

January 13, 2010

MEMORANDUM TO: Eileen M. McKenna, Chief
AP1000 Projects Branch 2
Division of New Reactor Licensing
Office of New Reactors

FROM: Patrick Donnelly, Project Manager
AP1000 Projects Branch 2 /RA/
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: SUMMARY OF A PUBLIC MEETING WITH WESTINGHOUSE
ELECTRIC COMPANY REGARDING AP1000 HUMAN FACTORS
ENGINEERING INTEGRATED SYSTEM VALIDATION PLAN (APP-OCS-
GEH-320) IN ROCKVILLE, MARYLAND ON DECEMBER 9, 2009

The U.S. Nuclear Regulatory Commission (NRC) held a Category I public meeting on December 9, 2009. The Office of New Reactors (NRO) met with Westinghouse Electric Company (Westinghouse) representatives to discuss issues with the AP1000 documentation submitted as part of their design certification amendment (DCA). Specifically, the participants discussed the technical issues related to the Integrated System Validation Plan, APP-OCS-GEH-320 (ISV-320). The meeting was held at NRC headquarters in Rockville, Maryland.

The purpose of this meeting summary is to briefly describe the meeting, its participants, and to delineate the results. There were 12 participants in attendance at the meeting. See Enclosure 1 for the list of attendees.

Background

In July and August 2009, a total of 32 request for additional information (RAIs) were sent to Westinghouse on ISV-320 (RAI-SRP18-COLP-22 through -53). Responses were received in September, October and November 2009. After reviewing the RAI responses, contractors from Brookhaven National Lab (BNL) assisting the staff with the review had follow-up questions on 12 of the responses (-19, -22, -23, -24, -26, -28, -31, -32, -33, -35, -49 and -52). The questions were provided to Westinghouse prior to the meeting with the exception of RAIs -22, -23 and -26, which were provided at the meeting. RAIs -19 and -31 were discussed during a phone call on December 7, 2009. The remaining questions were addressed at the meeting. All 12 questions were sent to Westinghouse as RAI revisions following the public meeting for formal response. See Enclosure 2 for the list of questions.

Enclosures:
As stated

cc w/encl: See next page

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Discussion

Following the introductions of the attendees at the meeting, the NRC Project Manager noted and confirmed with all participants, that there were no members of the general public in attendance at the meeting. None of the information provided and discussed at the meeting was proprietary and the meeting remained open for its duration.

Conclusion

In general, the staff found the meeting to be effective and necessary to understand Westinghouse's approach to resolve these RAIs. The following is a summary of the main discussion points and decisions at the meeting.

- 1) Due to the iterative nature of parts of the Integrated System Validation Plan (ISVP), while also having portions that are required to be Tier 2*, the ISVP will be split into two separate documents. The APP-OCS-GEH-320 document will be Tier 2*, the APP-OCS-GEH-321 document will contain scenario specific details and will be updated as necessary and included as a general reference within the Design Control Document (DCD).
- 2) All the Tier 2* references listed in the DCD, Tier 1, Table 1-1 are specified as not expiring at first full power operation. The NRC staff noted that this is not required, nor is it appropriate. Westinghouse agreed to change all the Chapter 18 references to expire at first full power operation. A list with additional Tier 2* material, which reflects the new implementation plans completed since Revision 15 of the DCD, was provided to Westinghouse for inclusion in Table 1-1 and within Chapter 18 text as appropriate in Revision 18 to the DCD. The APP-OCS-GEH-320 document is included in this list.
- 3) Revision 16 of the DCD, Tier 1, Table 3.2-1 contains Inspection, Test, Analysis and Acceptance Criteria (ITAAC), one column of which is labeled Design Commitments. Design Commitments 1 through 4 were deleted from Revision 17 of the DCD, and the remaining Design Commitments were renumbered accordingly, making Design Commitment 5 from Revision 16 of the DCD, Design Commitment 1 in Revision 17. In Revision 17 under Design Commitment 1, Design Commitment 3 is referenced in the acceptance criteria column. However, this reference is no longer relevant due to the deletion and renumbering of the design commitments. Westinghouse agreed to remove the reference, and the NRC staff agreed that the acceptance criteria adequately described the purpose of the ITAAC without the reference.
- 4) Revision 16 of the DCD, Tier 1, Table 3.2-1, Design Commitment 4, under Acceptance Criteria, Westinghouse commits to providing a report that concludes the Human Factors Engineering (HFE) verification and validation implementation plan was developed as described in the programmatic level description. This design commitment was deleted from Revision 17 of the DCD; however a report does not exist as required. Westinghouse agreed to provide a report to fulfill this requirement within the acceptance criteria as described in Revision 16. RAI-SRP18-COLP-23 R1 was created to track this commitment.

