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June 26, 2012

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-12173

Subject: MHI's Responses to US-APWR DCD RAI No. 907-6321 REVISON3 (SRP 02), 908-6327 REVISION 3 (SRP03.03.02)

Reference:
1) "Request for Additional Information No. 907-6321 REVISION 3, SRP Section: 02 - Site Characteristics and Site Parameters".
2) "Request for Additional Information No. 908-6327 REVISION 3, SRP Section: 03.03.02 – Tornado Loadings".

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

In the enclosed documents, MHI provides responses to RAI 907-6321 Question 02-03 and RAI 908-6327 Question 03.03.02-06 that are contained within Reference 1 and 2 respectively.

Please contact Mr. Joseph Tapia, General Manager of 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.

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NRO

Enclosures:

1. Response to Request for Additional Information No.907-6321 Revision 3

2. Response to Request for Additional Information No.908-6327 Revision 3

CC: J. A. Ciocco
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Enclosure 1

UAP-HF-12173
Docket No.52-021

Response to Request for Additional Information No.907-6321
Revision 3

June 2012

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/26/2012

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 907-6321 REVISION 3**
SRP SECTION:	**02 – SITE CHARACTERISTICS AND SITE PARAMETERS**
APPLICATION SECTION:	**TIER 1, SECTION 2.1; TIER 2, SECTIONS 2.0, 2.3.1, 3.3.2, 3.5.1.4, 3.5.3, 3.8.1, 3.8.4, 3.8.5, 3.12.5, 3.12.6**
DATE OF RAI ISSUE:	**3/5/2012**

QUESTION NO.: 2.0-3

10 CFR 52.47(a)(1) states that the FSAR for an application for a standard design certification must contain the site parameters postulated for the design and an analysis and evaluation of the design in terms of those site parameters, where site parameters are defined in 10 CFR 52.2(a) as the postulated physical, environmental and demographic features of an assumed site. 10 CFR Part 50, Appendix A, GDC 2 requires that SSCs important to safety shall be designed to withstand the effects of natural phenomena such as tornadoes and hurricanes without loss of capability to perform their safety functions. 10 CFR Part 50, Appendix A, GDC 4 requires that SSCs that are important to safety be appropriately protected against the effects of missiles that may result from events and conditions outside the nuclear power unit.

Nuclear power plants must be designed so that they remain in a safe condition under extreme meteorological events, including those that could result in the most extreme wind events (tornadoes and hurricanes) that could reasonably be predicted to occur at the site. Initially, the U.S. Atomic Energy Commission (predecessor to the NRC) considered tornadoes to be the bounding extreme wind events and issued RG 1.76, "Design-Basis Tornado for Nuclear Power Plants," in April 1974. The design-basis tornado wind speeds were chosen so that the probability that a tornado exceeding the design basis would occur was on the order of 10-7 per year per nuclear power plant. In March 2007, the NRC issued Revision 1 of RG 1.76, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants." Revision 1 of RG 1.76 relied on the Enhanced Fujita Scale, which was implemented by the National Weather Service in February 2007. The Enhanced Fujita Scale is a revised assessment relating tornado damage to wind speed, which resulted in a decrease in design-basis tornado wind speed criteria in Revision 1 of RG 1.76. Since design-basis tornado wind speeds were decreased as a result of the analysis performed to update RG 1.76, it was no longer clear that the revised tornado design basis wind speeds would bound design-basis hurricane wind speeds in all areas of the United States. This prompted an investigation into extreme wind gusts during hurricanes and their relation to design basis hurricane wind speeds, which resulted in issuing RG 1.221, "Design-Basis Hurricane and Hurricane Missiles for Nuclear Power Plants," in October 2011.

RG 1.221 also evaluated missile velocities associated with several types of missiles considered for different hurricane wind speeds. The hurricane missile analyses presented in RG 1.221 are based on missile aerodynamic and initial condition assumptions that are

similar to those used for the analyses of tornado-borne missile velocities adopted for Revision 1 to RG 1.76. However, the assumed hurricane wind field differs from the assumed tornado wind field in that the hurricane wind field does not hange spatially during the missile's flight time but does vary with height above the ground. Because the size of the hurricane zone with the highest winds is large relative to the size of the missile trajectory, the hurricane missile is subjected to the highest wind speeds throughout its trajectory. In contrast, the tornado wind field is smaller, so the tornado missile is subject to the strongest winds only at the beginning of its flight. This results in the same missile having a higher maximum velocity in a hurricane wind field than in a tornado wind field with the same maximum (3-second gust) wind speed.

Accordingly, the applicant is being requested to add hurricane wind speed and hurricane missile spectra to its list of site parameter values in Tier 1 and Tier 2 of the DCD and show in Chapter 3 of Tier 2 of the DCD how SSCs important to safety are protected from the combined effects of hurricane winds and missiles.

