MITSUBISHI HEAVY INDUSTRIES, LTD.
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TOKYO, JAPAN

December 3, 2013

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

Attention: Mr. Perry Buckberg

Docket No. 52-021
MHI Ref: UAP-HF-13286

Subject: MHI's Response to US-APWR DCD RAI No. 1057-7200 (SRP 01.05)

Reference: 1) "Request for Additional Information No. 1057-7200, SRP Section: 01.05– Other Regulatory Considerations, Application Section: 1.9.5.2" dated November 6, 2013 (ML13298A636).

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") the document entitled "Response to Request for Additional Information No. 1057-7200."

As indicated in the enclosed material, 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 (Enclosure 3) with the information identified as proprietary redacted and replaced by the designation "[ ]".

This letter includes a copy of the proprietary version of the response (Enclosure 2), a copy of the non-proprietary version of the response (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 Mr. Joseph Tapia, General Manager of the 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,
Executive Vice President
Mitsubishi Nuclear Energy Systems, Inc.
On behalf of Mitsubishi Heavy Industries, LTD.

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NRO

Enclosures:

1. Affidavit of Yoshiki Ogata
2. Response to Request for Additional Information No. 1057-7200 (proprietary version)
3. Response to Request for Additional Information No. 1057-7200 (non-proprietary version)

CC: P. Buckberg
J. Tapia

Contact Information
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ENCLOSURE 1

Docket No. 52-021
MHI Ref: UAP-HF-13286

MITSUBISHI HEAVY INDUSTRIES, LTD.
AFFIDAVIT

I, Yoshiki Ogata, state as follows:

1. I am Executive Vice President of Mitsubishi Nuclear Energy System, Inc. and have been delegated the function of reviewing MITSUBISHI HEAVY INDUSTRIES, LTD's ("MHI") 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 "Response to Request for Additional Information No. 1057-7200" dated December 3, 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 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 developed by MHI for the main control room (MCR) heating, ventilation and air conditioning (HVAC) system of the US-APWR.

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 of the US-APWR created by benefits of enhanced development costs associated with the design of the MCR HVAC system.

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 3rd day of December, 2013.

Yoshiki Ogata,
Executive Vice President
Mitsubishi Nuclear Energy Systems, Inc.

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Enclosure 3

UAP-HF-13286
Docket No. 52-021

Response to Request for Additional Information No. 1057-7200

December 2013
(Non-Proprietary)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

12/03/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 1057-7200**
SRP SECTION:	**01.05 – Other Regulatory Considerations**
	Application Section: 1.9.5.2
APPLICATION SECTION:	**1.9.5.2**
DATE OF RAI ISSUE:	**11/06/2013**

QUESTION NO. 01.05-11:

On March 12, 2012, NRC issued Order EA-12-049 (ML12054A735). This Order was issued to current reactor licensees and requires provisions for mitigation strategies for beyond-design-basis external events. The requirements of the Order were effective immediately and are expected to remain in place until superseded by Order or rule. As new reactors are licensed, they will receive the Order.

In response to the Order and anticipating the issuance of the Order to future licensees of the US-APWR design, the applicant issued its report, "US-APWR Evaluation and Design Enhancement to Incorporate Lessons Learned from TEPCO's Fukushima Dai-ichi Nuclear Power Stations Accident", (MUAP-13002, revision 1). As stated in its abstract, "This report summarizes strategies and design enhancements of US-APWR to incorporate lessons learned from the accidents at TEPCO's Fukushima Dai-ichi Nuclear Power Stations after the Great Tohoku Earthquake and the Tsunami which hit the station on March 11, 20111 and the requirements/recommendations issued after the disaster by the US NRC." NRC staff has reviewed this report needs a response to the following question in order to complete its review.

In the report MUAP-13002 (R1), the applicant does not address the issue of Main Control Room (MCR) environment during Phase 1 (i.e. 0 – 8 hours) of an extended loss of ac power (ELAP) station blackout (SBO) when the MCR air-handling units would be unavailable to maintain temperature control.

The staff notes that at a steady-state condition of 110°F, the environmental conditions within the main control room would remain at the uppermost habitability temperature limit defined in the accepted standard, NUMARC 87-00, for efficient human performance. NUMARC 87-00 provides the technical basis for this habitability standard as MIL-STD-1472C, which concludes that 110°F is tolerable for light work for a 4 hour period while dressed in conventional clothing with a relative humidity of ~30%. The NRC staff agrees that if it can be demonstrated that the temperature is maintained below 110°F, additional measures are not required. However, staff has determined that the applicant has supplied insufficient information to conclude that the habitability limits of the control room will be maintained during Phase 1 of an ELAP.

