

KHNPDCDRAIsPEm Resource

From: Ciocco, Jeff
Sent: Tuesday, December 22, 2015 12:17 PM
To: apr1400rai@khnp.co.kr; KHNPDCDRAIsPEm Resource; Harry (Hyun Seung) Chang; Andy Jiyong Oh; Erin Wisler
Cc: Pieringer, Paul; Junge, Michael; Ward, William; Lee, Samuel
Subject: APR1400 Design Certification Application RAI 353-8372 (18 - Human Factors Engineering)
Attachments: APR1400 DC RAI 353 COLP 8372.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.

18-83: 90 days
18-84: 90 days
18-85: 60 days
18-86: 90 days
18-87: 60 days
18-88: 60 days

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

Thank you,

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Subject: APR1400 Design Certification Application RAI 353-8372 (18 - Human Factors Engineering)
Sent Date: 12/22/2015 12:17:09 PM
Received Date: 12/22/2015 12:17:11 PM
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Options

Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
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REQUEST FOR ADDITIONAL INFORMATION 353-8372

Issue Date: 12/22/2015
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: NUREG-0711 Section 8.4.3 HFE Design Guidance for HSIs

QUESTIONS

18-83

Regulations: 10 CFR 52.47(a)(8) and 10 CFR 50.34(f)(2)(iii)

Regulatory guidance: NUREG-0700, Rev. 2, "Human-System Interface Design Review Guidelines," Section 1.1, "General Display Guidelines"

Evaluation: Section 1.1 contains general guidance and there were several criteria that were not addressed.

Question: Explain where the following guidance is captured within the style guide [APR1400-E-I-NR-14012, Rev. 0, "Style Guide"] (or other design guidance documents).

- 1.1-6 Levels of Abstraction – Displays should provide information at the levels of abstraction necessary to meet the operators' requirements relative to their task goals.
- 1.1-8 Understandability of Higher-Level Information – The methods by which lower-level data are analyzed to produce higher-level information and graphical elements should be understandable to users.
- 1.1-9 User Verification of Higher-Level Information – Operators should have access to the rules or computations that link process parameters and graphical features, and to an explanation of how the information system produces higher-level information.
- 1.1-10 Alert to Higher Level Displays – While viewing secondary (lower-level) displays, a perceptual (audible or visual) cue should be provided by the system to alert the user to return to the primary (higher-level) display if significant information in that display requires user attention.
- 1.1-13 Display of Future Status – The information system should support the user's ability to project future states of the system when this is required to safely operate the plant.
- 1.1-53 Display Area – Sufficient viewing area should be provided to display all important information so that repetitive transitions between displays are not required.
- 1.1-54 Predefined Displays – Predefined information groupings should be available.

18-84

Regulations: 10 CFR 52.47(a)(8) and 10 CFR 50.34(f)(2)(iii)

Regulatory guidance: NUREG-0700, various sections

Evaluation: Some sections of NUREG-0700 are reflected completely, in others it appears there has been selective use of the guidance. In many cases the staff was able to recognize redundancy/similarity with other criteria that supported the selective use of the criteria. In other cases we did not determine the basis for omitting the guidance.

Question: Please provide a summary of the logic used to omit selected criteria from NUREG-0700. For example, criteria 1.2.4-9, "Coding Segmented Bar Charts," and 10 "Ordering Data in Segmented Bars";

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and criteria 1.2.5-21, 22 and 23, deal with bar charts, curve graphs, and scatterplots. These display types appear to be used as there are numerous other criteria addressing their presentation yet these selective few are missing. Similarly, the following NUREG-0700 sections are not addressed:

- Hypertext – Criteria 2.5.1.2-13 through 19
- Navigation features for large display pages – Section 2.5.1.3
- Automated actions – Section 2.5.7
- Managing information – Section 2.6

The staff is not advocating they be included. We would like to understand the methods you used for selecting criteria.

18-85

Regulations: 10 CFR 52.47(a)(8) and 10 CFR 50.34(f)(2)(iii)

Regulatory Guidance: NUREG-0700 Section 1.6.1 criterion 1.6.1-2 VDU contrast

Evaluation: Contrast ratio for the Large Display Panel and printers are addressed. This characteristic is not addressed for VDUs

Question: Explain why there is no specification on VDU contrast ratio.

18-86

Regulations: 10 CFR 52.47(a)(8) and 10 CFR 50.34(f)(2)(iii)

Regulatory Guidance: NUREG-0700, Section 2.1, "General User Input Guidelines"

Evaluation: Section 2.1 contains general user input guidance. Several criteria were not addressed.

Question: Explain how the following guidance is captured within the style guide (or other design guidance documents).

- 2.1-8 Availability of information
- 2.1-15 Indicating completion of processing
- 2.1-16 indicating control lockout
- 2.1-21 Entries distinct from test
- 2.1-26 Guidance information
- 2.1-28 through 32 on stacked entries
- 2.1-34 Displayed context
- 2.1-55 through 59 on default values
- 2.1-67 Consistent location of interface management controls
- 2.1-68 Location of display page navigation controls
- 2.1-69 Set-up of computer-based systems
- 2.1-70 Reminders for interrupted tasks
- 2.1-71 Access to suspended tasks
- 2.1-72 Entry of data separators and delimiters

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18-87

Regulations: 10 CFR 52.47(a)(8) and 10 CFR 50.34(f)(2)(iii)

Regulatory Guidance: NUREG-0700

Question: Please address the following specific issues

- Brightness is used to differentiate information in several applications but the staff did not find any guidance as to the relative difference between bright and normal as suggested by NUREG-0700, Criterion 4.2.6.2-5 – Brightness levels for VDU displays.
- Style guide direction in section 5.3.4.2, "Alarm Control Type," criterion a1 (automatic silencing) is contrary to NUREG-0700 Criterion 4.3.2-2 (manual silencing). Please provide the basis for the style guide direction. The style guide criterion says "after a specified time." What time period is being used?
- Style guide criteria associated with character height (2.4.1.1 b and c) appear to be less than the guidance provided in NUREG-0700 (criteria 1.3.1-4, 1.6.2-2, and 6.3.2-9). Provide the basis for the Character heights specified in section 2.4.1.1 of the style guide.

18-88

Regulations: 10 CFR 52.47(a)(8) and 10 CFR 50.34(f)(2)(iii)

Regulation: NUREG-0700 Chapter 11, "Workstation Design"

Evaluation: The KHNP Style guide only addresses control room ergonomic configurations for the male population (Chapter 6, "Workstation and Workplace Design")

Question: Address control room ergonomic configurations for the female population.



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