

AP1000DCDFileNPEm Resource

From: Adams II, Samuel L. [adamssl@westinghouse.com]
Sent: Monday, June 30, 2008 9:06 AM
To: David Jaffe
Cc: Perry Buckberg
Subject: FW: Human Factors RAI
Attachments: RAI-SRP18-COLP-11thru15.doc; RAI-SRP18-COLP-07thru10 (2).doc

Hi Dave,

I acknowledge receipt of the attached RAIs on SRP Section 18.

I will let you know as soon as possible if a clarification call is necessary.

Thanks.

Sam

From: David Jaffe [mailto:David.Jaffe@nrc.gov]
Sent: Thursday, June 26, 2008 1:52 PM
To: Adams II, Samuel L.
Subject: Human Factors RAI

Please acknowledge receipt of this RAI.

Hearing Identifier: AP1000_DCD_Review
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Subject: FW: Human Factors RAI
Sent Date: 6/30/2008 9:06:07 AM
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From: Adams II, Samuel L.

Created By: adamssl@westinghouse.com

Recipients:
"Perry Buckberg" <Perry.Buckberg@nrc.gov>
Tracking Status: None
"David Jaffe" <David.Jaffe@nrc.gov>
Tracking Status: None

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REQUEST FOR ADDITIONAL INFORMATION

AP1000 Design Certification revision 16

Chapter 18 Human Factors Engineering

Procedure Development RAI-SRP18-COLP-11

Bullets 7 and 9 of NUREG-0711, Section 9.4, give the acceptance criteria the staff uses to review an applicant's computer based procedures approach to procedure development. Interim Staff Guidance #5 (ISG 5), Digital Instrumentation and Controls, Computer-Based Procedures section gives additional review guidance to the staff on computer-based procedure systems and computer-based procedures.

The NRC staff reviewed APP-OCS-J1-020, Rev. A, "Computerized Procedure System Functional Requirements," at the Westinghouse Rockville office and developed the following requests for additional information.

General Review Criteria 2, in the Computer-Based Procedures Systems section of ISG 5, states that the procedure user should always be in control of the procedure system, and that the system should only accomplish a procedure automated step at the direction of the user.

In section 2 of technical report APP-OCS-J1-020, Rev. A, bullet 2, it states:

The Computerized Procedures System shall have the capability to be either user paced or computer paced. When user paced, the system shall not advance to a procedure step, a Note, Caution or Foldout Page item or a procedure unless instructed to do so by the user. When computer paced, the system shall advance to the next appropriate procedure step as long as plant process conditions are satisfied and an alternate pathway through the procedures has been specified, the system shall advance according to that path.

In Section 3.1.3, of APP-OCS-J1-020, it states:

The system will not advance to the next substep, or step, it will not respond to any parallel information violation, nor will it transition to a new step or procedure for any reason without the concurrence of the user.

Please clarify whether the system, when in its automated mode, takes advances with or without operator input. Also, please explain how the operator determines when the computer is in the automated mode or the user initiated mode.

Procedure Development RAI-SRP18-COLP-12

Criterion 3 of NUREG-0711, Section 9.4, states that a writer's guide should be developed to establish the process for developing technical procedures. Criterion 3 clarifies certain characteristics that the writers guide should include. This guidance in Criterion 3 can be applied to both computer-based procedures and paper-based procedures.

The staff reviewed APP-OCS-J1-020, "Computerized Procedure System Functional Requirements," APP-GW-GJP-100, "Writer's Guidelines for Normal Operating Procedures," and APP-GW-GJP-200, "Two-Column Format Procedures," at the Westinghouse office in Rockville. From the available writer's guides available for review and other technical reports, it is difficult to

determine whether the display format the operator sees on the main control room (MCR) visual display units (VDUs) is the same as the format the operator will view for the paper based procedures.

Please explain whether the format of the computer based procedures uses the same format as that which is in the reports mentioned above, or if there is a separate writer's guide, or criteria, specifically for the display formatting for the computer based procedures.

