
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

02/27/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 886-6202 REVISION 3
SRP SECTION: 03.07.01 – Seismic Design Parameters
APPLICATION SECTION: 3.7.1
DATE OF RAI ISSUE: 01/10/2012

QUESTION NO. 03.07.01-33:

In October 2011, Mitsubishi Heavy Industries (MHI) submitted a revised report describing the supporting technical bases for US-APWR DCD Sections 3.7.1 and 3.7.2. This revised technical report, titled MUAP-10001-P, "Seismic Design Bases of the US-APWR Standard Plant," Revision 4, states that seed motion corresponding to the Mt. Baldy, CA, recording of the January 14, 1994, Northridge earthquake was replaced with the Site 3 recording of the December 23, 1985, Nahanni, Canada earthquake. During a November 7, 2011 public meeting on this topic [ML113186257], MHI stated that the use of the Northridge seed motion resulted in unrealistic building base shear and overturning moment response, adversely affecting sliding stability and soil bearing pressures. MHI stated that the Northridge time history set was replaced on the basis that there were high demands caused by coherent peak accelerations (i.e., maximum acceleration demands in three directions occurring at the same time). MHI results, presented at the meeting, indicated that the use of the Nahanni seed motions reduced bearing pressure demands by as much as 50 percent.

The staff notes that coherent seed motion is plausible based on historic earthquake event recordings, and it is realistic to expect that design time histories (developed from such seeds) may have time intervals where maximum response occurs in several directions simultaneously. The SRP does not address reducing seismic demands using an alternative seed motion, when developing a single set of design time histories (Option 1). However, the SRP does recognize that some applications may need to use multiple sets of time histories (based on multiple seed motions) to better represent a broad banded design response spectra such as a RG 1.60 based CSDRS. SRP Section 3.7.1.II.1B, Option 2, discusses acceptance criteria for the use of multiple sets of time histories.

Based on the above, the staff finds that the MHI approach for developing design time histories is not in accordance with SRP guidance; the staff requests additional information to assess whether the applicant is satisfying NRC regulations (Appendix A to 10 CFR Part 50). To address this issue, the staff requests MHI to justify the adequacy of the current set of design time histories based on the Nahanni seed records, and demonstrate that the seismic demands yield results comparable to an approach that uses multiple set of time histories. Specifically, the staff requests MHI to:

- (a) Provide five sets of individual time histories that are developed from separate seed motions and are considered appropriate for use in computing ISRS needed for

design evaluation. Included in the five time history sets should be sets developed from the Northridge and Nahanni seed motions.

- (b) Explain how the selected sets of time histories satisfy SRP Subsection 3.7.1.II.1B (Option 2) guidelines.
- (c) Provide the technical basis for concluding that the selected seed motions possess spectral shapes that are appropriate for fitting to the CSDRS.
- (d) Provide response spectra and corresponding PSD functions for both the seed motion and the synthetic time histories developed to match the CSDRS spectra, for all five time history sets.
- (e) Compare ISRS at the key nuclear island locations that are currently used for comparing two sets of results, for two seismic analysis cases:

Case 1 - based on the single set of time histories (Nahanni seed motions), and

Case 2 - based on the mean of the five sets of time histories selected in (a).

Assess the significance of any differences in results for the US-APWR design.

ANSWER:

This answer revises and replaces the previous MHI response that was transmitted by letter UAP-HF-12050 (ML12062A251).

Due to the design changes and methodology changes as described and documented in the US-APWR Seismic Closure Plan (MHI letter UAP-HF-13034, transmitted on February 15, 2013) the NRC's requested comparison between Northridge and Nahanni is no longer needed or required for justification of the seismic design basis time histories used for the updated US-APWR soil-structure interaction analyses. The seismic design basis time histories based on the Northridge seed record is presented in Section 01.4.1 of Technical Report MUAP-10006, Rev. 3. The seismic design basis time histories developed from the Northridge seeds for use on the US-APWR Standard Plant were developed to be compliant with the guidance provided in SRP Section 3.7.1.II.1B, Option 1, Approach 1.

Impact on DCD

DCD markups of Subsection 3.7.1 were submitted via MHI Letter UAP-HF-13017, January 31, 2013.

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 the Technical/Topical Report.

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