MITSUBISHI HEAVY INDUSTRIES, LTD.
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TOKYO, JAPAN

July 27, 2012

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-12216

Subject: MHI's 3rd Amended Response to US-APWR DCD RAI No. 354-2585 Revision 0 (SRP 06.02.02 and 06.03)

References:
[1] "Request for Additional Information No. 354-2585 Revision 0, SRP Section: 06.02.02 – Containment Heat Removal System –Application Section: 6.2.2 and 6.3," dated May 7, 2009 (ML091270651).
[2] MHI Letter UAP-HF-09365, "MHI's Response to US-APWR DCD RAI No. 354-2585 Revision 0 (SRP 06.02.02 and 06.03)," dated July 7, 2009 (ML091910256).
[3] MHI Letter UAP-HF-09487, "MHI's Amended Response to US-APWR DCD RAI No. 354-2585 Revision 0 (SRP 06.02.02 and 06.03)," dated October 19, 2009 (ML092950148).
[4] MHI Letter UAP-HF-09382, "MHI's Second Response to US-APWR DCD RAI No. 354-2585 Revision 0 (SRP 06.02.02 and 06.03)," dated July 17, 2009 (ML092030412).
[5] MHI Letter UAP-HF-12129, "MHI's 2nd Amended Response to US-APWR DCD RAI No. 354-2585 Revision 0 (SRP 06.02.02 and 06.03)," dated May 29, 2012 (ML121510376).
[6] MHI Letter UAP-HF-12131, "MHI's 2nd Amended Response to US-APWR DCD RAI No. 815-5986 Revision 3 (SRP 06.03)," dated May 29, 2012 (ML12153A080).

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "3rd Amended Response to Request for Additional Information No. 354-2585 Revision 0 (SRP 06.02.02 and 06.03)".

In Reference 2, MHI provided the original response to the NRC's Request for Additional Information ("RAI") in Reference 1, except for Question 06.02.02-44. The response for Question 06.02.02-44 of Reference 1 was provided in Reference 4. Reference 3 subsequently provided an amended response for Question 06.02.02-24. In Reference 5, MHI provided 2nd amended response for Question 06.02.02-24 and an amended response for Question 06.02.02-44 incorporating the design change that is discussed in Reference 6.

This response supersedes all previous responses for Questions 06.02.02-24 and 06.02.02-44 that were transmitted in References 2 through 5. The current version incorporates NRC staff comments and corrects typographical errors in the previous response (Reference 5).

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NRO

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 revised responses, a copy of the non-proprietary version (Enclosure 3) of the revised responses, 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 this submittal. His contact information is provided below.

Sincerely,

Y. Ogata

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

Enclosures:

1. Affidavit of Yoshiki Ogata

2. 3rd Amended Response to Request for Additional Information No. 354-2585 Revision 0 (SRP 06.02.02 and 06.03) (proprietary version)

3. 3rd Amended Response to Request for Additional Information No. 354-2585 Revision 0 (SRP 06.02.02 and 06.03) (non-proprietary version)

CC: J. A. Ciocco
J. Tapia

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Enclosure 1

Docket No. 52-021
MHI Ref: UAP-HF-12216

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 "3rd Amended Response to Request for Additional Information No. 354-2585 Revision 0 (SRP 06.02.02 and 06.03)," dated July 27, 2012, 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 design and methodology developed by MHI for performing the nuclear design of the US-APWR reactor.

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 methodology related to the analysis.

B. Loss of competitive advantage of the US-APWR created by benefits of modeling information.

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 27th day of July 2012.

Y. Ogata

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

Enclosure 3

UAP-HF-12216
Docket No. 52-021

3rd Amended Response to Request for Additional Information
No. 354-2585 Revision 0 (SRP 06.02.02 and 06.03)

July 2012
(Non-Proprietary)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

7/27/2012

US-APWR Design Certification

Mitsubishi Heavy Industries, Ltd.