5) Westinghouse agreed to provide the RAI responses in January 2010, and both the ISVPs before the end of February 2010. Westinghouse agreed to provide at least three observer guides along with all the scenario descriptions in the APP-OCS-GEH-321 submittal. The NRC staff stressed that the scenario descriptions and the observer guides must be sufficiently diverse and complete to make a safety finding given the size of the sample.

6) The staff outlined their plans to conduct audits of specific parts of the HFE Design when the designs are sufficiently complete. The audits would be similar in scope to the computer based procedure audit conducted in September 2009. Westinghouse agreed to provide a schedule of when they expected design elements to be sufficiently complete to support these audits.

Enclosed with this summary are the materials relevant to this meeting. The enclosed documents are as follows: (1) meeting attendees list (2) table of questions discussed.

Enclosure:
As stated

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| OFFICE | LA:NRO/NWE2 | PM:NRO/NWE2 | BC:NRO/NWE2 |
| NAME | RButler | PDonnelly | EMcKenna |
| DATE | 01/12/2010 | 01/12/2010 | 01/13/2010 |

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Meeting Attendance List

| <u>Name</u> | <u>Organization</u> |
|------------------|---------------------|
| Patrick Donnelly | NRC |
| Eileen McKenna | NRC |
| Paul Pieringer | NRC |
| John O'Hara | BNL |
| Jim Higgins | BNL |
| Bob Seelman | Westinghouse |
| Zhonghai Li | Westinghouse |
| Julie Reed | Westinghouse |
| Paul Hunton | Westinghouse |
| Santiago Alvarez | Westinghouse |
| Bob Hirmanpour | NuStart |
| James Flowers | Southern Nuclear |

**Table of Questions Discussed at AP1000 Chapter 18 Public Meeting
December 9, 2009**

| RAI | Supplemental Question |
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| RAI-SRP18-COLP-19 | With respect to OSA-2, some clarification is needed. The response indicates that “the worst case scenario is defined as the scenario in which every possible step is involved.” What does this mean? |
| RAI-SRP18-COLP-22 | <p><u>Technical Support Center (TSC):</u> Westinghouse notes that the extent of the HFE design verification will be limited to the design aspects of the TSC that are within the scope of Westinghouse. Please provide what those “design aspects” are or give a reference that contains that information.</p> <p><u>Risk Important Maintenance, Test, and Inspection Human Actions (RIMTIS HAS):</u> Westinghouse states that a subset of the “Representative MTIS Activities for Risk-Significant Components” (WCAP-16555, Section 3.3, Reference 3) will be included in a number of the scenarios in ISV. Other MTIS activities in Table 3.3-1 and Table 3.3-2 will be incorporated as scenario complications. Any MTIS activities in WCAP-16555, Section 3.3, which cannot be reasonably incorporated into an ISV scenario will be subject to HFE analysis by another means. This may include assessment against HFE design guidelines, task walkthrough, maintenance trails utilizing manufactured equipment or part of the HFE design verification at plant startup (Reference 4), as appropriate.</p> <p>This is an acceptable approach. Please provide a table that shows which of the MTIS items will be addressed by each of the noted V&V methods.</p> <p><u>Validation of HRA Assumptions:</u> The ISV does appropriately verify that the RIHAs can be performed within the time window. However, documentation of actual times during the scenarios and then feeding that information back to the HRA to see that assumptions were correct and that recovery and HEPs were appropriately treated seems to be missing.</p> <p>Please specifically address how this feedback will be accomplished.</p> |
| RAI-SRP18-COLP-23 | DCD Tier I contains V&V ITAAC in Table 3.2-1, #4 and #5. ITAAC #4 states in part: “A report exists and concludes that the HFE V&V implementation was developed in accordance with the programmatic level description.” WCAP-16769-P provides the Westinghouse logic for closing ITAAC #4. WCAP-16769P does not state such conclusions, as specified in the ITAAC, although it seems as if that would be the appropriate place to do so. Please provide the report specified by the ITAAC. |

