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August 24, 2011

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-11275

Subject: MHI's Responses to US-APWR DCD RAI No. 777-5776 REVISION 3 (SRP 18.12)

Reference: 1) "Request for Additional Information No. 777-5776 REVISION 3, SRP Section: 18 - Human Factors Engineering, Application Section: 18.12" dated July 6, 2011.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Responses to Request for Additional Information No. 777-5776 Revision 3."

Enclosed are the responses to the RAI contained within Reference 1.

Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of the submittals. His contact information is below.

Sincerely,

Y. Ogata

Yoshiki Ogata,
General Manager- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

D081
NRO

Enclosure:

1. Responses to Request for Additional Information No. 777-5776 REVISION 3

CC: J. A. Ciocco
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Docket No. 52-021
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Enclosure 1

UAP-HF-11275
Docket No. 52-021

Responses to Request for Additional Information No. 777-5776
REVISION 3

August 2011

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

08/24/2011

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 777-5776 REVISION 3**
SRP SECTION:	**18. – HUMAN FACTORS ENGINEETING**
APPLICATION SECTION:	**18.12 – HUMAN PERFORMANCE MONITORING**
DATE OF RAI ISSUE:	**07/06/2011**

QUESTION NO. : 18-121

Criterion 4 of NUREG-0711, Section 13.4, Human Performance Monitoring Plan states "When actual conditions cannot be simulated, monitored, or measured, the available information that most closely approximates performance data in action conditions should be used."

MUAP-10014 Revision 0 indicates that simulation will be used as part of a change management plan. MUAP-07007-P Revision 3 indicates that simulation or actual performance data will be used to predict performance degradation. Neither document however indicates how the information will be prioritized to ensure that the data "that most closely approximates performance data in actual conditions."

Please clarify how the plan ensures that the best method will be selected.

ANSWER

MUAP-10014 Revision 0 will be revised to add the following description to the end of Section 4.2.1 to ensure that the best method will be selected:

> The US-APWR design includes a robust set of computer based recording systems to collect and store plant data that may help to understand trends and the sequence of events and conditions leading up to a problem such that the role the human played in problem initiation, progression, consequence, and recovery can, in most anticipated cases, be determined. This plant data is expected to directly support the plant corrective action system. Human performance will be monitored and documented based on actual plant conditions during plant commissioning and commercial operation. This will be accomplished through review of computer event logs, which include process parameter and component status history along with computer based procedure execution history, and post event personnel debriefings. Evaluation techniques are used (see MUAP-10014 Revision 0, References 5-16, 17 and 18) to gather and evaluate the required information from these data systems to trend and determine problem causes and corrective actions.

In cases when human performance under actual plant conditions cannot be monitored, measured or simulated, such as for local control stations or manual actions outside of the main control room, available information that is determined by judgment to most closely approximate performance data under actual conditions will be used. In these cases, a hierarchical and systematic logic will be applied to the evaluation, selection and documentation of the appropriate surrogate data. Using the review criteria found in reference 5-16 as guidance, the following logic will be used to prioritize plant and human performance data to best approximate performance in actual conditions:

i. Actual plant data of the event from plants records and testamentary evidence.

ii. Plant historical baseline and operating records of similar or related events.

iii. Desktop evaluations and analysis including applications of the plant task analysis, PRA and safety analysis.

iv. Structured and specific dynamic training simulator exercises.

v. Past or ongoing training program records from the training simulator.

vi. vi Predecessor plant data.

vii. Industry Operating Experience Review.

viii. Structured expert opinion.

In most cases when performance under actual conditions cannot be monitored, measured or simulated it is expected that a combination of sources of data will be applied to predict performance trends, evaluate events and determine corrective action.

Impact on DCD

There is no impact on the DCD

Impact on R-COLA

There is no impact on the R-COLA

Impact on S-COLA

There is no impact on the S-COLA

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

08/24/2011

US-APWR Design Certification
Mitsubishi Heavy Industries
Docket No. 52-021

RAI NO.:	**NO. 777-5776 REVISION 3**
SRP SECTION:	**18. – HUMAN FACTORS ENGINEETING**
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DATE OF RAI ISSUE:	**07/06/2011**

QUESTION NO. : 18-122

The DCD Tier 2, Revision 3, Section 18.12.4, states that "No additional information is required to be provided by a COL Applicant in connection with this section." The only COL item which existed for this section was deleted with revision 1 of the DCD.

MUAP-10014 Section 4.3 states that COL applicants will track and disposition Human Engineering Discrepancies "...in accordance with the site specific QA program."

There are discrepancies of the anticipated role of the COL applicants between documents with regards to HPM. Please clarify the anticipated role of the COL applicant.
If the COL applicant will not be the party responsible for addressing issues not addressed here please state who will be responsible.