Procedure Development RAI-SRP18-COLP-13

In technical report APP-OCS-J1-020, Rev. A, "Computerized Procedure System Functional Requirements," Section 3.1.5, what is meant by GOOD, BAD, POOR, and TIMED OUT data? Please explain their differences.

Procedure Development RAI-SRP18-COLP-14

The second part of NUREG-0711, Section 9.4, criterion 7, states that an analysis of alternatives in the event of loss of computer based procedures should be performed and documented. It is not clear to the staff where this analysis has been documented, or if it has been performed. If documentation of this analysis exists please provide a detailed explanation.

Procedure Development RAI-SRP18-COLP-15

Interim Staff Guidance #5, Digital Instrumentation and Controls (ISG 5), states that computer-based procedure systems that call for the user to enter data should provide a method for data entry.

In the AP1000 computerized procedure system, are there any conditions for which the operator, or user, may be prompted to input data? If so, what method for data entry is used?

REQUEST FOR ADDITIONAL INFORMATION

AP1000 Design Certification revision 16

Chapter 18 Human Factors Engineering

Four areas of concern have been identified from the staff reviews of AP1000 DCD and its referenced documents. These areas require additional information from Westinghouse as stated below.

RAI-SRP18-COLP-07

Concern 1: The NRC staff requested documents that were referenced in various Westinghouse Technical Reports. These documents were referenced in NRC letters dated April 7 and April 17, 2008. Please state whether these documents, provided to the NRC staff at the Westinghouse Rockville office, were approved procedures vice unapproved drafts.

RAI-SRP18-COLP-08

Concern 2: Technical Reports contain significant numbers of secondary references. The staff requested these references to validate they had been completed in accordance with implementation plans and to verify regulatory guidance was implemented. Based on this usage, the staff requested that Westinghouse docket the information. In a phone call with Westinghouse the suggestion was made that the staff submit the questions they were trying to answer via a "Request for additional information" verses requesting the documents. This allows Westinghouse to decide whether they should excerpt the relevant information or submit the complete document on the docket. The information provided below provides the original document request followed by the associated questions that the NRC staff reviewers were trying to answer.

1. Please provide Document APP-OCS-J1-002, AP1000 Human System Interface Design Guidelines.

OR

- a. In accordance with NUREG-0711 section 8.4.5 first bullet,
 - Explain how generic HFE guidance was applied to APP-OCS-J1-002 . Provide references and examples of how this generic HFE guidance was used.
 - Explain how Westinghouse used their own design-related analyses and experience to develop the design guidelines. Provide examples.
 - Provide evidence that guidelines not derived from generic HFE guidelines are justified. Explain how these guidelines were justified. Provide examples.
 - Explain how the document has been tailored to reflect specific AP1000 design decisions so it addresses specific goals and needs of the HSI design. Provide examples.

- b. In accordance with NUREG-0711 section 8.4.5 second bullet
 - Demonstrate that the Design Guidelines address the scope of HSIs included in the design.
 - Explain how the guidelines address the form, function, and operation of the HSIs as well as environmental characteristics relevant to human performance. Provide examples.
 - c. In accordance with NUREG-0711 section 8.4.5 third bullet
 - Demonstrate the individual guidelines have been expressed in concrete, easily observable terms. List the 3 most abstract guidelines and provide evidence that the degree of abstractness does not challenge consistent implementation of the guideline.
 - Provide evidence that the guidelines are detailed enough to permit their use by design personnel to achieve a consistent and verifiable design.
 - d. In accordance with NUREG-0711 section 8.4.5 fourth bullet
 - How does the style guide user determine where and how HFE guidance is to be used in the overall design process?
 - Demonstrate how supplemental text such as graphical examples, figures, and tables are used to support the interpretation and comprehension of the design guidelines. Provide examples.
 - Provide evidence that the design guidelines can be easily understood by designers.
 - e. In accordance with NUREG-0711 section 8.4.5 fifth bullet
 - Explain how the form of the guidance ensures it is readily accessible and useable by designers.
 - Explain how the form of the guidance ensures the contents can be updated as the design matures.
 - Explain the use of basis documentation for the guidelines. How consistently is it used?
 - f. In accordance with NUREG-0711 section 8.4.5 sixth bullet
 - Explain how the style guide addresses future HSI modifications.
2. Please provide the following documents: APP-OCS-J1R-120, APP-OCS-J1R-100, APP-OCS-J1A-030, APP-OCS-J1R-110

