US-APWRRAIsPEm Resource

From: Buckberg, Perry
Sent: Wednesday, February 05, 2014 10:47 AM
To: 'us-apwr-rai@mhi.co.jp'; US-APWRRAIsPEm Resource
Cc: Lee, Samuel; Ward, William; Jung, Ian; Nguyen, Khoi
Subject: US-APWR Design Certification Application RAI 1076-7368 (07.09 - Data Communication Systems)
Attachments: US-APWR DC RAI 1076 ICE2 7368.pdf

MHI,

The attachment contains a 'Data Communication Systems' related request for additional information (RAI). This RAI was sent to you in draft form on February 3, 2014 resulting in no need for clarification. Your licensing review schedule assumes technically correct and complete responses when the response is issued.

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

Thanks,

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REQUEST FOR ADDITIONAL INFORMATION 1076-7368

Issue Date: 2/5/2014

Application Title: US-APWR Design Certification - Docket Number 52-021

Operating Company: Mitsubishi Heavy Industries

Docket No. 52-021

07.09 - Data Communication Systems

QUESTION 07.09-27:

Background

The staff issued RAI 992-6999, Question 07.09-26 requesting the applicant to address the compliance with GDC 24 and IEEE Std. 603-1991. In summary, the staff requested the applicant to provide the following:

1. Sufficient evidence associated with the HFE full scope simulator testing or a quantative analysis to demonstrate that the use of operational visual display unit (O-VDU) to operate safety equipment enhances the performance of the safety function.

2. An ITAAC that adequately verifies testing for normal and abnormal data transmission conditions for all non-safety to safety interfaces.

The applicant responded to this RAI in two parts:

Response Part 1:

In the RAI response Part 1, dated August 26, 2013 (ML13240A040), the applicant stated, in parts, that the full scope simulator testing with U.S. operators was performed to show reduced time required and improved situation awareness when operators managed accident scenarios using O-VDUs, compared to the same accident management using only Safety-VDUs (S-VDUs).

New Appendix I of MUAP-07004 shows the results of time required analysis using operational sequence diagram patterns for the operation of a main steam isolation valve, which is one of typical risk-important and credited operator actions in the safety analysis, and also performed in normal operation for plant shutdown. The results show that the time required to complete these actions is reduced by almost half using only O-VDUs for both safety-related and non-safety monitoring and controls, compared to using both O-VDUs and S-VDUs.

In conclusion, the applicant stated that the reduction of response time and operator's workload by utilizing O-VDUs to control both safety-related and non-safety systems will contribute to plant safety.

Response Part 2:

In the RAI Response Part 2, dated November 1, 2013 (ML13308C479), the applicant stated, in parts, that regarding manual controls of safety-related components from O-VDUs, the following functions will be verified by existing ITAAC to ensure normal data transmission for manual operations from O-VDUs:

(1) Manual operations of the safety-related components from O-VDUs

(2) Priority logic between S-VDUs and O-VDUs (i.e., overrides of O-VDU by S-VDU)

(3) Priority logic between safety signals and O-VDUs (i.e., overrides by safety signal)

(4) Disable manual operations of safety-related components from O-VDUs by safety-related disable switch on S-VDUs

Also, the applicant proposed the addition of new acceptance criteria 6.iii to Tier 1, Table 2.5.6-1, ITAAC #6 to verify that the communication processors used for the DCS can mitigate all the design-basis communication faults and technical report MUAP-07005-P was revised to include an appendix that documents the design-basis communication faults analyses.

Staff Evaluation

The staff evaluation of the response to RAI 992-6999, Question 07.09-26 is summarized as follow:

1. Time to complete an action is generally not accepted as a direct measure of safety improvement. However, it can be used to help determine that an action can be reliably performed within the analysis limits, which in turn is used to support a safety conclusion. Therefore, the staff found that the Response Part 1 is reasonable and acceptable.

2. The staff found that the Response Part 2 is not fully acceptable for the following reasons:

- On Page 07.09-3 of the response, the applicant stated that "The tests of the as-built PSMS [safety systems] as described in ITAAC#4 of Table 2.5.1-6 will be conducted to demonstrate that all normal data transmission conditions. These test results will adequately demonstrate that the DCS can mitigate the design-basis communication faults results in abnormal data transmission conditions, and can perform all required normal data transmission conditions from all non-safety systems to PSMS." In this statement, the first sentence is incomplete and the second sentence is not clear. It is not clear how the result of ITAAC#4 of Table 2.5.1-6, which requires tests to be performed to verify normal data transmission, can be used to demonstrate that the DCS can mitigate the design-basis communication faults results in abnormal data transmission conditions.

- The Tier 1, Table 2.5.6-1, ITAAC #6 proposed acceptance criteria 6.iii, is not adequate to address the staff request. There is no design commitment made to demonstrate that all possible design-basis communication faults are identified and mitigated. In addition, the proposed ITAAC does not call for performing any tests (or type tests) for verifying this design commitment.

Follow-up RAI:

The staff found that the response is partially unacceptable and in this follow-up RAI requests the applicant to provide the following:

1. Explanation of the statement in the Part 2 response to RAI 992-6999, "The tests of the as-built PSMS [safety systems] as described in ITAAC#4 of Table 2.5.1-6 will be conducted to demonstrate that all normal data transmission conditions. These test results will adequately demonstrate that the DCS can mitigate the design-basis communication faults results in abnormal data transmission conditions, and can perform all required normal data transmission conditions from all non-safety systems to PSMS." In this statement, the first sentence is incomplete, and the second sentence is not clear how the result of ITAAC#4 of Table 2.5.1-6, which requires tests to be performed to verify normal data transmission, can be used to demonstrate that the DCS can mitigate the design-basis communication faults results in abnormal data transmission conditions.

2. A revision of ITAAC#6 or a new ITAAC to address the staff concern as discussed in the second bullet of Part 2 of the Staff Evaluation section above. This ITAAC should include (a) design commitment, (b) inspections, tests, analyses, and (c) acceptance criteria. The design commitment section should at least clearly state that digital communication independence is achieved by communication processors that can mitigate all identifiable design-basis communication faults. The inspections, tests, analyses section should include tests (or type tests) being performed for each design-basis communication fault.

3. A description in Section 7.9 of DCD Tier 2 of the design-basis communication faults and a reference to technical report MUAP-07005-P for the details.