

  
**MITSUBISHI HEAVY INDUSTRIES, LTD.**  
16-5, KONAN 2-CHOME, MINATO-KU  
TOKYO, JAPAN

December 2, 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-11419

**Subject: Amended MHI's Response to US-APWR DCD RAI No. 614-4853 REVISION 0 (SRP 03.09.02)**

- Reference:**
- 1) "Request for Additional Information No. 614-4853 Revision 0, SRP Section: 03.09.02 – Dynamic Testing and Analysis of Systems Structures and Components", dated August 13, 2010.
  - 2) "MHI's Response to US-APWR DCD RAI No. 614-4853 Revision 0", UAP-HF-10293, dated October 28, 2010.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Amended Response to Request for Additional Information No. 614-4853 Revision 0".

Enclosed is the response to one (1) RAI contained within Reference 1. This response amend the previously transmitted responses submitted under MHI's Reference UAP-HF-10293 on October 28, 2010 (Reference 2) in order to correct description of responses to US-APWR DCD RAI No. 614-4853 Revision 0 (Reference 1).

This submittal contains information that MHI considers proprietary, and therefore should be withheld from public disclosure pursuant to 10 C.F.R. § 2.390 (a)(4) as trade secrets and commercial or financial information which is privileged or confidential. The proprietary information is bracketed by the designation "[ ]". This letter includes a copy of the proprietary answers (Enclosure 2) and the Affidavit of Yoshiki Ogata (Enclosure 1) which identifies the reasons MHI respectfully requests that all materials designated as "Proprietary" in Enclosure 2 be withheld from public disclosure pursuant to 10 C.F.R. § 2.390 (a)(4).

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.

D081  
WPO

Sincerely,

A handwritten signature in black ink, appearing to read "Y. Ogata".

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

Enclosures:

1. Affidavit of Yoshiki Ogata
2. Amended Response to Request for Additional Information No. 614-4853 Revision 0 (Proprietary Version)
3. Amended Response to Request for Additional Information No. 614-4853 Revision 0 (Non Proprietary Version)

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

Contact Information

C. Keith Paulson, Senior Technical Manager  
Mitsubishi Nuclear Energy Systems, Inc.  
300 Oxford Drive, Suite 301  
Monroeville, PA 15146  
E-mail: ck\_paulson@mnes-us.com  
Telephone: (412) 373-6466

## ENCLOSURE 1

Docket No.52-021  
MHI Ref: UAP-HF-11419

### MITSUBISHI HEAVY INDUSTRIES, LTD.

#### AFFIDAVIT

I, Yoshiki Ogata, state as follows:

1. I am General Manager, APWR Promoting Department, of Mitsubishi Heavy Industries, LTD ("MHI"), and have been delegated the function of reviewing MHI's US-APWR documentation to determine whether it contains information that should be withheld from public disclosure pursuant to 10 C.F.R. § 2.390 (a)(4) as trade secrets and commercial or financial information which is privileged or confidential.
2. In accordance with my responsibilities, I have reviewed the enclosed document entitled "Amended MHI's Response to US-APWR DCD RAI No. 614-4853 REVISION 0", and have determined that portions of the document contain proprietary information that should be withheld from public disclosure. Those pages containing proprietary information are identified with the label "Proprietary" on the top of the page and the proprietary information has been bracketed with an open and closed bracket as shown here "[ ]". The first page of the document indicates that all information identified as "Proprietary" should be withheld from public disclosure pursuant to 10 C.F.R. § 2.390 (a)(4).
3. The information identified as proprietary in the enclosed document has in the past been, and will continue to be, held in confidence by MHI and its disclosure outside the company is limited to regulatory bodies, customers and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and is always subject to suitable measures to protect it from unauthorized use or disclosure.
4. The basis for holding the referenced information confidential is that it includes the output of analyses used by mathematical models developed at significant cost to MHI, since it required the performance of detailed design calculations and testing extending in MHI experienced activity in Japanese domestic plants. The information out of the analyses is not available in public sources and could not be gathered readily from other publicly available information. MHI knows of no way the information could be lawfully acquired by organizations or individuals outside of MHI.
5. The referenced information is being furnished to the Nuclear Regulatory Commission ("NRC") in confidence and solely for the purpose of information to the NRC staff.
6. The referenced information is not available in public sources and could not be gathered readily from other publicly available information. Other than through the provisions in paragraph 3 above, MHI knows of no way the information could be lawfully acquired by organizations or individuals outside of MHI.
7. Public disclosure of the referenced information would assist competitors of MHI in their design of new nuclear power plants without incurring the costs or risks associated with the design of the subject systems. Therefore, disclosure of the information contained in the