The applicant is requested to supply a summary of the analysis it performed that demonstrates the acceptability of continued habitability of the main control room under the postulated conditions. The applicant does not need to provide detailed calculations. This analysis should include a discussion of: (1) the initial conditions, including the postulated inside and outside air temperatures and humidity, (2) the heat loads from personnel in the MCR, (3) any additional relief efforts for the MCR staff (e.g. short stay time cycles, use of ice vests/packs, supplies of bottled water, etc.). (4) a description of the MCR temperature and

humidity from time-zero to time equal eight hours. (5) a sensitivity study with up to double the number of MCR occupants and any effects on necessary equipment.

In particular: (1) What are the expected worst case temperatures (hot and cold) and humidity within the MCR after eight hours from the onset of an ELAP SBO? (2) What are the limiting temperature and humidity conditions for the population of MCR instrumentation and controls depended upon in this beyond design basis external event?

The applicant is requested to update the report MUAP-13002 to include a summary of these conditions.

ANSWER:

Based on MCR temperature and humidity analyses as described below, MHI deems that the habitability conditions of the US-APWR main control room (MCR) under the postulated conditions of ELAP are acceptable.

The result of the MCR temperature and humidity analysis for the first 8 hours after onset of a SBO provides the maximum MCR temperature of 98.5 °F with a MCR humidity of 31.4 %RH at 8 hours as illustrated in Figure 1. The following initial conditions are assumed for the analysis:

1. Outdoor temperature: 115 °F (outdoor air temperature in summer per DCD Tier 2 Table 3.8.1-3)
2. Initial MCR ambient temperature: 78°F (maximum temperature under normal condition per DCD Tier 2 Table 9.4-1)
3. Initial temperature of adjacent rooms: 115°F (wall, floor), 130 °F (ceiling) (per DCD Tier 2 Table 3.8.1-3, Table 9.4-1)
4. Number of operators in the MCR: 5
5. Heat load from personnel in the MCR: [ ] Btu/hr
6. Initial MCR humidity: 60 %RH (maximum relative humidity under normal conditions per DCD Tier 2 Table 9.4-1)

For this base case analysis, the number of MCR operators was assumed to be five (5) which is the design basis of the US-APWR MCR HVAC system. The US-APWR mitigation strategies have been developed such that no additional operator support is needed in the MCR for the first 8 hours.

In addition to the base case analysis, a sensitivity study was performed for a case when the number of MCR operators is doubled. The result provides the maximum MCR temperature of 99.0°F and the MCR humidity of 31.0 %RH at 8 hours. The calculated MCR temperature of the sensitivity study from time-zero to 8 hours is illustrated in Figure 2. The differences in initial conditions from the base case are as follows:

1. Number of operators in the MCR: 10
2. Heat load from personnel in the MCR: [ ] Btu/hr

As addressed in NUMARC 87-00, 110°F should be considered as the temperature limit for operator's habitability in the MCR. Even in the sensitivity analysis when number of MCR operators is 10, the MCR temperature of the US-APWR will not reach 110°F at 8 hour after onset of SBO.

At times beyond 8 hours after the onset of a SBO, operators can initiate a MCR air handling unit for reducing MCR temperature as necessary because an AAC GTG can supply ac power to the unit as described in MUAP-13002.

Regarding the humidity, the resultant humidity of 31.4 %RH at 8 hrs after SBO does not impose a habitability issue for the MCR operators. Note that NUMARC 87-00 does not specify a humidity limit for operator habitability. The calculated MCR humidity from time-zero to 8 hours for the base case and the sensitivity study are illustrated in Figure 1 and Figure 2, respectively.

Environmental effects on MCR instrumentation and controls are not an issue for the US-APWR because the calculated maximum MCR temperature of 98.5°F during time zero through 8 hours after the onset of a SBO is below 122°F, which is assumed as the abnormal room condition in Table 5-2 of MUAP-08015 Equipment Qualification Program of the MCR. Additionally, an MCR air handling unit can be operated as described in Section 5.1.2.3.1 of MUAP-13002 at times greater than 8 hours after a SBO event.

Figure 1 MCR Temperature and Humidity from Time-zero to 8 hours after SBO (Base Case)

Figure 2 MCR Temperature and Humidity from Time-Zero to 8 hours after SBO (Sensitivity Study)
01.05-11-5

Impact on DCD

There is no impact on the DCD.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical/Topical Report

The summary of the MCR temperature analysis during ELAP which is described in Attachment 1 to this RAI response will be incorporated into the MUAP-13002 at the next revision.

