16-5, KONAN 2-CHOME, MINATO-KU TOKYO, JAPAN

May 27, 2009

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

Attention: Mr. Jeffrey A. Ciocc

Docket No. 52-021 MHI Ref: UAP-HF-09264

Subject: MHI's Responses to US-APWR DCD RAI No. 334-2396 Revision 1

Reference:

1) "Request for Additional Information No. 334-2396 Revision 1, SRP Section: 18 - Human Factors Engineering, Application Section: 18.6 Human Reliability Analysis," dated April 13<sup>th</sup>, 2009.

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. 334-2396 Revision 1."

Enclosed is the responses to 3 RAIs 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,

Yoshiki Ogata,

General Manager- APWR Promoting Department

1. Ogatu

Mitsubishi Heavy Industries, LTD.

**Enclosure:** 

1. Responses to Request for Additional Information No. 334-2396 Revision 1

CC: J. A. Ciocco

C. K. Paulson

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# **Contact Information**

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Docket No. 52-021 MHI Ref: UAP-HF-09264

# Enclosure 1

UAP-HF-09264 Docket No. 52-021

Responses to Request for Additional Information No. 334-2396 Revision 1

May 2009

#### RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

5/27/2009

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

RAI NO.:

NO. 334-2396 REVISION 1

**SRP SECTION:** 

**18 - HUMAN FACTORS ENGINEERING** 

**APPLICATION SECTION:** 

**18.6 HUMAN RELIABILITY ANALYSIS** 

**DATE OF RAI ISSUE:** 

4/13/2009

#### **QUESTION NO. 18-24**

#### NUREG-0711, Section 7.4, Criterion 2 states:

Risk-important HAs and their associated tasks and scenarios should be specifically addressed during function allocation analyses, task analyses, HSI design, procedure development, and training. This will help verify that these tasks are well supported by the design and within acceptable human performance capabilities (e.g. within time and workload requirements).

### The US-APWR DCD, Section 18.6.2, second bullet point states:

Risk-important HAs and their associated tasks and scenarios are specifically addressed during function allocation analyses, task analyses, HSI design, procedure development, and training development. Proper consideration of HAs helps verify that these tasks are well supported by the design and within acceptable human performance capabilities (e.g. within time and workload requirements).

The US-APWR restates the NUREG-0711 criterion and does not demonstrate, with sufficient detail, **how** criterion 2 (of NUREG-0711) has been met. The information to meet this criterion should:

- Provide a complete process description
- Provide a flow diagram, or similar graphic example, that illustrates the relationship of the different process steps to each other (if applicable)
- Contain a sufficient description of quality, and technical requirements, to enable the staff to verify that the product conforms to the intent of the methodology

Please provide detailed information to satisfy criterion 2 of NUREG-0711, section 7.4.

## **ANSWER:**

The Technical report which will be submitted in June, 2009 includes to the HRA integration implementation procedure. The procedure explains the steps used in the process to identify risk significant HAs and the steps for addressing these HAs within each HFE program element.

## **Impact on DCD**

There is no impact on the DCD

# **Impact on COLA**

There is no impact on the COLA

## Impact on PRA

There is no impact on the PRA

#### RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

5/27/2009

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

RAI NO.:

NO. 334-2396 REVISION 1

SRP SECTION:

18 - HUMAN FACTORS ENGINEERING

**APPLICATION SECTION:** 

**18.6 HUMAN RELIABILITY ANALYSIS** 

DATE OF RAI ISSUE:

4/13/2009

#### **QUESTION NO. 18-25**

### NUREG-0711, Section 7.4, Criterion 3 states:

The use of PRA/HRA results by the HFE design team should be specifically addressed; that is, how are risk-important HAs addressed (through HSI design, procedural development, and training) under the HFE program to minimize the likelihood of operator error and provide for error detection and recovery capability.

## The US-APWR DCD, Section 18.6.2, third bullet point states:

The HFE design team characterizes risk-important human-system interactions by identifying the performance shaping factors (PSF) as described in Reference 18.6-2, Subsection 4.5.2. The team then applies HFE guidelines to the HSI to optimize the PSF, thereby enhancing the overall human success probability.

Please clarify what the HFE guidelines are (used to optimize the PSF), and how they are applied.

#### ANSWER:

HFE guidelines means Human System Interface guidelines i.e. NUREG-0700, Rev.2. The methodology/implementation for applying these guidelines is described in the technical report which will be submitted in June, 2009.

#### Impact on DCD

There is no impact on the DCD

# Impact on COLA

There is no impact on the COLA

# Impact on PRA

There is no impact on the PRA

#### RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

5/27/2009

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

**RAI NO.:** 

NO. 334-2396 REVISION 1

SRP SECTION:

18 - HUMAN FACTORS ENGINEERING

APPLICATION SECTION: 18.6 HUMAN RELIABILITY ANALYSIS

DATE OF RAI ISSUE: 4/13/2009

#### **QUESTION NO. 18-26**

## NUREG-0711, Section 7.4, Criterion 4 states:

HRA assumptions such as decision making and diagnosis strategies for dominant sequences should be validated by walkthrough analyses with personnel with operational experience using a plant-specific control room mockup or simulator. Reviews should be conducted before the final quantification stage of the PRA.

#### The US-APWR DCD, Section 18.6.2, fourth bullet point states:

HRA assumptions such as decision-making and diagnosis strategies for dominant sequences are validated by walkthrough analyses with personnel with operational experience using a plant-specific control room mockup or simulator. Reviews are conducted before the final quantification stage of the PRA as part of the V&V process.

The US-APWR restates the NUREG-0711 criteria and does not demonstrate, with sufficient detail, how criterion 4 of NUREG-0711 has been met. The information to meet this criterion should:

- Provide a complete process description
- Provide a flow diagram, or similar graphic example, that illustrates the relationship of the different process steps to each other (if applicable)
- Contain a sufficient description of quality, and technical requirements, to enable the staff to verify that the product conforms to the intent of the methodology

Please provide detailed information to satisfy criterion 4 of NUREG-0711, section 7.4.

#### ANSWER:

The technical report which will be submitted in June, 2009 includes the HRA integration procedure. This procedure explains the emphasis applied to risk significant HAs during the HFE verification and validation program element. While many risk significant actions that are typical for most PWRs were included in the Phase 1 V&V program, the Phase 2b V&V program will encompass all risk significant actions for the US-APWR. The integration of risk significant HAs throughout all HFE program elements is explained in the updated Appendix C of MUAP-07007.

## Impact on DCD

There is no impact on the DCD

## Impact on COLA

There is no impact on the COLA

## Impact on PRA

There is no impact on the PRA

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