Docket No. 52-021

RAI NO.:	**NO. 354-2585 REVISION 0**
SRP SECTION:	**06.02.02 – Containment Heat Removal System**
APPLICATION SECTION:	**6.2.2 & 6.3**
DATE OF RAI ISSUE:	**05/07/2009**

QUESTION NO.: 06.02.02-24

MUAP 08001-NP (R2) Section 3.7.1 states, "In the refueling cavity, there are two 8 inches drain pipes which are communicated to bottom portion of the containment...and it is quite unlikely that a large amount of fibrous debris will blow down on the cavity, and block the drain path." The NRC staff requests that MHI provide the following information regarding upstream effects associated with these two 8 inch drain pipes:

1) Please describe what "communicated to bottom portion of containment" means? Do they go directly to RWSP? Are these drains depicted in the DCD (for example, DCD Figure 6.2.1-9)?

2) If the drain pipes were to fully block flow, how much water holdup would occur and what would the impact be on cooling the core and cooling containment?

3) What amount of water holdup (expressed in gallons or cubic meters and height in refueling cavity as well as height in RWSP) would result in challenging head loss across strainer (submergence etc) and/or NPSHa?

4) Operating plants with similar drain configurations have installed debris interceptors to ensure the drains remain functional during an accident. What is the APWR justification for not establishing debris interceptors?

ANSWER:

As described in Enclosure 2 of response to RAI 815-5986 (Reference 1), the recirculation flow path is changed from the original design. In order to reflect the design change of the recirculation flow path, the previous response to Question 06.02.02-24 is amended as follows:

1) The drain piping from the refueling cavity is connected to the header compartment and the drained water fills the header compartment. After the header compartment is filled, the overflow is directed to the RWSP through overflow piping installed in the header compartment. Therefore, the drain piping is not directly connected to the RWSP.

2) If the refueling cavity drain pipes were to become fully blocked, the containment spray water may not be drained from the refueling cavity. As a result, the safety pumps required for long term cooling may not be operated safely because the RWSP minimum water level will be lower than the design basis.

3) The amount of water in the refueling cavity accounted for as an "in-effective pool (i.e., 810 ft^3)" was provided in Table 3-10 of the technical report MUAP-08001 (Reference 2). In addition, a 1 in. height of water stream on the refueling cavity floor (i.e., 180 ft^3) was included as part of the "water stream on the floor" (i.e., 7,320 ft^3, See Table 3-10). No hold-up volume due to full blockage of the cavity drains was accounted for in the upstream effect evaluation. Given the additional hold-up volumes beyond the design basis, the RWSP water level will be reduced approximately 1 in. for every 470 ft^3 increase in entrapped water.

4) The following design considerations are employed as a counter measure against blockage of the drain piping.

   - The US-APWR will be categorized as a low-fiber plant. Fiber debris existing in containment is only latent fiber. No fiber insulation is expected, but 4.5 lbm fiber is taken into account as operating margin for the design basis of the sump strainer. In general, the US-APWR has relatively low risk for potential blockage.

   - To cope with the large debris, a grating with approximately 120 ft^2 of horizontal area will be provided in the upper core internal laydown pit (in the refueling cavity) to prevent credible large debris from reaching the refueling cavity drains. (See DCD Figure 6.2.1-9 and Figure 6.2.1-13 of Reference 3)

The gratings are classified as non safety-related, and designed as seismic category II structures. As discussed in response to Question 06.02.02-31, design change control procedures, procedures for conduct of maintenance activities, and administrative procedures for maintaining the cited gratings will also be established. These procedures will ensure that the gratings are maintained within the bounds of the analyses and design bases that support Emergency Core Cooling (ECC) and Containment Spray (CS) recirculation functions and ensure the long-term core cooling requirements of 10 CFR 50.46 will be accomplished.

References

1) MHI Letter No. UAP-HF-12131, "MHI's 2nd Amended Response to US-APWR DCD RAI No. 815-5986 Revision 3 (SRP 06.03)", dated May 29, 2012.
2) MHI Letter No. UAP-HF-12125, MUAP-08001 Revision 6, "US-APWR Sump Strainer Performance", dated June 1, 2012.
3) MHI Letter No. UAP-HF-12135, "Transmittal of the US-APWR DCD GSI-191 Tracking Report (May 2012 Version)", dated June 1, 2012.

Impact on DCD

Following impacts on the DCD due to this RAI are incorporated into GSI-191 Tracking Report submitted in June 2012 (Reference 3).