ANSWER:

The COL item, which existed for this section, was deleted with revision 1 of the DCD because Section 18.12.4, including its reference to MUAP-10014, is sufficient to comply with NUREG-0711 regarding all human performance monitoring commitments. This section of the DCD is incorporated by reference in the COLA, therefore these commitments apply to the COL applicant. The COL applicant is the party responsible for addressing all issues related to the Human Performance Monitoring Implementation Plan.

There is no discrepancy between the DCD and MUAP-10014, because Section 4.3 of MUAP-10014 is only referring to the COL applicant's QA program. That simply means that the COL applicant must track and disposition HEDs under control of their own QAP, not in accordance with the process defined by MUAP-09019 Section 6. To clarify this issue, Section 4.3 will be revised as follows:

> In addition, periodic status reports will be documented, and human performance issues are identified as HEDs and are tracked and dispositioned in accordance with the site specific QA program. The site specific QA program establishes the requirements for HED

issue tracking, evaluation and closure. The QA program addresses the same issues defined by Section 6 of reference 5-4 [MUAP-09019], but identifies site specific processes. The periodic status report will describe...

Impact on DCD

There is no impact on the DCD

Impact on R-COLA

There is no impact on the R-COLA

Impact on S-COLA

There is no impact on the S-COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 18-123

NUREG-0711, Section 13.4, Criterion 3 states "HAs are monitored commensurate with their safety importance."
MUAP-10014, Section 4.2.2 discusses the procedures for terminating investigations into potentially unsafe Human Actions. A set of criteria for terminating investigations is listed including "a pre-set deadline for completing the investigation..." It is possible that a preset deadline may occur before an adequate investigation can be completed, especially for safety-related anomalies in performance. The fact that time has elapsed does not ensure that the issue is resolved and may contribute to safety-related HAs of importance not being completely and adequately addressed.

Please provide the basis for why this is satisfactory evidence that pre-set deadlines will not prematurely terminate safety-related investigations.

ANSWER:

MHI concurs with NRC staff;
A pre-set deadline is not appropriate criteria for terminating an investigation. Although investigations may be performed in accordance with a schedule, investigations will be continued until an appropriate resolution is reached.

Therefore, the last three sentences in Section 4.2.2 of MUAP-10014, will be replaced with the following:

> "Licensees Corrective Action Programs will determine level of significance of the event, assign the appropriate level of investigation, and drive all investigations to logical conclusions."

Impact on DCD

There is no impact on the DCD

Impact on R-COLA

There is no impact on the R-COLA

Impact on S-COLA

There is no impact on the S-COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 18-124

NUREG-0711, Section 13.4, Criterion 5 states "The cause determination should identify the cause of the failure or degraded performance to the extent that corrective action can be identified that would preclude [recurrence of] the problem or provide adequate assurance that it is anticipated prior to becoming a safety concern."

MUAP-10014, Section 4.2.4 states "Other management initiatives and events may arise that take precedence over implementing the corrective actions." This may allow management to use initiatives to cancel safety-related actions for reasons that are detrimental to safety.

What assurances exist that management will not preempt necessary corrective actions for reasons such as economy or convenience?

ANSWER:

MHI concurs with NRC staff; there is no intent to allow preempting corrective actions. Therefore, the sentence in question, in Section 4.2.4 of MUAP-10014, will be deleted.

Impact on DCD

There is no impact on the DCD

Impact on R-COLA

There is no impact on the R-COLA

Impact on S-COLA

There is no impact on the S-COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 18-125

NUREG-0711, Section 13.4, Criterion 2 states that "A human performance monitoring strategy should be developed and documented."

While it is clear from the documents submitted that there are many tools to monitor human performance it is unclear what the strategy is for implementing them.

Please describe how these tools will be integrated and applied in practice as part of a human performance strategy.

ANSWER:

MUAP-10014 Revision 0 will be revised to add the following to Section 4.2 to explain the integrated human performance monitoring strategy:

> The goal of human performance monitoring is to ensure that no significant safety degradation occurs because of changes in human performance, including any changes that may be due to design changes made in the plant. Human performance problems are identified through HFE evaluation of data collected from actual plant events, and HFE evaluation of periodic simulated training activities specifically designed to identify human performance deficiencies. Human performance problems are analyzed to determine causes . Practical experience has shown that different methods to monitor human performance may result in different conclusions. Therefore, in order to assure robust results that do not overlook important conclusions the US-APWR strategy is to apply a combination of tools as described in NUREG/CR 6751.After finding causes, corrective action plans are developed to preclude recurrence of the human performance deficiency. The following sections describe the integrated human performance monitoring implementation strategy.

Impact on DCD

There is no impact on the DCD

Impact on R-COLA

There is no impact on the R-COLA

Impact on S-COLA

There is no impact on the S-COLA

Impact on PRA

There is no impact on the PRA

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DATE OF RAI ISSUE:	**07/06/2011**

QUESTION NO. : 18-126

NUREG-0711, Section 13.4, Criterion 4 suggests that a plan be developed for utilizing different sources of data when actual plant performance data cannot be used.