OR

- a. In AP1000 DCD Rev 16, the applicant made substantial changes to the Operational Sequence Analysis (OAS)-2 description. Please compare the new plan to the 7 criteria in NUREG-0711 section 5.4 and illustrate how each criterion is met.
- b. AP1000 DCD Rev 16 deletes the detailed description of how work load analysis will be completed. Explain how workload analysis will be conducted within the OAS-2 methodology.
- c. Describe the methods used for analyzing the collected sequence information associated with the following issues identified in the DCD: 1)

- completeness of available information, 2) Time to perform tasks, 3) operator workload analysis, and 4) operational crew staffing
- d. In the AP1000 FSER (NUREG-1793) section 18.5.4, the staff identified COL action item 18.5-1 (FSER item 18.5.3-3) which states:

“The staff reviewed the applicant’s task analysis at an implementation plan level of detail; finished products to complete the element were not available for review, but the methodology for conducting a complete task analysis was evaluated. The COL applicant will use this methodology to conduct a complete HFE task analysis after design certification.”

- Having completed the function based task analysis, please confirm no additional site specific activities are required.
- Demonstrate that the methodology used to perform the Function-based Task Analysis effectively implemented the Function-Based Task Analyses description contained in AP1000 section 18.5.2.1.
- Provide examples of how the Function-based Task Analysis fulfilled the purpose of obtaining:

A completeness check on the availability of needed indications, parameters, and controls and,

. Input to the specification and layout of functional displays

3. Procedure Development: Please provide WCAP-14645-NP, Rev. 3 “Human Factors Engineering Operating Experience Review Report for the AP1000 Nuclear Power Plant” and APP-OCS-T2R-020, Rev. 0 “AP1000 Engineering Tests Phase 1 Test Report.”

OR

- a. In accordance with NUREG-0711, Section 9.4, Criteria (7):
- Provide a description of the analysis that was done to determine the impact of providing computer-based procedures (CBPs). Please give all justifications considered.
 - Specify how using a computer-based procedures approach would improve procedure utilization and reduce operating crew errors as opposed to using a paper based procedure approach. Please give all justifications considered.
 - Provide the analysis of alternatives to the CBPs that was done for the event of loss of CBPs. Please give all alternatives identified.
- b. In accordance with NUREG-0711, Section 9.4, Criteria (9):
- Provide a description (or descriptions) of the process by which the operators, by physical means, access and use the CBPs during operational events. Please include an explanation of the ease by which the operator can access the correct procedures within the CBP system.
 - Provide a description (or descriptions) of the process by which the operators, by physical means, access and use the paper-based procedures during operational events. The process should address how

the procedures are stored, the ease of operator access to the correct procedures, and laydown of hard-copy procedures for use in the control room, remote shutdown facility, and local control stations.

- iii. Provide a description of how the HFE design process was evaluated, with regards to the physical means by which the operators access and use the CBPs.
4. NUREG-0711, Section 9.4, Criteria (3), states that a writer's guide should be developed to establish the process for developing technical procedures within the scope of the Procedures Development element. Does the writer's guide for Two-Column Format Procedures (APP-GW-GJP-200), describe the process to create both the paper-based procedures and the computer-based procedures?

If the Two-Column Format writer's guide is not the same process used to develop the computer-based procedures, please explain what process was used.

5. Please provide an explanation of the computer-based procedure system using the following seven criteria:
 - a. Interaction between the operator and the computer-based procedure;
 - b. Interaction between the computer-based procedure system and the control and process systems;
 - c. The use of plant data, if any, in the computer-based procedure system;
 - d. The use of automation, if any, in the computer-based procedure system;
 - e. The use of operating controls, if any, in the computer-based procedure system;
 - f. Presentation of procedures on the computer-based procedure system, and
 - g. Implementation of a backup system to the computer-based procedure system

RAI-SRP18-COLP-09.