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

Following description is added after Section 5.1.2.5 of MUAP-13002:

5.1.2.6 MCR Habitability

During the Phase 1 period, the maximum MCR temperature is determined to be 98.5 °F, which is below the uppermost habitability temperature limit (110 °F) defined in the accepted standard, NUMARC 87-00, for efficient human performance. During the Phases 2 and 3, a MCR Air Handling Unit can be utilized for cooling because of the availability of an AAC and alternate UHS. As such, MCR habitability is not a challenge even during ELAP with simultaneous loss of normal access to UHS. Details of the analyses are described in Appendix X[1] to this report.

Note 1: The specific appendix number will be determined considering responses to other Fukushima-related RAI changes.

Description from next page is added as Appendix X[1] to MUAP-13002.

Note 1: The specific appendix number will determined considering responses to other Fukushima-related RAI changes.

Appendix X[1] MCR Habitability Analysis

Note 1: specific appendix number will determined considering responses to other Fukushima-related RAI changes.

1. Summary

Based on MCR temperature and humidity analyses as described below, the habitability conditions of the US-APWR main control room (MCR) under the postulated conditions of ELAP are acceptable.

2. MCR Habitability Analyses

The result of the MCR temperature and humidity analysis for the first 8 hours after the onset of a SBO provides the maximum MCR temperature of 98.5°F with a MCR humidity of 31.4 %RH at 8 hours as illustrated in Figure AX[1]-1. The following initial conditions are assumed for the analysis:

1. Outdoor temperature: 115°F (outdoor air temperature in summer per DCD Tier 2 Table 3.8.1-3)
2. Initial MCR ambient temperature: 78°F (maximum temperature under normal condition per DCD Tier 2 Table 9.4-1)
3. Initial temperature of adjacent rooms: 115°F (wall, floor), 130°F (ceiling) (per DCD Tier 2 Table 3.8.1-3, Table 9.4-1)
4. Number of operators in the MCR: 5
5. Heat load from personnel in the MCR: [ ] Btu/hr
6. Initial MCR humidity: 60 %RH (maximum relative humidity under normal conditions per DCD Tier 2 Table 9.4-1)

For this base case analysis, the number of MCR operators was assumed to be five (5) which is the design basis of the MCR HVAC system. The US-APWR mitigation strategies have been developed such that no additional operator support is needed in the MCR for the first 8 hours.

In addition to the base case analysis, a sensitivity study was performed for a case when the number of MCR operators is doubled. The result provides the maximum MCR temperature of 99.0°F and the MCR humidity of 31.0 %RH at 8 hours. The calculated MCR temperature of the sensitivity study from time-zero to 8 hours is illustrated in Figure AX[1]-2. The differences in initial conditions from the base case are as follows:

1. Number of operators in the MCR: 10
2. Heat load from personnel in the MCR: [ ] Btu/hr

As addressed in NUMARC 87-00, 110°F should be considered as the temperature limit for operator habitability in the MCR. Even in the sensitivity analysis when number of MCR operators is 10, the MCR temperature of the US-APWR will not reach 110 °F at 8 hour after a SBO.

At times beyond 8 hours after the onset of a SBO, operators can initiate a MCR air handling unit for reducing MCR temperature as necessary because an AAC GTG can supply ac power to the unit as described in MUAP-13002.

Regarding the humidity, the resultant humidity of 31.4 %RH at 8 hrs after SBO does not impose a habitability issue for the MCR operators. Note that NUMARC 87-00 does not specify a humidity limit for operator habitability. The calculated MCR humidity from time-zero to 8 hours for the base case and the sensitivity study are illustrated in Figure AX[1]-1 and Figure AX[1]-2, respectively.

Note 1: specific number will determined considering responses to other Fukushima-related RAI changes.

3. Effects on MCR instrumentation and controls

Environmental effects on MCR instrumentation and controls are not an issue for the US-APWR because the calculated maximum MCR temperature of 98.5°F during time zero through 8 hours after the onset of a SBO is below 122°F, which is assumed as the abnormal room condition in Table 5-2 of MUAP-08015 Equipment Qualification Program of the MCR. Additionally, an MCR air handling unit can be operated as described in Section 5.1.2.3.1 at times greater than 8 hours after a SBO event.

Figure AX[1]-1 MCR Temperature and Humidity from Time-zero to 8 hours after SBO (Base Case)

Figure AX[1]-2 MCR Temperature and Humidity from Time-Zero to 8 hours after SBO (Sensitivity Study)