, APR1400-E-I-NR-14003, Rev 0, "Functional Requirements Analysis and Function Allocation Implementation Plan," Section 4.3.3, provides Table 4-1, "Example of a Function Definition Table for a Critical Function." The functional data table (FDT) provides a means of documenting how a high-level function is achieving its purpose, by describing the lower-level functions that support the respective high-level function, all the way down to a particular component.

Section 4.3.3 (pg 15) discusses the decomposition of the functions into lower-level supporting functions. Table 4-1 is provided as an example of the documentation of a high-level function.

The staff has the following questions that should be addressed so that the staff can verify that the design satisfies this NUREG-0711 criterion:

1. An example of linking the lower level functions with a 1.0, 1.1, 1.2, etc., structure is provided. If Table 4-1 is used as an example, does this mean that the lower level functions will have their own FDTs? So, for the lower level function of "Safety Injection,"

code: 310000, there would be another table that looks exactly like Table 4-1, but with data relevant to this lower level function?

2. Do the high-level functions have documentation of their decomposition to a component level in the FDTs? By the example table 4-1, the text in Section 4.3.3, and Figure 4-3, it is difficult to determine how the functions in the FDT are attached to the success path resource trees (which decompose the functions all the way to a component). The example Table 4-1 does not indicate a component level of specificity (there isn't a cell where a component can be entered/identified).

Response

1. Yes, the lower level functions within the reactor coolant system (RCS) inventory control, in the case of Table 4-1 of the Functional Requirements Analysis and Function Allocation Implementation Plan (FRA/FA), Safety Injection (Code 310000) and Charging (Code 320000), will have their own function definition tables (FDTs). As stated in Section 4.3.3 of APR1400-E-I-NR-14003 below Table 4-1, "Additional FDTs are prepared at all functional levels." The FDTs will all follow the same format with the data relevant to the level of the function.
2. Documentation of high level function decomposition to a component level is accomplished by linking of the FDTs with a hierarchical numbering scheme. The FDT cell labeled Function Type indicates whether that function type is a high level function, process, system, component, or control action, consistent with Figure 4-2 of APR1400-E-I-NR-14003. As stated in Section 4.3.3 "As functions are divided into lower level supporting functions, FDTs are created and linked to track the decomposition and provide traceable connection throughout the hierarchy. The linkage is provided either manually or as part of a database. For example, a hierarchical code field similar to document section numbering is used where 1.0 is a critical function, 1.1 a process to accomplish that critical function. An alternative process for that critical function is 1.2. Two systems that provide the second process are 1.2.1 and 1.2.2. Additional levels continue through the components and actions."

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

There is no impact on any Technical, Topical, or Environmental Report.