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TOKYO, JAPAN

September 10, 2008

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-08180

Subject: MHI's Response to US-APWR DCD RAI No. 59-1086 Revision 0

References: 1) "Request for Additional Information No. 59-1086 Revision 0, SRP Section: 02.03.01 – Regional Climatology," dated August 27, 2008

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") document as listed in Enclosures.

Enclosed is the response to 1 RAI contained within Reference 1.

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.

Sincerely,

Y. Ogata

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

Enclosure:

1. "Response to Request for Additional Information No. 59-1086 Revision 0"

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

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Docket No. 52-021
MHI Ref: UAP-HF-08180

Enclosure 1

UAP-HF-08180
Docket No. 52-021

Response to Request for Additional Information No.59-1086 Revision 0

September 2008

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

9/10/2008

US-APWR Design Certification
Mitsubishi Heavy Industries
Docket No. 52-021

RAI NO.:	**NO. 59-1086 REVISION 0**
SRP SECTION:	**02.03.01 – REGIONAL CLIMATOLOGY**
APPLICATION SECTION:	**02.03.01**
DATE OF RAI ISSUE:	**6/23/2008**

QUESTION NO. : 02.03.01-16

Specify and identify the normal and extreme liquid and frozen precipitation events used in the design of the roofs of safety related structures in accordance with the Proposed Interim Staff Guidance (ISG) DC/COL-ISG-07, "Interim Staff Guidance on Assessment of Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category I Structures." These events should be identified as site parameters in DCD Tier 1 Table 2.1-1 and Tier 2 Table 2.0-1. Provide a basis for the chosen site parameter values, including ensuring the postulated site parameter values are representative of a reasonable number of sites that have been or may be considered for a COL application. Also describe the design and analysis method used to accommodate the resulting loads.

ANSWER:

The US-APWR is designed for a normal roof live load of 50 lb/ft^2, and it is to be verified by the COL Applicant as bounding their site-specific regional climatology and local meteorology as stated in DCD Section 2.3. Normal winter precipitation roof loads are added to all other live loads that may be expected to be present at the time to determine the design live load on the roof, and include using appropriate load factors in applicable loading combinations.

The normal ground snow load p_g is determined based on the highest ground-level weight of:

- the 100-year return period snowpack,
- the historical maximum snowpack,
- the 100-year return period snowfall event, or
- the historical maximum snowfall event in the site region.

The maximum ground snowpack is obtained from ASCE 7-05 Figure 7-1 using a multiplier of 1.22 (Reference ASCE 7-05, Section C7.3.3) to convert the design value from the 50-year mean recurrence interval to a 100-year recurrence interval. Snowfall values for the 100-year return period snowfall event and the historical maximum snowpack and snowfall event are evaluated on

a site-specific basis to determine if any of these values are to be used as higher than the maximum ground snowpack obtained from ASCE 7-05.

The US-APWR is designed for an extreme winter precipitation roof load of 75 lb/ft^2, and it is to be verified by the COL Applicant as bounding their site-specific regional climatology and local meteorology as stated in DCD Section 2.3. The extreme winter precipitation roof load is based on the sum of the normal ground level winter precipitation plus the highest weight at ground level resulting from either the extreme frozen winter precipitation event or the extreme liquid winter precipitation event. The extreme frozen winter precipitation event is assumed to accumulate on the roof on top of the antecedent normal winter precipitation event. The extreme liquid winter precipitation event may not accumulate on the roof, depending on the geometry of the roof and the type of drainage provided. The extreme winter precipitation roof load is included as live load in extreme loading combinations using the applicable load factor. Other extreme environmental loads, e.g., seismic and tornado loads are not considered as occurring simultaneously.

The extreme frozen winter precipitation event is the higher ground level weight of (1) the 100-year return period snowpack, or (2) the historical maximum snowfall event in the site region. The extreme frozen winter precipitation roof load is determined from the sum of the extreme frozen winter precipitation event plus the antecedent normal winter precipitation event converted to roof loads.

