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

March 4, 2013

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC20555-0001

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-13046

Subject: 2nd Amended Response to US-APWR DCD RAI No.377-2629 Revision 1

References:
1) "Request for Additional Information No. 377-2629 Revision 1, SRP Section: 04.04 – Thermal and Hydraulic Design, Application Section: 4.4.2.5," dated May 29, 2009.
2) "MHI's Amended Responses to US-APWR DCD RAI No. 377-2629 Revision 1", MHI Ref: UAP-HF-09546, dated December 2, 2009
3) "MHI's Response to ACRS Subcommittee Questions on Jan. 15 2013, MHI Ref: UAP-HF-13037, dated March 1, 2013

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "2nd Amended Response to US-APWR DCD RAI No. 377-2629 Revision 1."

Enclosed is the amended response to Question No. 04.04-4 contained in Reference 1. MHI replaces the previous response (Reference 2) with this amended response. This amendment is submitted to incorporate comments provided in the ACRS subcommittee meeting held on January 15, 2013 (Reference 3).

As indicated in the enclosed materials, this document 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 with the information identified as proprietary redacted and replaced by the designation "[ ]".

This letter includes a copy of the proprietary version (Enclosure 2) of the response, a copy of the non-proprietary version (Enclosure 3) of the response, 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 Mr. Joseph Tapia, General Manager of Licensing Department, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of the submittal. His contact information is below.

D081
NRO

Sincerely,

Y. Ogata

Yoshiki Ogata,
Director, APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosures:

1. Affidavit of Yoshiki Ogata

2. 2nd Amended Response to US-APWR DCD RAI No.377-2629 Revision 1(Proprietary version)

3. 2nd Amended Response to US-APWR DCD RAI No.377-2629 Revision 1(Non-proprietary version)

CC: J. A. Ciocco
J. Tapia

Contact Information
Joseph Tapia, General Manager of Licensing Department
Mitsubishi Nuclear Energy Systems, Inc.
1001 19th Street North, Suite 710
Arlington, VA22209
E-mail: joseph_tapia@mnes-us.com
Telephone: (703) 908-8055

ENCLOSURE1

Docket No. 52-021
MHI Ref: UAP-HF-13046

MITSUBISHI HEAVY INDUSTRIES, LTD.

AFFIDAVIT

I, Yoshiki Ogata, state as follows:

1. I am Director, 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 "2nd Amended Response to US-APWR DCD RAI No.377-2629 Revision 1" dated March 2013, 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 as 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 describes the unique design information of thermal design methodology developed by MHI and 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.

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 thermal design. 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 thermal design.

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 4th day of March, 2013.

Y. Ogata

Yoshiki Ogata,
Director, APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosure 3

UAP-HF-13046
Docket No. 52-021

2nd Amended Response to US-APWR DCD RAI No.377-2629
Revision 1

March 2013
(Non-Proprietary)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

03/04/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 377-2629 REVISION 1**
SRP SECTION:	**04.04 – THERMAL AND HYDRAULIC DESIGN**
APPLICATION SECTION:	**4.4.2.5**
DATE OF RAI ISSUE:	**5/29/2009**

QUESTION NO.: 04.04-4

Provide a tabulation of all numerical uncertainty values considered in the statistical evaluation of DNBR for the US-APWR fuel. These uncertainties are discussed qualitatively in Design Control Document, Section 4.4.2.9.1 for DNB analyses.

ANSWER:

The Revised Thermal Design Procedure (RTDP, Ref. 04.04.4-1) is applied to obtain the design limit of the minimum DNBR in the US-APWR core. As required by applying the RTDP methodology, sensitivity factors are evaluated for the US-APWR based on the uncertainties of key parameters involving plant operating parameters, heat flux distribution, computer codes, and the DNB correlation. Tables 04.04.4-1 and 04.04.4-2 show the nominal and uncertainty values of those parameters in generic sense and the sensitivity factors for typical cell and thimble cell as well.

Since some of those uncertainties are dependent on the measurement error allowances of the plant-specific instrumentation and the fabrication tolerances of the manufactured fuel pellets, the design limit of minimum DNBR will be re-evaluated after the plant-specific uncertainties become available. The design limit and the safety analysis limit of minimum DNBR will be confirmed/ updated accordingly.

Table.04.04.4-1 US-APWR RTDP sensitivity factors for low flow rate condition (typical cell)

Parameters (x_i)	μ_i	σ_i	σ_i/μ_i	S_i	$S_i^2(\sigma_i/\mu_i)^2$
Power (fraction)					
Tin (°F)					
Pressure (psia)					
Flow (fraction)					
Effective Core Flow (fraction)					
$F^N_{\Delta H}$					
$F^E_{\Delta H,1}$					
Subchannel Code					
Transient Code					

-Uncertainties of input parameters and code predictions:
[ ]

-Uncertainty of DNB correlation prediction (Refer to Table B.3-6 in Appendix B of Ref. 04.04-4-2):
[ ]
[ ]

-Design Limit of minimum DNBR (DL)

[ ]

where,

μ: mean or nominal value
σ: standard deviation
S_i: sensitivity factor associated with i-th parameter, x_i $(=\partial(\ln y)/\partial(\ln x_i))$
y: DNBR(variable)/DNBR(nominal)
M/P: measured to predicted ratio of DNB heat flux
z: (M/P) x (y)

Table.04.04.4-2 US-APWR RTDP sensitivity factors for low flow rate condition (thimble cell)

Parameters (x_i)	μ_i	σ_i	σ_i/μ_i	S_i	$S_i^2(\sigma_i/\mu_i)^2$
Power (fraction)					
Tin (°F)					
Pressure (psia)					
Flow (fraction)					
Effective Core Flow (fraction)					
$F^N_{\Delta H}$					
$F^E_{\Delta H,1}$					
Subchannel Code					
Transient Code					

-Uncertainties of input parameters and code predictions:
[ ]

-Uncertainty of DNB correlation prediction (Refer to Table B.3-6 in Appendix B of Ref. 04.04-4-2):
[ ]
[ ]

-Design Limit of minimum DNBR (DL)

[ ]

where,

μ: mean or nominal value
σ: standard deviation
S_i: sensitivity factor associated with i-th parameter, x_i $(=\partial(\ln y)/\partial(\ln x_i))$
y: DNBR(variable)/DNBR(nominal)
M/P: measured to predicted ratio of DNB heat flux
z: (M/P) x (y)

References

04.04.4-1 Friedland, A. J. and Ray, S., "Revised Thermal Design Procedure," WCAP-11397-P-A, April 1989.

04.04.4-2 "Thermal Design Methodology," MUAP-07009-P, May 2007.

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 Technical/Topical reports.