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

December 7, 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-11422

Subject: MHI's Responses to US-APWR DCD RAI No. 864-6150 Revision 3 (SRP 15.0)

Reference: 1) Request for Additional Information No. 864-6150 Revision 3, SRP Section: 15 -Introduction - Transient and Accident Analyses" dated November 8, 2011.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") the document entitled "MHI's Responses to US-APWR DCD RAI No. 864-6150 Revision 3 (SRP 15.0)".

Enclosed are the responses to 2 RAIs contained within Reference 1.

As indicated in the enclosed materials, Enclosure 2 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. A non-proprietary version of the document is also being submitted in this package (Enclosure 3). In the non-proprietary version, the proprietary information, bracketed in the proprietary version, is replaced by the designation "[ ]".

This letter includes a copy of the proprietary version of the RAI response (Enclosure 2), a copy of the non-proprietary version of the RAI response (Enclosure 3), and the Affidavit of Yoshiki Ogata (Enclosure 1) which identifies the reasons MHI respectfully requests that all material designated as "Proprietary" in Enclosure 2 be withheld from 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 this submittal. His contact information is provided below.

Sincerely,

Y. Ogata

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

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NRO

Enclosures:

1. Affidavit of Yoshiki Ogata
2. MHI's Responses to US-APWR DCD RAI No. 864-6150 Revision 3 (SRP 15.0) (proprietary)
3. MHI's Responses to US-APWR DCD RAI No. 864-6150 Revision 3 (SRP 15.0) (non-proprietary)

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-11422

MITSUBISHI HEAVY INDUSTRIES, LTD.

AFFIDAVIT

I, Yoshiki Ogata, being duly sworn according to law, depose and 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 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 "MHI's Responses to US-APWR DCD RAI No. 864-6150 Revision 3 (SRP 15.0)", dated December 7, 2011, and have determined that the document contains 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 information identified as "Proprietary" should be withheld from public disclosure pursuant to 10 C.F.R. § 2.390 (a)(4).

3. The basis for holding the referenced information confidential is that it describes the unique design of the safety analysis, developed by MHI (the "MHI Information").

4. The MHI Information is not used in the exact form by any of MHI's competitors. This information was developed at significant cost to MHI, since it required the performance of research and development and detailed design for its software and hardware extending over several years. Therefore public disclosure of the materials would adversely affect MHI's competitive position.

5. The referenced information has in the past been, and will continue to be, held in confidence by MHI and is always subject to suitable measures to protect it from unauthorized use or disclosure.

6. The referenced information is not available in public sources and could not be gathered readily from other publicly available information.

7. The referenced information is being furnished to the Nuclear Regulatory Commission ("NRC") in confidence and solely for the purpose of supporting the NRC staff's review of MHI's application for certification of its US-APWR Standard Plant Design.

8. Public disclosure of the referenced information would assist competitors of MHI in their design of new nuclear power plants without the costs or risks associated with the design and testing of new systems and components. Disclosure of the information identified as proprietary would therefore have negative impacts on the competitive position of MHI in the U.S. nuclear plant market.

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 7th day of December, 2011.

Y. Ogata

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

ENCLOSURE 3

UAP-HF-11422
Docket No. 52-021

MHI's Responses to US-APWR DCD RAI No. 864-6150 Revision 3
(SRP 15.0)

December 2011

(Non-Proprietary)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

12/07/2011

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 864-6150 REVISION 3**

SRP SECTION: **15 – INTRODUCTION – TRANSIENT AND ACCIDENT ANALYSES**

APPLICATION SECTION: **15.0**

DATE OF RAI ISSUE: **11/08/2011**

QUESTION NO.: 15-35

RAI 786-5881, Question 15.0.0-30 (b) asked for justification of the Doppler feedback assumptions for 15.2 and 15.3 events. The response stated that the Doppler feedback is not a key parameter for any of these events based on sensitivity studies. The staff notes that this response did not include sensitivities on the departure from nucleate boiling ratio (DNBR) for the limiting Anticipated Operational Occurrence (15.2.2) or the limiting Postulated Accident (15.3.3). Please provide the DNBR values for the sensitivity case for 15.2.2 and compare the number of rod failures for the sensitivity study on 15.3.3 to the DCD case. If the sensitivity case is more limiting than the DCD case, either include it in the DCD or justify not including it in the DCD.

ANSWER:

The response to Question 15.0.0-30 of RAI 786-5881, submitted by MHI letter UAP-HF-11271 dated August 25, 2011, provided a comparison of results between the DCD cases and sensitivity cases with modified Doppler feedback assumptions. No sensitivity analysis results were provided for the DCD Section 15.2.2 event since the transient analysis for this event was not added to the DCD until the response to Question 15.02.01-15.02.05-9 of RAI 789-5920 submitted by MHI letter UAP-HF-11331 dated September 30, 2011. The sensitivity analysis, including the DNBR values, for the DCD Section 15.2.2 event are provided in Table 15-35.1 and Figures 15-35.1 through 15-35.4 below. The DCD results are slightly more limiting than the sensitivity case although the difference between the DCD results and the sensitivity analysis results is negligible. In addition, both cases have sufficient margin to the safety analysis limit. Therefore, no changes to the DCD are required based on this sensitivity study.