It is unclear how the DCD addresses criterion 4. Failing to address at a high level does not prepare for adequate planning at more specific IP level.

Clarify how this criterion is met in the existing document or update the DCD to include it.

ANSWER:

Please see DCD change below.

Impact on DCD

The following will be added to the end of Section 18.12.2:

> The US-APWR relies on a robust set of computer based recording systems to collect and store plant data that may help to understand trends and the sequence of events and conditions leading up to a problem such that the roll the human played in the problems initiation, progression, consequence, and recovery can be, in most anticipated cases, be determined. This plant data is expected to directly support the plants corrective action tracking system. Human performance will be monitored and documented based on actual plant conditions during plant commissioning and commercial operation. This is accomplished through review of computer event logs, which include process parameter and component status history along with computer based procedure execution history, and post event personnel debriefings. Evaluation techniques are used (see references 5-16, 17 and 18) to gather the required information from these data systems to evaluate trend and determine problem causes and corrective actions.
> However, in some cases when human performance under actual plant conditions cannot be monitored, measured or simulated, such as for local control stations or manual actions outside of the main control room, available information that is determined by judgment to

most closely approximate performance data under actual conditions will be used. In these cases, a hierarchical and systematic logic (see MUAP-10014 Revision 0, References 5-16, 17, and 18) will be applied to the evaluation, selection and documentation of the appropriate surrogate data.

Impact on R-COLA

There is no impact on the R-COLA

Impact on S-COLA

There is no impact on the S-COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 18-127

The first line of MUAP-10014 Section 1.0, "The US-APWR Human Performance Monitoring Implementation Plan addresses the process of the HFE aspects of a site specific US-APWR human performance," appears to be missing words necessary for understanding the intention of the sentence.

Please reword or clarify the sentence.

ANSWER:

The first lines of MUAP-10014 Section 1.0 and Abstract will be revised to: "The US-APWR Human Performance Monitoring Implementation Plan provides an integrated strategy for monitoring for human performance degradation and management of the related corrective actions to assure that human performance does not degrade over time, including degradation that may occur due to plant design changes.

Impact on DCD

There is no impact on the DCD

Impact on R-COLA

There is no impact on the R-COLA

Impact on S-COLA

There is no impact on the S-COLA

Impact on PRA

There is no impact on the PRA

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QUESTION NO. : 18-128

The guidance in NUREG-0711 Section 13.4, Criterion 3 indicates that feedback should be provided in a timely manner.

DCD Tier 2 section 18.2.3 and DCD Tier 1, Section 2.9, Table 2.9-1 both mention that periodic reports will be filed. Stating that the reports are periodic does not ensure that they are timely.

Please describe how the HPM ensures that these periodic reports will be made in a timely manner.

ANSWER:

The timeliness of the Human Performance Monitoring Program is assured by the following sentence in Section 1.0 of MUAP-10014

> Trends are maintained so that degraded performance is identified prior to reaching unacceptable levels.

In addition, the next sentence in that same paragraph will be changed to reinforce timeliness, as follows:

> Corrective actions are tracked to ensure resolution in a timely manner.

Impact on DCD

Section 18.12.3 will be modified as follows:

> Human performance issues are identified as HEDs and are tracked and dispositioned in a timely manner in accordance with the site specific QA program. HED disposition is documented in a periodic status report.

Impact on R-COLA

There is no impact on the R-COLA

Impact on S-COLA

There is no impact on the S-COLA

Impact on PRA

There is no impact on the PRA

This completes MHI's responses to the NRC's questions.

- Specific cause determination
- Safety Importance
- Feedback of information
- Corrective actions

The US-APWR relies on a robust set of computer based recording systems to collect and store plant data that may help to understand trends and the sequence of events and conditions leading up to a problem such that the roll the human played in the problems initiation, progression, consequence, and recovery can be, in most anticipated cases, be determined. This plant data is expected to directly support the plants corrective action tracking system. Human performance will be monitored and documented based on actual plant conditions during plant commissioning and commercial operation. This is accomplished through review of computer event logs, which include process parameter and component status history along with computer based procedure execution history, and post event personnel debriefings. Evaluation techniques are used (see references 5-16, 17 and 18) to gather the required information from these data systems to evaluate trend and determine problem causes and corrective actions. DCD_18-126

However, in some cases when human performance under actual plant conditions cannot be monitored, measured or simulated, such as for local control stations or manual actions outside of the main control room, available information that is determined by judgment to most closely approximate performance data under actual conditions will be used. In these cases, a hierarchical and systematic logic (see MUAP-10014 Revision 0, References 5-16, 17, and 18) will be applied to the evaluation, selection and documentation of the appropriate surrogate data.

18.12.3 Results

Human performance issues are identified as HEDs and are tracked and dispositioned in a timely manner in accordance with the site specific QA program.. HED disposition is documented in a periodic status report. DCD_18-128

18.12.4 Combined License Information

No additional information is required to be provided by a COL Applicant in connection with this section.

COL 18.12(1) Deleted