Concern 3: From a program overview perspective, the staff determined that revision 16 of Chapter 18 of the AP1000 DCD makes numerous changes that can be characterized as closing or deleting COL information items based upon work performed by Westinghouse. This work in support of the DCD modifications is described in Technical Reports (TR) provided for staff review. Most of the TRs indicate that partial progress has been made and the work to address the action items is ongoing. Specifically, this is the case for COL information items in the following sections of Rev 16 of the DCD: 18.2.6 (HFE Program), 18.7.1 (HRA-HFE Integration), 18.8.5 (HSI Design), and 18.11.1 (HFE V&V).

The staff's review of the Westinghouse strategy for COL action item closure raised the question of whether closing an action item prior to completion could result in an incomplete DCD and/or implementation challenges for COL applicants referencing the DCD. The staff also noted that the original intent of the action item was to verify the COL applicant completed the HFE actions and incorporated site-specific information.

The staff notes that while Westinghouse has made considerable progress in implementing the HFE program plan and associated HFE activities, many of these activities are not complete. The staff's position is that closure of COL action items based on partial progress is not sufficient. Westinghouse should complete the design activities described in the AP1000 HFE program plan and submit the completed design for staff

review as part of the DCD amendment. This should include all work through integrated system validation. Submitting the completed design will allow closure of all design-related COL items and related ITAAC/DAC. Please provide the following information:

1. COL action item 18.2-1 states the COL applicant referencing the AP1000 certified design is responsible for the execution of an NRC-approved HFE program. DCD rev. 16 section 18.2.6.1 states, "No additional work is required by the Combined License applicant to address the Combined License information requested in this subsection." Table 1.8-2 Sheet 12 of 13 indicates that action is still required by the COL applicant. Please resolve this inconsistency.

Design commitment 3 from ITAAC table 3.2-states an evaluation will be performed of the "implementation of the HSI design." Explain why completion of implementation plan documents and evaluation of these documents is equivalent to an evaluation of the "implementation of the HSI design."

The NRC staff determined that the ITAAC should remain unchanged and that the COL can be closed because it is redundant to the ITAAC. In addition to verifying completion of the design documents listed in the acceptance criteria, the "evaluation of the implementation of the HSI design" should use the requirements in these documents as acceptance criteria in evaluating the as built HSI design as reflected in installed equipment. The report referenced in the ITAAC acceptance criteria should document the results of these activities.

2. Design Commitment 1, ITAAC Table 3.2-1 states the integration of human reliability analysis with HFE design is performed in accordance with the implementation plan. COL information item 18.7-1 states the Combined License Applicants referencing the AP1000 certified design will address the execution and documentation of the human reliability analysis/human factors engineering integration implementation plan that is presented in Section 18.7. The staff determined that neither of these actions is complete as described in the paragraph below. Please provide the additional information needed to complete these action items.

WCAP-14651 (Revision 2, "Integration of Human Reliability Analysis with Human Factors Engineering Design Implementation Plan") was reviewed and approved as a supporting document for DCD revision 15. Sections 2 through 5 describe the four major aspects of the plan.

Section 2 – Probabilistic Risk Assessment (PRA)/HRA identification of critical human actions and risk-important tasks

Section 3 – Task Analyses for critical human actions and risk-important tasks

Section 4 – Re-examination of critical human actions and risk-important tasks

Section 5 – Validation of HRA performance assumptions

The staff used this implementation plan in addition to applicable regulation to review WCAP-16555 (Revision1, "AP1000 Identification of Critical Human

Actions and Risk Important Tasks,"). WCAP-16555 was provided by Westinghouse to the NRC to close COL information item 18.7-1. In WCAP-16555, the applicant provided the results of an evaluation of the AP1000 PRA/HRA to identify the critical human actions and risk important tasks for plant operation.

The staff determined that WCAP-16555 only addressed the information of Section 2 of the WCAP-14651 implementation plan. Sections 3, 4, and 5, of WCAP-14651 were not addressed in WCAP-16555.