For the DCD Section 15.3.3 event, the sensitivity analysis results were provided in the previous RAI response. However, the number of rods in DNB was not provided. The comparison of the number of rods in DNB for the DCD Section 15.3.3 event is provided in Table 15-35.1. The number of rods in DNB is slightly larger than the current DCD case, however the value is still well below the bounding value of 10% which is assumed for the radiological consequences evaluation as described in DCD subsection 15.3.3.5.2. In addition, the DNBR calculation conservatively assumes constant RCS pressure. MHI has performed an additional sensitivity study which shows that assuming the transient RCS pressure in the DNBR calculation will reduce the number of rods in DNB to [ ] which is less limiting than the current DCD case. Since the DNBR calculation already contains this additional conservative assumption and the current radiological consequences evaluation assumption for the number of rods in DNB is sufficiently bounding, no

changes to the DCD are required based on this sensitivity study.

These results further confirm the assertion in the previous RAI response that Doppler feedback does not have a significant impact on the results and is not a key parameter. Therefore, the current Doppler feedback assumptions in the DCD for both of these events will be maintained.

Table 15-35.1 Summary of Sensitivity Study Results

Section	Event	DCD Assumptions		Sensitivity Case		DCD case	Sensitivity case
		Doppler Power Coefficient	Doppler Fuel Temperature Coefficient	Doppler Power Coefficient	Doppler Fuel Temperature Coefficient		
15.2.2	Turbine trip	Min. feedback Fig.15.0-2 in Ch.15	Min. (-1.0E-5Δk/k/°F)	Max. feedback Fig.15.0-2 in Ch.15	Max. (-2.9E-5Δk/k/°F)		
15.3.3	Reactor coolant pump rotor seizure	Max. feedback Fig.15.0-2 in Ch.15	Max. (-2.9E-5Δk/k/°F)	Min. feedback Fig.15.0-2 in Ch.15	Min. (-1.0E-5Δk/k/°F)		

* The number of rods in DNB is[ ]if the effect of the transient RCS pressure is assumed in the DNBR calculation.

Figure 15-35.1 **DNBR versus Time**
Doppler Feedback Sensitivity Study
Turbine Trip (Assuming Loop) - DNBR Analysis

Figure 15-35.2 **Reactor Power versus Time**
Doppler Feedback Sensitivity Study
Turbine Trip with LOOP - RCS Pressure Analysis

Figure 15-35.3 **RCP Outlet Pressure versus Time**
Doppler Feedback Sensitivity Study
Turbine Trip with LOOP - RCS Pressure Analysis

Figure 15-35.4 **Steam Generator Pressure versus Time**
Doppler Feedback Sensitivity Study
Turbine Trip with LOOP – Main Steam Pressure Analysis

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 Technical/Topical Report

There is no impact on a Technical/Topical Report.

This completes MHI's response to the NRC's question.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

12/07/2011

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 864-6150 REVISION 3**
SRP SECTION:	**15 – INTRODUCTION – TRANSIENT AND ACCIDENT ANALYSES**
APPLICATION SECTION:	**15.0**
DATE OF RAI ISSUE:	**11/08/2011**

QUESTION NO.: 15-36

The response to RAI 769-5797 Question 15-26 proposed adding text to DCD Sections 15.1.4.2 and 15.1.4.3.2 to explain that the main steam line pressure signal used to actuate the ECCS function is a lead/lag compensated signal. However, as described in Table 15.1.4-1, the ECCS function for this event is actuated on low pressurizer pressure (not the lead/lag compensated main steam line pressure). Please explain why these statements are being added to Section 15.1.4.

ANSWER:

DCD Sections 15.1.4.2 lists signals that are available to actuate the ECCS. Both low pressurizer pressure and low main steam line pressure are listed as available signals. The low main steam line pressure ECCS actuation signal considers lead/lag compensation while the EFW isolation signal is based on actual steam pressure. In order to clarify this difference, MHI proposed to revise DCD Section 15.1.4 to include additional details on the signal processing described in the response to RAI 769-5797 Question 15-26, submitted by MHI letter UAP-HF-11305 dated September 9, 2011.

As indicated in the RAI, the DCD Section 15.1.4 analysis results indicate that the low pressurizer pressure signal is the signal that actuates ECCS, since it is reached earlier than the low main steam line pressure ECCS actuation. However, the low main steam pressure signal is still a valid available signal. Since the signal was described in Section 15.1.4, MHI thought it was appropriate to provide the additional details about how the signal was compensated. The additional descriptions added by MHI to DCD Section 15.1.4 are statements about the design features of the signal. This information is accurate even though the signal is not the first to occur in the DCD Section 15.1.4 analysis.

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 Technical/Topical Report

There is no impact on a Technical/Topical Report.

This completes MHI's response to the NRC's question.