

## **KHNPDCDRAIsPEm Resource**

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**From:** Ward, William  
**Sent:** Friday, January 22, 2016 12:57 PM  
**To:** apr1400rai@khnp.co.kr; KHNPDCDRAIsPEm Resource; daegeun.ahn@gmail.com; Andy Jiyong Oh; Erin Wisler (erin.wisler@aecom.com)  
**Cc:** Lee, Samuel; Ciocco, Jeff; Kent, Lauren; Junge, Michael; Ward, William  
**Subject:** APR1400 Design Certification Application RAI 373-8480 (18 - Human Factors Engineering)  
**Attachments:** APR1400 DC RAI 373 COLB 8480.pdf

KHNP,

The attachment contains the subject request for additional information (RAI). This RAI was sent to you in draft form. Your licensing review schedule assumes technically correct and complete responses within 30 days of receipt of RAIs. However, KHNP requests, and we grant, the following RAI question response times. We may adjust the schedule accordingly.

**18-91 : 60days**  
**18-92 : 60days**  
**18-93 : 60days**  
**18-94 : 45days**  
**18-95 : 45days**

Please submit your RAI response to the NRC Document Control Desk.

Thank you,

**William R. Ward, P.E.**  
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**U.S. Nuclear Regulatory Commission**  
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## REQUEST FOR ADDITIONAL INFORMATION 373-8480

Issue Date: 01/22/2016  
Application Title: APR1400 Design Certification Review – 52-046  
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.  
Docket No. 52-046  
Review Section: 18 - Human Factors Engineering  
Application Section:

### QUESTIONS

#### 18-91

NRC regulation 10CFR 50.34(b)(6)(v) requires a design certification applicant to submit plans for coping with emergencies, including the items specified in 10CFR 50, Appendix E. Section IV.E.8 of Appendix E requires the making and description of adequate provision for emergency facilities and equipment, including an onsite technical support center (TSF) and an emergency operations facility (EOF). This question concerns how and which APR1400 EOF design expectations the applicant will pass on to the COL.

NUREG-0711, Section 8.4.4.4 contains criteria applicable to the HFE design of the EOF. The staff reviewed APR1400-E-I-NR-14007-P, Rev. 0, "Human-System Interface [HSI] Design Implementation Plan (HD IP)," APR1400-E-I-NR-14011-P, Rev. 0, "Basic HSI" Technical Report (TeR), DCD Tier 2 Chapter 7, and DCD Tier 2 Chapter 13. The staff finds the following information in the application appears to be inconsistent:

- COL Information Item 7.5(2) in DCD Tier 2, Table 1.8-2, "Combined License Information Items," Item COL 7.5(2) states, "The COL applicant is to provide a description of the site-specific EOF." The response to RAI #54-7963, Question #18-5 (ADAMS Accession No. ML15254A492) dated September 11, 2015, states that NUREG-0696, "Functional Criteria for Emergency Response Facilities" and NUREG-0700, "Human-System Interface Design Review Guidelines" will be applied to the design of the EOF. However, DCD Tier 2, Section 18.7, HD IP), and COL information item 7.5(2) do not provide direction to a COL applicant to incorporate these HFE guidelines into the design of the EOF.
- Although the HD IP, Appendix A, lists sections of the HD IP that address criteria in NUREG-0711, Section 8.4.4.4, "Emergency Operations Facility," the staff found that these sections do not specifically address Criteria 8.4.4.4(1) – (8) and 8.4.4.4(10). The presence of this information in Appendix A of the HD IP seems to contradict the RAI response and also does not seem to be accurate.
- DCD Tier 2, Figure 7.7-12, "HSI Information Processing Block Diagram," seems to indicate that the same information that is transmitted to the control room and technical support center (TSC) by the Information Processing System (IPS) will be transmitted and available in the EOF. However, the last paragraph in the HD IP, Section 4.1.4.19, "Emergency Offsite Facility," and the Basic HSI TeR, Section 4.18, "Emergency Operations Facility," imply that this information may be displayed differently in the EOF than in the other facilities.

Align COL information item 7.5(2), the HD IP, the Basic HSI TeR, and the response to RAI #54-7963, Question #18-5, to address how human factors engineering (HFE) will be incorporated into the design of the EOF. Revise the submittal as necessary.

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### 18-92

NUREG-0711, Section 1.2.2, "Review Elements," states that an acceptable implementation plan (IP) describes the methodology in a step-by-step format to ensure that design personnel can reliably use the IP consistent results will be obtained from executing the methodology.

The HD IP, Section 3.2.7, "Performance-Based Tests," refers to a time margin for important human actions, and a value is given for this margin. This same margin is discussed in the TA IP, Section 4.3.2, "Time Margin." The staff requested additional information about the basis for this margin in RAI 315-8091, Question # 18-53 (Issued 11/16/2015, ML15320A406). The response has not yet been provided.

Align the information in the HD IP with the response that will be submitted for RAI 315-8091, Question # 18-53, if the response will result in inconsistent information between the HD IP and the task analysis implementation plan.

### 18-93

NUREG-0711 Criterion 8.4.4.3(1), "Technical Support Center," states in part that the applicant should describe **how** the HSIs give personnel information needed to provide reliable voice communications facilities to the control room, operations support center, the EOF, the NRC, and state and local operations centers.

The staff did not find **how** reliable communications will be provided for communication with TSC personnel and personnel in other emergency response facilities.

Describe **how** the HSIs give personnel information needed to provide reliable voice communications facilities to the control room, operations support center, the EOF, the NRC, and state and local operations centers.

### 18-94

NUREG-0711, Criterion 8.4.4.3(5) states in part that "the applicant should describe how the HSIs allow all Technical Support Center (TSC) personnel to complete their assigned tasks with unhindered access to alphanumeric and/or graphical representations..."

The HD IP, Section 4.2.8, "Central Facilities," lists the method used to design the TSC. Item 10 in this section lists acceptance criteria; however, the specific criteria in NUREG-0700 are not identified. It is not clear to the staff which acceptance criteria in NUREG-0700 apply, and if the same acceptance criteria apply to the main control room as the TSC.

Clarify which criteria in NUREG-0700 will be used as acceptance criteria for Item 10(b) in the HD IP, Section 4.2.8, for the TSC, remote shutdown room and main control room.

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### 18-95

NUREG-0711, Criterion 8.4.4.3(7) states that the applicant should describe how HFE was incorporated into the TSC design to ensure that personnel easily understand and use the HSIs.

The response to RAI #54-7963, Question #18-5, (ADAMS Accession No. ML15254A492) dated September 11, 2015, stated that the guidance provided in NUREG-0696, "Functional Criteria for Emergency Response Facilities," and NUREG-0700, "Human-System Interface Design Review Guidelines" will applied to the design of the TSC and EOF instead of the full-scope described in NUREG-0711, since NUREG-0696 and NUREG-0700 provide guidance specific to the design of emergency response facilities and human system interfaces, respectively.

However, the second sentence in the HD IP, Section 4.1.4.18, "Technical Support Facility," states something that seems to the staff to possibly contradict the RAI response. Also, because the HD IP, Section 4.2.8, "Central Facilities," provides a design method for the control room and the TSC, it appears to the staff that the same HFE standards apply to the design of both facilities.

Please clarify which HFE standards apply to the design of the TSC. Also, clarify if the displays in the TSC are replications of the control room displays and are therefore designed to the same HFE standards documented in the APR1400 detailed design documentation.