ANSWER:

MHI plans to adopt the guidance described in Regulatory Guide (RG) 1.221, Revision 0, in evaluating the potential effects of hurricane wind speeds and hurricane-generated missile speeds on the design of the US-APWR standard plant. Revisions to the DCD to adopt RG 1.221, Revision 0, will be provided by the end of August, 2012, including revisions to Table 2.1-1 in Chapter 2 of DCD Tier 1, and Table 2.0-1 and Section 2.3.1 in Chapter 2 of DCD Tier 2, and to Section 3.5 in Chapter 3 of DCD Tier 2 and other Chapters.

Impact on DCD

Revisions to the DCD will be provided by the end of August, 2012.

Impact on R-COLA

The COL Applicant is required by the COL items as revised by this response to evaluate the impact to the design of site-specific SSCs based on the evaluation of the standard plant for site-specific wind and wind-generated missiles.

Impact on S-COLA

The COL Applicant is required by the COL items as revised by this response to evaluate the impact to the design of site-specific SSCs based on the evaluation of the standard plant for site-specific wind and wind-generated missiles.

Impact on PRA

There is no impact on the PRA.

Impact on Topical Report / Technical Report

There is no impact on the Topical Report / Technical Report.

Enclosure 2

UAP-HF-12173
Docket No.52-021

Response to Request for Additional Information No.908-6327
Revision 3

June 2012

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

6/26/2012

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 908-6327 REVISION 3**

SRP SECTION: **03.03.02 – TORNADO LOADS**

APPLICATION SECTION: **3.3.2**

DATE OF RAI ISSUE: **3/5/2012**

QUESTION NO.: 03.03.02-06

Nuclear power plants must be designed so that they remain in a safe condition under extreme meteorological events, including the most extreme wind events (tornadoes and hurricanes) that could reasonably be predicted to occur at the site. This requirement is based on the following regulations:

- 10 CFR Part 50, Appendix A, GDC 2 requires that SSCs important to safety shall be designed to withstand the effects of natural phenomena such as tornadoes and hurricanes with appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area and with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated without loss of capability to perform their safety functions.
- 10 CFR Part 50, Appendix A, GDC 4 requires that SSCs that are important to safety be appropriately protected against the effects of missiles that may result from events and conditions outside the nuclear power unit.
- 10 CFR 100.20(c)(2) states that the meteorological characteristics of the site that are necessary for safety analysis or that may have an impact upon plant design must be identified and characterized.
- 10 CFR 100.21(d) states, in part, that the meteorological characteristics of the site must be evaluated and site parameters established such that potential threats from such physical characteristics will pose no undue risk to the type of facility proposed to be located at the site.

Initially, the U.S. Atomic Energy Commission (predecessor to the NRC) considered tornadoes to be the bounding extreme wind events and issued RG 1.76, "Design-Basis Tornado for Nuclear Power Plants," in April 1974. In March 2007, the NRC issued Revision 1 of RG 1.76, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants," which is based on the Enhanced Fujita Scale implemented by the National Weather Service in February 2007. The Enhanced Fujita Scale is an indirect assessment relating tornado damage to wind speed, which resulted in a decrease in design-basis tornado wind speed criteria in Revision 1 of RG 1.76. Since design-basis tornado wind speeds were decreased, it was no longer certain that the reduced tornado design basis wind speeds would bound design-basis hurricane wind speeds in all areas of the United States. This resulted in issuing

a new RG 1.221, "Design-Basis Hurricane and Hurricane Missiles for Nuclear Power Plants," in October 2011.

In consideration of the guidance provided in RG 1.221, the applicant is requested to define the design-basis hurricane wind speeds and hurricane produced missile speeds in cases where hurricane, not tornado, is bounding for the extreme wind. Furthermore, methodology should be given on the conversion of hurricane wind and missile impact effects to design load, and on the determination of total wind load effects from the combination of hurricane wind effects and missile impact effects. The applicant is also requested to revise COL Information items in Sec. 3.3.3 and Table 1.8-2 of the DCD, taking into account the hurricane effects, should it bound the extreme wind conditions.

ANSWER:

As noted in the response to RAI 907-6321, MHI plans to adopt the guidance described in Regulatory Guide (RG) 1.221, Revision 0, in evaluating the potential effects of hurricane wind speeds and hurricane-generated missile speeds on the design of the US-APWR standard plant. Revisions to the DCD to adopt RG 1.221, Revision 0, will be provided as described in the response to RAI 907-6321.

Impact on DCD

See the response to RAI 907-6321.

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 Topical Report / Technical Report

There is no impact on the Topical Report / Technical Report.