The roof load of the extreme liquid winter precipitation event is based on the roof load due to the normal winter precipitation event plus the roof load due to the extreme liquid winter precipitation event, which is derived from the maximum 48-hour winter rainfall. The value for 48-hour probable maximum winter precipitation (PMWP) is 36 inches, based on interpolation of 24-hour probable maximum precipitation (PMP) and 72-hour PMP data for the month of March (Reference: Hydrometeorological Report No. 53, Seasonal Variation of 10-Square-Mile Probable Maximum Precipitation Estimates, United States East of the 105th Meridian, Figures 27 and 37). It is therefore estimated the normal and extreme roof loads bound 75% to 80% of the US landmass (that is, continental US exclusive of Alaska), including all sites under current consideration.

The methodology for the design and analysis of snow and PMWP loads on seismic category I structures is consistent with ASCE 7-05, Chapter C7. Slope roof snow loads, partially loaded, unbalanced roof snow loads, and drifts (including sliding snow) on lower roofs, as applicable, are determined in accordance with ASCE 7-05.

The roof snow load in DCD Table 2.0-1, Revision 1, currently reflects the extreme roof snow load of 75 lb/ft^2 as the 100-year snowpack maximum snow weight including contributing portion of 48-hour PMWP. Revision 2 of the DCD will clarify the extreme winter precipitation roof load considers both frozen and liquid events. DCD Table 2.0-1 is to be changed to clarify and define the site parameters for normal winter precipitation roof load, extreme winter precipitation roof load, and 48-hour probable maximum winter precipitation as described above. DCD Subsection 3.8.4.3.4.2, Roof Snow Loads, is to be changed to align with changes to Chapter 2.

Impact on DCD

The DCD will be changed in Revision 2 to incorporate the following:

- A new 3rd row is added, and subsequent 4th and 5th rows revised in DCD Tier 1 Table 2.1-1 and Tier 2 Table 2.0-1 (Sheet 1 of 5) to incorporate the following changes:

Table 2.0-1 Key Site Parameters
(Sheet 1 of 5)

Normal winter precipitation roof load(11)	50 lb/ft^2
Extreme winter precipitation roof load(12) (100-year snowpack maximum snow weight including contributing portion of either extreme frozen winter precipitation event or extreme liquid winter precipitation event)	75 lb/ft^2
48-hr probable maximum winter precipitation(13) (PMWP)	36 in.

- Notes 11, 12, and 13 are added to the end of DCD Tier 1 Table 2.1-1 and Tier 2 Table 2.0-1 Notes, Sheet 5 of 5:

  11. Normal winter precipitation roof load is determined by converting ground snow load p_g in accordance with ASCE 7-05. p_g is based on the highest ground-level weight of:
      - the 100-year return period snowpack,
      - the historical maximum snowpack,
      - the 100-year return period snowfall event, or
      - the historical maximum snowfall event in the site region.
  12. The extreme winter precipitation roof load is based on the sum of the normal ground level winter precipitation plus the highest weight at ground level resulting from either the extreme frozen winter precipitation event or the extreme liquid winter precipitation event. The extreme frozen winter precipitation event is assumed to accumulate on the roof on top of the antecedent normal winter precipitation event. The extreme liquid winter precipitation event may not accumulate on the roof, depending on the geometry of the roof and the type of drainage provided. The extreme winter precipitation roof load is included as live load in extreme loading combinations using the applicable load factor indicated in DCD Section 3.8.
  13. The 48-hour PMWP is based on interpolation of 24-hour PMP and 72-hour PMP data for the month of March in HMR-53 (Reference: Hydrometeorological Report No. 53, Seasonal Variation of 10-Square-Mile Probable Maximum Precipitation Estimates, United States East of the 105th Meridian, Figures 27 and 37)

- The paragraph in DCD Subsection 3.8.4.3.4.2 is replaced with the following: "The roof is designed for uniform snow live load as specified in Chapter 2. Normal winter precipitation roof loads are added to all other live loads that may be expected to be present at the time to determine the design live load on the roof, and include appropriate load factors in applicable loading combinations. The extreme winter precipitation roof load is included as live load in extreme loading combinations using the applicable load factor. Other extreme environmental loads, e.g., seismic and tornado loads are not considered as occurring simultaneously. Slope roof snow loads, partially loaded, unbalanced roof snow loads, and drifts (including sliding snow) on lower roofs, as applicable, are determined in accordance with ASCE 7-05 (Reference 3.8-35)."

Impact on COLA

There is no impact on COLA.

Impact on PRA

There is no impact on PRA.

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