- Figure 6.2.1-9 and Figure 6.2.1-13 will be revised to incorporate the grating credited to prevent blockage of refueling cavity drain line as shown on pages 6.2-233 and 6.2-237 of Reference 3.
- The description of the grating will be added to the DCD as shown in the 3rd paragraph of page 6.2-46 and the 1st paragraph on page 6.2-59 of Reference 3.

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 any Technical/Topical Report.

Figure-1 Grating important to preventing credible large debris from blocking the refueling cavity drains (refueling cavity)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

7/27/2012

US-APWR Design Certification

Mitsubishi Heavy Industries, Ltd.

Docket No. 52-021

RAI NO.:	**NO. 354-2585 REVISION 0**
SRP SECTION:	**06.02.02 – Containment Heat Removal System**
APPLICATION SECTION:	**6.2.2 & 6.3**
DATE OF RAI ISSUE:	**05/07/2009**

QUESTION NO.: 06.02.02-44

As part of its review of the US-APWR design aspects that address GSI-191, the staff reviewed the applicant's sump strainer performance to the applicable regulatory criteria 10CFR52.47 "Contents of Applications; technical information" using the guidance of RG 1.206 Combined License Applications for Nuclear Power Plants. RG 1.206 outlines information to be submitted with design certification applications that will facilitate review by the NRC staff. The following information items, outlined in Section C.I.6.2.2 Containment Heat Removal Systems, as it relates to sumps, were not provided in the US-APWR DC application and form the basis for this request for additional information:

1) Discuss [in the DCD FSAR] the types of insulation used inside the containment and identify where and in what quantities each type is used. As part of the DCD FSAR discussion, identify the design basis debris source term used for the strainer performance analysis to include LOCA generated and Latent debris types and quantities.

2) Describe the methods used to attach the insulation to piping and components.

ANSWER:

MHI has changed the design inside the containment to close GSI-191 issues since the original response was submitted to the NRC in July 2009. Due to the change, values provided in the previous response to this RAI question needed to be changed. This amended response updates those values.

1) Type, application and quantity of insulation

The primal insulation used in the containment is reflective metallic insulation (RMI). Fibrous (blanket) insulation is not used in the containment of the US-APWR, but 4.5 lbm of fibrous debris are used as a design basis value for the evaluation of sump strainer performance as an operating margin. Pre-formed, buoyant type insulation is used as anti-sweat insulation chiller piping. NEI GR indicates that the buoyant insulation will not contribute to blockage in a fully submerged strainer plant, and therefore it is excluded from debris source.

The discussion about debris type and the quantity for the sump strainer performance evaluation is discussed in Section 3.2 of Technical Report MUAP-08001 "Sump Strainer Performance" (Reference 1). Also the discussion will be revised in the DCD as shown in Section 6.2.2.3.2 and 6.2.2.3.3 of the DCD Revision 3 Tracking Report Revision 1 (Reference 2).

The type, application and quantity of insulation in the containment are listed as follow:

Table-1 Insulation used in the containment

2) Methods used for attachment of the insulation

See Section 6.2.2.3.2 of the DCD Revision 3 Tracking Report Revision 1 (Reference 2) for the description of attachment method of insulation. The DCD will be revised as shown in the Tracking Report.

References

1) MHI Letter No. UAP-HF-12125, MUAP-08001 Revision 6, "Sump Strainer Performance", June 1, 2012.
2) MHI Letter No. UAP-HF-11452, "Submittal of the US-APWR DCD Revision 3 Tracking Report Revision 1", December 28, 2011.

Impact on DCD

Following impacts on the DCD due to this RAI are incorporated into DCD Revision 3 Tracking Report Revision 1 submitted in December 2011 (Reference 2).

Discussion 1): Type, application and quantity of insulation

Section 6.2.2.3.2 and 6.2.2.3.3 will be revised to incorporate the discussion as shown in 1st and 2nd paragraph of Section 6.2.2.3.2 on pages 6.2-50 and 6.2.51, and Section 6.2.2.3.3 on page 6.2-54 of Reference 2.

Discussion 2): Methods used for attachment of the insulation

Section 6.2.2.3.2 will be revised to add description of attachment method of insulation as shown in 3rd paragraph on page 6.2-51 of Reference 2.

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 any Technical/Topical Report.