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## ESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

### APR1400 Design Certification

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

Docket No. 52-046

RAI No.: 518-8654  
SRP Section: 18 – Human Factors Engineering  
Application Section: HSI Design  
Date of RAI Issue: 08/24/2016

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### **Question No. 18-129**

Acceptance criterion 8.4.5(2) of NUREG-0711 states that the applicant should specify the alarms and other information personnel need to detect degraded I&C and HSI conditions in a timely manner, and to identify their extent and significance.

The response to RAI 383-8458, Question 18-110 (ADAMS Accession No. ML16103A429), addresses the HSI needed to "support" degraded I&C and HSI conditions and also addresses HSI that will be required for operators to manage the plant during degraded I&C and/or HSI conditions; however, the response does not describe how the alarms and other information personnel need to detect degraded I&C and HSI conditions in a timely manner will be identified.

Describe in the submittal the alarms and other information that will be available for personnel to detect degraded I&C and HSI conditions in a timely manner, and to identify their extent and significance will be identified (describe how personnel will know that the HSI as well as the I&C system are degraded). Or, identify where in the application the information is located.

### **Response**

The degraded I&C and HSI conditions (e.g., loss of heart beat signals, trouble and disable alarms, health status, etc.) are processed by IPS and QIAS-N and displayed on the LDP and IFPDs, and mini-LDP and QIAS-N FPDs.

The details of failure mode and failure detection method for ESF-CCS are provided in Chapter 7 Table 7.3-8 of the DCD.

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### **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.

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### **Question No. 18-130**

NUREG-0711, Criterion 8.4.6.2(2) states that the applicant should base the general approach to testing on the test's objective(s). The following aspects of the tests should be described: tasks or scenarios used, performance measures, test procedures, and data analyses. Also, NUREG-0711, Section 1.2.2, "Review Elements," states that an implementation plan (IP) is acceptable if it is verifiable, i.e., the final results can be evaluated using NUREG-0711 criteria, and the IP describes the products (expected results from executing the methodology).

The Human-System Interface (HSI) Design (HD) IP, APR1400-E-I-NR-14007 (Rev. 0), Section 4.1.7, "Basic HSI Tests and Evaluations," prescribes that a performance-based test will be performed with US operators to ensure the effectiveness of the APR1400 Basic HSI. The response to RAI 8458, Question 18-111 (ADAMS Accession No. ML16123A371) states, "...when there is a need to conduct specific design performance tests using the Basic HSI Test Facility, Section 5 of the Human Factors Verification and Validation Implementation Plan, APR1400-E-I-NR-14008 (Rev. 0) will be used as guidance. Tests will follow a test procedure and results will be documented." However, the HD IP was not revised to include this direction.

Include this direction in the HD IP.

### **Response**

The HSI Design Implementation Plan, APR1400-E-I-NR-14007 will be revised to include a direction for Basic HSI Tests and Evaluations as indicated in the Attachment associated with this response.

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### **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-14007-NP, Rev.0, "HSI Design Implementation Plan," Sections 4.1.7 will be revised as indicated in the attachment associated with this response.

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**4.1.7 Basic HSI Tests and Evaluations**

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## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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### **Question No. 18-131**

Attachment 4/4 of the response to RAI Attachment 4/4 of the response to RAI 400-8425, Question 18-125 (ADAMS Accession No. ML16144A662), says, "...Section 4.4.1.14, "Important Human Actions." However, it appears this should refer to Section 4.1.4.14.

Please revise the document if necessary.

### **Response**

Section 4.2.1 of the Human-System Interface Design Implementation Plan, APR1400-E-I-NR-14007 will be revised to correct a section number, as indicated in the attachment associated with this response.

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### **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-14007-NP, Rev.0, "HSI Design Implementation Plan," Sections 4.2.1 will be revised, as indicated in the attachment associated with this response.

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**4.2.1 Critical Safety Function Displays**

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