3. COL action item 18.8-1 states that the COL applicant is responsible for the executing and documenting of the human system interface design implementation plan. AP1000 DCD rev 16 states that Westinghouse will complete this work. Using section 8.8 of the AP1000 DCD as the implementation plan, NRC staff verified the products listed in TR-82 were developed in accordance with the plan, were of sufficient detail to support a standardized design approach and contained appropriate information from regulation and the applicant's programmatic design guidance. Design specifications have not been completed for all the HSI systems therefore this COL action item remains open.

Please provide a schedule for completion of the remaining products.

4. COL action item 18.5-1 states the COL applicant will use the methodology described in the DCD to conduct a complete HFE task analysis after design certification. DCD rev. 16 section 18.5.4.1 states, "No additional work is required by the Combined License applicant to address the Combined License information requested in this subsection." Table 1.8-2 Sheet 12 of 13 indicates that action is still required by the COL applicant. Please resolve this inconsistency.

The staff determined that a function based task analysis has been completed and appropriately implements the methodology described in the DCD. The OCA has NOT been completed. The staff concluded that the COL action item should remain open. Please provide a schedule for completing the remaining task analyses.

ITAAC design commitment Evaluation of Design Commitment 2, ITAAC Table 3.2-1 requires the Task analysis is performed in accordance with the task analysis implementation plan.

Inspection, Tests, Analyses: An evaluation of the implementation of the task analysis will be performed.

Acceptance Criteria: AP1000 DCD Tier 1, Design Commitment 2 from ITAAC Table 3.2-1, was changed to delete acceptance criteria associated with completion of a function-based task analysis. TR-81 ("Closure of COL Information Item 18.5-1, Task Analysis," APP-GW-GLR-081 rev 1, May 2007) states that this Design Commitment change reflects the completion of the AP1000 function-based task analysis.

Evaluation: The task analysis consists of a function based task analysis and an Operational Sequence Analysis (OSA). The staff reviewed the Function based

task analysis results and concludes this half of the task analysis is complete. The staff reviewed the evaluation contained in TR-81 and determined it was incomplete. It did not evaluate the "*implementation* of the task analysis." The staff expects that, in addition to providing a summary of results, the evaluation of implementation would include verification that the task analysis results have been appropriately implemented into the HSI design, procedures, and training programs. The staff concludes the ITAAC acceptance criteria should not be changed until the evaluation of task analysis implementation is complete.

Please provide the supporting documentation described above.

5. In the AP1000 FSER (NUREG-1793) section 18.11.4, the staff identified COL action item 18.11-1 (FSER item 18.11.4-1) which states. Combined License applicants referencing the AP1000 certified design will address the development, execution and documentation of an implementation plan for the verification and validation of the AP1000 human factors engineering program. The programmatic level description of the AP1000 verification and validation program presented and referenced by Section 18.11, will be used by the Combined License applicant to develop the implementation plan.

The NRC staff determined that COL information item 18.11-1 is redundant to the existing Design Commitments 4 and 5, ITAAC Table 3.2-1 and can be closed. However, ITAAC Design Commitment 4 creates the V&V implementation plan needed to verify implementation of NUREG-0711 criteria below the programmatic level. The staff believes this implementation plan level review needs to be completed to approve DCD revision 16. TR-84 section 2.4.3 states that the detailed implementation plan is expected to be available for NRC staff review during the first AP1000 COL Application review. The Bellefonte submittal has been received and is in review but to date we have not received the V&V implementation plan. Since an approved COL applicant submittal is contingent on an approved DCD, please provide the completed verification and validation implementation plans as described in WCAP 15860, including:

- HSI Task Support Verification
- HFE Design Verification
- Integrated System Validation
- Issue Resolution Verification

RAI-SRP18-COLP-10

Concern 4: NUREG-0800, Section 13.5.2.1, states that the procedure development program, as described in the PGP for EOP's, which is to include the plant-specific technical guidelines and writers' guides, and a description of the EOP verification and validation program and the program for training operators on EOP's, and should be submitted to the NRC at least three months prior to the date the applicant plans to begin formal operator training on the EOP's. What is the schedule for development and submittal of the PGP?