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| RAI-SRP18-COLP-24 | The response discusses 4 Phases of simulator testing. Please clarify the purposes of Phases 3 and 4. Are either of these the ISV itself or are they preliminary to the ISV? Also, the ISV Plan indicates that “the simulator will satisfy general requirements of Sections 3 and 4 of ANSI/ANS-3.5-1998.” Please describe how the simulator will meet the requirements of ANSI/ANS 3.5, Section 4.2.1, “Physical Fidelity and Human Factors.” |
| RAI-SRP18-COLP-26 | WCAP-15860, Section. 4.9, Subjects, states that “validation crews will consist of currently qualified operating crews, as adjusted in number to man the AP1000 control room for conditions of minimum and maximum staffing.” TR-52, AP1000 MCR Staff Roles and Responsibilities, defines the minimal and maximum crews, but the crew size in the ISV does not fully agree with that of TR-52. TR-52 states the minimal crew size will be 1 RO, 2 SROs, and 2 AOs. Also it notes that the STA role will be filled by one of the available SROs, not by a dedicated individual. TR-52 also defines two other staffing levels, one with an added unit supervisor and a maximum staff level. Most of the ISV scenarios (1 to 19) will be done with a staff of 2 Ros, 1 SRO, and 1 STA, while other scenarios (20 to 29) will be done with 2 ROs and 1 SRO. The ISV does not address at all the maximum crew as defined in TR-52. Please address the apparent conflicts in staffing levels between the various Westinghouse documents. |
| RAI-SRP18-COLP-28 | Are there any high level criteria that can be stated as requiring a retest, such as those listed in Section 6.2.1 of the ISV Plan? The response indicates that each scenario will be run three times. If a trial fails, the human engineering deficiency (HED) resolution process is conducted and design changes may be implemented. Independent verifiers will determine if retesting is necessary. It remains unclear what the actual criteria are for determining that the design passes for a given scenario. And it seems as if there may be no retest even if the high-level acceptance criteria from Section 6.2.1 of the ISV Plan are not met. For example, suppose a scenario has one pass and two failures. Each of the two failures results in design changes to resolve the HEDs identified. If the independent verifiers determine that no additional testing is necessary, is the design considered validated for that scenario even though two out of three scenarios were failures? Please clarify how you determine that testing of a particular scenario is successfully completed. Also please address actions when the acceptance criteria in Section 6.2.1 are not met for a given scenario. Lastly, please define “defense-in-depth systems” as used in the discussion of Priority 1 HEDs. |

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| RAI-SRP18-COLP-31 | NRC requests at least 3 scenarios be fully complete including the observer guides. Does the revision schedule mean that the ISV plan will not be Tier 2*? WEC should also clarify how revisions to the ISV plan (made after the NRC review is completed for design certification of Rev. 17 of the DCD) will be made available to NRC for their review. |
| RAI-SRP18-COLP-32 | The response identifies five tasks derived from OSA-2 task analyses will be included in the ISV. However, additional information is needed to close this RAI: A. how were the tasks selected (what criteria were used to determine their inclusion in ISV) B. does the addition of these tasks require additional scenarios C. is the performance of these tasks part of the P/F measures or the diagnostic measures? Please provide this information. |
| RAI-SRP18-COLP-33 | The response indicates that the RIHA behaviors to be measured are “the actions identified by the procedures to address the conditions of the scenario.” What does this statement mean? Will all actions specified by the procedure be measured? Will each of the behaviors be categorized as P/F criteria? Please provide these clarifications. The response also indicates that Revision C of the plan will contain an example of a detailed observer guide for at least one ISV scenario. The staff does not consider a single guide is sufficient to provide reasonable assurance that RIHAs are being properly assessed. |
| RAI-SRP18-COLP-35 | The response clarified the last part of the RAI concerning use of the same questionnaires operators and observers by indicating that the questionnaire will contain only those questions appropriate to the person filling it out. The response did not completely address the staff’s question about measurement characteristics. The response mixtures measuring approaches, such as questionnaires and debriefing, and the performance measures themselves: such as workload. For example, how does the statement: “In ISV, a post-test questionnaire will be given to the operators and observers in order to investigate specific areas of interest and to assess workload, situation awareness, team work, and goal achievement” constitute construct validity for any of the performance measures listed? The staff expects the discussion of measurement characteristics to focus on the aspects of performance being measured: e.g., plant performance, task performance, situation awareness, etc. We recognize that the means of collecting data on the performance measures, such as by way of a questionnaire, is applicable to some of the specific characteristics, such as intrusiveness. Please provide information pertaining to applicable measurement characteristics for the aspect of performance being measured. |

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| RAI-SRP18-COLP-49 | <p>WEC specified in the response OER-identified tasks that were found to be difficult. These will be incorporated into the ISV. Use of administrative procedures will also be incorporated. Tasks, as will communications between the MCR and offsite. The situational were addressed in the response, but there are two followup areas associated with these.</p> <ol style="list-style-type: none"> 1. Please clarify the discussion of how environmental factors are addressed. 2. Please clarify why fatigue/circadian factors are not addressed. For example, isn't it possible to run some scenarios during the "graveyard" shift? |
| RAI-SRP18-COLP-52 | <p>One aspect of the ISV of the RSW is that it will include a "mock-up of the RSW panel switches." DCD Section 7.4.3.1.1 states that the RSW includes dedicated non-safety controls that provide the minimum inventory of controls listed in Table 18.12.2-1. These would appear to be the same dedicated controls that are in the MCR and hence in the simulator. Why are these simulator controls not used for this scenario rather than an additional mock-up that may not be functional?</p> |