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## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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1/31/2013

### US-APWR Design Certification

### Mitsubishi Heavy Industries

### Docket No. 52-021

**RAI NO.:** NO. 798-5876 REVISION 3  
**SRP SECTION:** 03.07.01 – Seismic Design Parameters  
**APPLICATION SECTION:** 3.7.1  
**DATE OF RAI ISSUE:** 08/05/11

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#### QUESTION NO. RAI 03.07.01-16:

In Subsection 3.7.1.1 of DCD (R3), "Design Ground Motion", the second paragraph under the subtitle "Duration of Motion" (Page 3.7-8) states, "the total duration of the ground motion time histories has been demonstrated to be long enough such that adequate representation of the Fourier components at low frequency is included in the time history."

The Applicant is requested to define "low frequency" in this context and to show how the adequate representation of the Fourier components is implemented to assure that the ground motion duration is sufficient.

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#### ANSWER:

This answer revises and replaces the previous MHI answer that was transmitted by letter UAP-HF-11296 (ML11252B126).

Subsection 3.7.1.1 has been rewritten to discuss the development of artificial time histories using SRP 3.7.1 Option 1 Approach 1. The referenced sentence acknowledged consideration of a long enough time history such that low frequency Fourier components are represented. Adequate representation of the Fourier components at low frequency is achieved by ensuring the artificial time history matches the certified seismic design response spectra (CSDRS) at all damping values and meets the PSD targets.

Although the CSDRS conservatively start at a frequency of 0.1 Hz, for the context of durations sufficiently long enough to capture low frequency hazards, "low frequency" is defined consistently with RG 1.208 (DCD Reference 3.7-3) guidance, which identifies "low frequency" hazards as being at 1 to 2.5 Hz. The periods associated with these low frequencies vary from 1 to 0.4 seconds, respectively. The 22.08 second duration of the US-APWR standard plant ground motion time histories exceeds the durations recommended for magnitude 6.5 earthquakes applicable for the US-APWR for all distances shown in Table 3-2 of NUREG CR-6728. Considering Table 3-2, a 20 second duration represents from 20 to 50 cycles of these low frequency hazards. For the standard plant structures, analyzed with SASSI in the frequency domain, this duration is sufficient to capture resonance effects, considering the reductions due to

damping. Therefore, the 22.08 second durations of the US-APWR time histories are considered long enough such that low frequency Fourier components are represented.

See Section 01.5.1.2 of Technical Report MUAP-10006, Rev. 3, for more information on the development of the CSDRS time histories for the US-APWR standard plant.

**Impact on DCD**

There is no impact on the DCD

**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 a Technical/Topical Report.

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