


MITSUBISHI HEAVY INDUSTRIES, LTD.
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TOKYO, JAPAN

January 15, 2010

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

Attention: Mr. Jeffery A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-10007

Subject: MHI's Amended Response to NRC RAI on Topical Report "Thermal Design Methodology" MUAP-07009 Revision 0

- References:** 1) "Request for Additional Information Topical Report Thermal Design Methodology MUAP-07009 Rev. 0", dated August 20, 2009.
2) "Response to the NRC Request for Additional Information on Thermal Design Methodology MUAP-07009 Rev. 0", UAP-HF-09500, dated October 30, 2009

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "MHI's Amended Response to NRC RAI on Topical Report "Thermal Design Methodology" MUAP-07009 Revision 0." This amendment is submitted to supplement the previous information for the methodology used in transition core DNBR analysis within Reference 2. The Reference 2 was submitted to NRC as the response to Reference 1.

Enclosed is the amended response to the question No. 1.9. MHI replaces the previous response (Reference 2) with this amended response.

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), a copy of the non-proprietary version (Enclosure 3), 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.

DOB1
NRO

Sincerely,



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

Enclosures:

1. Affidavit of Yoshiki Ogata
2. MHI's Amended Response to NRC RAI on Topical Report "Thermal Design Methodology" MUAP-07009 Revision 0 (proprietary version)
3. MHI's Amended Response to NRC RAI on Topical Report "Thermal Design Methodology" MUAP-07009 Revision 0 (non-proprietary version)

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

Contact Information

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Enclosure 1

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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 "MHI's Amended Response to NRC RAI on Topical Report "Thermal Design Methodology" MUAP-07009 Revision 0", dated January 2010 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 describes the unique thermal and hydraulic design developed by MHI and not being used in the exact form by any 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 the development of the thermal and hydraulic 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 and hydraulic 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 15th day of January, 2010.



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

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Enclosure 3

**UAP-HF-10007, Rev.0
Docket No. 52-021**

**MHI's Amended Response to NRC RAI on Topical Report "Thermal
Design Methodology" MUAP-07009 Revision 0**

**January 2010
(Non-Proprietary)**

- 1.9 Provide a discussion on transition cores. Include how the transition cores will be accounted for (especially in any thermal limits) and the basis for that decision.

Response:

A transition core may contain more than one single type of fuel assembly with different hydraulic resistances. Since the cross flow is induced between the fuel assemblies with different hydraulic resistances, DNBR penalty may be introduced as the result of variations of mass flow and enthalpy distributions, compared with a reference core which is composed of only a single type of fuel assembly. Although transition cores are not taken into account in the first core design of US-APWR described in the DCD, the methodology outlined below will be adopted for the reload core design as the need arises.

The DNBR penalty for a transition core is determined by the following procedure and it should be confirmed that the safety analysis limit of minimum DNBR can conservatively cover its penalty.

When two types of fuel assemblies, e.g. type A and type B co-exist in a transition core and the type B fuel assemblies, which include the hot assembly, have a relatively higher pressure loss coefficient, the DNBR penalty for the transition core is defined as follows:

$$DNBR_{penalty}(\%) = \left(1 - \frac{DNBR_{A+B}}{DNBR_A} \right) \times 100$$

where

$DNBR_{A+B}$: Minimum DNBR for a transition core composed of types A and B
 $DNBR_A$: Minimum DNBR for a reference core fully occupied by type A

VIPRE-01M code and applicable DNB correlation are applied for the calculation of $DNBR_{A+B}$ and $DNBR_A$.

Since the DNBR penalty [], VIPRE-01M calculations are performed []

[]. The DNBR penalty for each fuel assembly arrangement is evaluated at various DNBR limit conditions, which cover the operable range of pressure, flow rate, core thermal power and power distributions. Based on those case studies, DNBR penalty will be conservatively determined so as to cover the transition core conditions.