
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.: 351-8381
SRP Section: 18 – Human Factors Engineering
Application Section:
Date of RAI Issue: 12/22/2015

Question No. 18-60

NUREG-0711, "Human Factors Engineering Program Review Model," Chapter 4, "Functional Requirements Analysis and Function Allocation" (FRA/FA), Section 4.3, "Applicant Products and Submittals," states that at a minimum, the "Results Summary Report" (ReSR) should include the following:

- an explanation of the methodology used to define the safety functions
- the set of safety functions for the facility
- an explanation of the methodology used to allocate functions and the final set of allocations
- the technical basis for modifying high-level functions of predecessor plants in the new design
- a complete set of functional requirements necessary to satisfy the plant goals
- identification of how personnel and automatic systems perform the functions
- the technical basis for all function allocations

Section 6, "Results Summary Report," of APR1400-E-I-NR-14003-P, Rev.0, "Functional Requirements Analysis and Function Allocation Implementation Plan," (FRA/FA IP) lists several items that will be included in the FRA/FA ReSR. For some items, the staff was able to find a correlation to what is requested in Section 4.3 above. As an example, for "the set of safety functions for the facility," the IP states that the ReSR will have "Defined those functions that must be carried out to satisfy the plant's safety goals and its goal of generating power."

However, the staff was not able to correlate other items provided in Section 6 to those mentioned in Section 4.3 of NUREG-0711. For instance, "Each FRA/FA team member's name,

the SME position fulfilled, and the types of FRA/FA outputs generated by that team member,” or “A detailed description of any resulting HEDs identifying conflicts between FRA/FA results and the APR1400 plant design.” In addition, the staff could not determine if other items in the NUREG-0711, Section 4.3 list would be provided in the FRA/FA ReSR, such as “the technical basis for modifying high-level functions of predecessor plants in the new design,” or “the technical basis for all function allocations.”

Revise the IP to address all bullets in Section 4.3 of NUREG-0711.

Response

Section 6, “Results Summary Report,” of the FRA/FA Implementation Plan (IP) will be revised to address all the NUREG-0711, Section 4.3 bullets, 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-14003-P/NP, Rev.0, “FRA/FA Implementation Plan,” Subsection 6 will be revised, as indicated in the attachment associated with this response.

6. RESULTS SUMMARY REPORT

The results of the FRA/FA are documented in the ReSR, either directly or through reference to the FDT database. The ReSR demonstrates that the FRA/FA were conducted in accordance with this IP.

In addition to referencing the FDTs, the FRA/FA includes the following:

- The FRA/FA results overview, which describes the principal findings of the HFE program element, including confirmation of IHAs and an overview of any HEDs
- Each FRA/FA team member's name, the SME position fulfilled, and the types of FRA/FA outputs generated by that team member
- ~~A summary tabular listing of all Control actions and associated automation configuration (Allocation Table)~~
- A detailed description of any resulting HEDs identifying conflicts between FRA/FA results and the APR1400 plant design.
- ~~A conclusion that the FRA/FA program element:

 - ~~Has been conducted in accordance with the FRA/FA IP~~
 - ~~Defined those functions that must be carried out to satisfy the plant's safety goals and its goal of generating power~~
 - ~~Allocated control actions to personnel and automation in a way that takes advantage of human strengths and avoids human limitations~~~~

The FRA/FA is a one-time non-recurring HFE PE whose closure is marked by the FRA/FA ReSR. However, the analyses conducted within FRA/FA are iterative, in that HEDs generated by other HFE PEs are evaluated for any potential changes needed in those analyses. Similarly, plant design changes are evaluated for their impact to the output of all HFE PEs, including the output of the FRA/FA; HEDs are generated as needed. Therefore, any FRA/FA analyses changes that may be needed after completing the FRA/FA ReSR are managed through the HED resolution process. HEDs that affect FRA/FA outputs are resolved prior to completing the HD PE, which establishes the APR1400 HSI design for verification and validation (V&V).

After completion of V&V, site-specific changes, including any required FRA/FA output changes, are managed within the DI PE, which is a recurring PE for each plant. DI also ensures that all HEDs are closed.

- an explanation of the methodology used to define the safety functions
- the set of safety functions for the facility
- an explanation of the methodology used to allocate functions and the final set of allocations
- the technical basis for modifying high-level functions of predecessor design in the new design
- a complete set of functional requirements necessary to satisfy the plant goals
- identification of how personnel and automatic systems perform the functions
- the technical basis for all function allocations