referenced document would have the following negative impacts on the competitive position of MHI in the U.S. nuclear plant market:

- A. Loss of competitive advantage due to the costs associated with development of the methodology of modeling and analysis for Reactor Coolant Pressure Boundary of the US-APWR. Providing public access to such information permits competitors to duplicate or mimic the methodology without incurring the associated costs.
- B. Loss of competitive advantage of the US-APWR created by benefits of enhanced plant safety, and reduced operation and maintenance costs associated with the Reactor Coolant Pressure Boundary.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information and belief.

Executed on this 2nd day of December, 2011.

A handwritten signature in black ink, appearing to read "Y. Ogata". The signature is written in a cursive, somewhat stylized font.

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

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Enclosure 3

UAP-HF-11419  
Docket Number 52-021

Amended Response to Request for Additional Information  
No. 614-4853 Revision 0

(Non-Proprietary)

December 2011

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**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

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12/02/2011

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

**RAI NO.: NO. 614-4853**

**SRP SECTION: 03.09.02 – Dynamic Testing and Analysis of Systems Structures and Components**

**APPLICATION SECTION: 3.9.2**

**DATE OF RAI ISSUE: 08/13/2010**

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**QUESTION NO.: RAI 3.9.2-91**

In RAI 498-3782, question 03.09.02-78, the applicant was requested to discuss the analysis performed to assess adverse flow effects on the reactor piping system due to the increased flow velocity at the vessel outlet nozzle above that of the current 4-loop reactors. In its response, MHI does not give, or reference, any details of the analysis and just mentions that based on the analysis of the 4-loop reactor, there is sufficient margin of safety against flow-induced vibration. Since this response does not provide the requested information, the staff's concerns remain unresolved.

The applicant is therefore requested to discuss the analysis performed to assess adverse flow effects on the reactor piping system due to the increased flow velocity at the vessel outlet nozzle as identified in Table 2.1-1 of MUAP-07027-P (R1). The applicant may refer to other sections of the DCD or to technical reports which address the concerns expressed in this RAI.

Reference: MHI's Response to US-APWR DCD RAI No. 498-3782; MHI Ref: UAP-HF10008; dated January 15, 2010; ML100200161.

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**ANSWER:**

MHI planned to adopt the thermowell design of the current 4-loop reactor for US-APWR reactor coolant loop piping. This thermowell design was confirmed to have sufficient margin against flow-induced vibration under the flow condition of US-APWR reactor as shown in Table 1 below. It was confirmed that the reduced velocity satisfies the condition that  $V/f_1D$  is less than 1, in accordance with ASME Code Section III Appendix N-1324, and that generated stress  $\sigma_R$  is less than the lower bound of design fatigue curve in accordance with ASME Code Section III Appendix – 1 (13.6 ksi, Curve C for austenitic steels).

Table 1 Comparison of FIV evaluation result between current 4-loop reactor and US-APWR

	Current 4-loop reactor	US-APWR
Flow velocity at vessel outlet nozzle (ft/s)		
Reduced velocity defined by N-1324.1, $V/f_1D$		
Stress amplitude generated by random excitation, $\sigma_R$ (ksi)		

However, this plan has been revised and MHI has now decided to procure thermowells from a thermocouple supplier. MHI will describe the thermowell design requirements in a Design Specification and procure thermowells which satisfy the ASME Code Section III Appendix N-1300 to avoid flow-induced vibrations under the operating conditions of the US-APWR.

**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.

**Impact on Topical/Technical Report**

There is no impact on the Topical/Technical Report.