

  
**MITSUBISHI HEAVY INDUSTRIES, LTD.**  
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. Ciocco

Docket No. 52-021  
MHI Ref: UAP-HF-09266

**Subject: MHI's Responses to US-APWR DCD RAI No. 336-2375 Revision 1**

**Reference:** 1) "Request for Additional Information No. 336-2375 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. 336-2375 Revision 1."

Enclosed is the responses to 8 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,



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

Enclosure:

1. Responses to Request for Additional Information No. 336-2375 Revision 1

CC: J. A. Ciocco  
C. K. Paulson



Contact Information

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Docket No. 52-021  
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Enclosure 1

UAP-HF-09266  
Docket No. 52-021

Responses to Request for Additional Information No. 336-2375  
Revision 1

May 2009

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**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

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5/27/2009

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

**RAI NO.:** NO. 336-2375 REVISION 1  
**SRP SECTION:** 18 - HUMAN FACTORS ENGINEERING  
**APPLICATION SECTION:** 18.3 FUNCTIONAL REQUIREMENTS ANALYSIS AND  
FUNCTION ALLOCATION  
**DATE OF RAI ISSUE:** 4/13/2009

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**QUESTION NO. 18-28**

In DCD section 18.3.2.1, MHI states that the functional requirements analysis and the allocation analysis were performed using a structured, documented methodology. This is a direct quote from NUREG-0711 rather than a description of how the criterion is implemented. Two references (IEC 964 and NUREG 3331) were cited as sources for guidance. As guidance documents it is not clear what was used or not used to establish a "Structured, documented methodology." Topical Report MUAP 7007 subsection 5.3.2 is referenced but it does not provide any additional information on the "Structured, documented methodology." RAI 18-30 on the topical report documented the same conclusion and requested details on the methodology used. In the RAI response, MHI stated their position that, "The functions and allocations are based primarily on historical practices .... Therefore the focus of this HFE effort is to identify any changes from historical practices." Subsequent to this response MHI provided the following documents describing historical practices:

PWR Plant Critical Function Hierarchy Analysis, January, 2009 (UAP-HF-09020–  
Enclosure 1)  
Operating Task Functional Analysis, January, 2009 (UAP-HF-09020– Enclosure 2)  
Functional Assignment to Operator, January, 2009 (UAP-HF-09020– Enclosure 3)  
Plant automation System Function, Summary January, 2009 (UAP-HF-09020–  
Enclosure 4)

The cover letter for these enclosures stated they were intended to present the HFE bases used for the design of the US-APWR.

The enclosures to MHI document UAP-HF-09020 provided information that would lead one to believe a methodology was used but they did not sufficiently demonstrate how that methodology incorporated guidance from NUREG-0711. Nor was the case made that the predecessor plant design could stand on its own as the starting point for the development of the US-APWR design. From the information the staff has received, there does not appear to be a good basis for making such a case.

The enclosures of MHI document UAP-HF-09020 were particularly difficult to evaluate

for the following reasons:

1. No overall structure was provided. It was difficult to understand how the 4 enclosures related to each other even though they referred to each other.
2. There were missing words in sentences.
3. There was a significant amount of atypical word usage. The staff had to make assumptions about intended meaning in many places.
4. Criteria and methods used to reach results were not sufficiently described.
5. The pedigree of these enclosures is uncertain. They do not appear to documents that would be included by reference within the DCD.

This collection of material does not demonstrate a "structured, documented methodology".

Please provide a description of the methodology used to complete the functional requirements analysis and the functional allocation. Ensure the level of detail is sufficient to demonstrate the structure of the approach.

Please address the quality issues associated with the enclosures from MHI document UAP-HF-9020 if these are intended to support the DCD.

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**ANSWER:**

The technical report which will be submitted in June, 2009 includes the implementation procedure used to conduct the functional requirements analysis. The quality issues of the enclosures to UAP-HF-9020 will be addressed by including any information from historical analysis that is needed to support the conclusions of the US-APWR functional requirements analysis within the June report.

**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

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**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

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**QUESTION NO. 18-29**

In DCD Tier 2, Section 18.3.2.1, MHI restates the 0711 criterion 4.4(2) but does not explain how the criterion will be accomplished.

Please explain how the criterion will be addressed.

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**ANSWER:**

The technical report which will be submitted in June, 2009 includes the functional requirements analysis implementation procedure, which explains how the methodology of the 0711 criterion 4.4(2) is accomplished.

**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

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**QUESTION NO. 18-30**

In DCD section 18.3.3, MHI restates 0711 criterion 4.4(4) but does not explain how the criterion will be implemented or provide the descriptions the criterion specifies.

Please explain how this criterion will be addressed.

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**ANSWER:**

The Technical report which will be submitted in June, 2009 includes the FRA/FA procedure which explains how the 0711 criterion 4.4(4) is implemented.

**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

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**QUESTION NO. 18-31**

In DCD section 18.3.3, MHI restates 0711 criterion 4.4(5) but does not explain how the criterion will be implemented or provide the all information the criterion specifies. The text indicates the information will be provided in a future HSI Design Technical report.

Two Functional allocation changes for the US-APWR as compared to the standard Japanese PWR are listed. MHI indicates functional details are described in the FRA/FA report. This report was neither provided nor referenced.

Please submit the reports described in the DCD to support evaluation of this criterion.

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**ANSWER:**

The Technical report which will be submitted in June, 2009 includes the FRA/FA procedure which explains how the 0711 criterion 4.4(5) is implemented. This report also describes the function allocation changes for the US-APWR compared to the standard Japanese PWR, which is also the same as the conventional Westinghouse PWR in the US.

**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

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**QUESTION NO. 18-32**

In DCD section 18.3.3, MHI restates 0711 criterion 4.4(6) but does not explain how the criterion will be implemented or provide the information the criterion specifies. The DCD references Topical Report MUAP-07007 rev2, section 5.3.2 which describes the rules and considerations for functional allocation. This information provides a good basis for function allocation decision making. However, because there is no "structured, documented, methodology" (see RAI 2375 question 9869), it is not clear how each allocation decision is being documented.

Please explain how the criterion will be addressed.

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**ANSWER:**

The technical report which will be submitted in June, 2009 includes the FRA/FA procedure which explains the structured methodology for implementing the 0711 criterion 4.4(6) and documenting each allocation decision.

**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

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**QUESTION NO. 18-33**

In DCD section 18.3.2.1 MHI restates the 0711 criterion 4.4(7) but does not explain how the criterion will be accomplished.

Please explain how the criterion will be addressed.

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**ANSWER:**

The Technical report which will be submitted in June, 2009 includes the FRA/FA implementation procedure which explains how the 0711 criterion 4.4(7) is accomplished.

**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

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**QUESTION NO. 18-34**

In DCD section 18.3.2.2, MHI restates NUREG-0711 criterion 4.4(8) but does not explain how the criterion will be accomplished.

Please explain how the criterion will be addressed.

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**ANSWER:**

The Technical report which will be submitted in June, 2009 includes the FRA/FA implementation procedure which explains how the 0711 criterion 4.4(8) is accomplished.

**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

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**QUESTION NO. 18-35**

In DCD section 18.3.2.2, MHI restates NUREG-0711 criterion 4.4(10) but does not explain how the criterion will be accomplished.

Please explain how the criterion will be addressed.

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**ANSWER:**

The Technical report which will be submitted in June, 2009 includes the FRA/FA implementation procedure which explains how the 0711 criterion 4.4(10) is accomplished.

**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.