US-APWRRAIsPEm Resource

From: Ciocco, Jeff
Sent: Monday, April 29, 2013 7:16 AM
To: us-apwr-rai@mhi.co.jp; US-APWRRAIsPEm Resource
Cc: Thomas, Vaughn; Shams, Mohamed; Galvin, Dennis
Subject: US-APWR Design Certification Application RAI 1025-7092 (3.7.2)
Attachments: US-APWR DC RAI 1025 SEB1 7092.pdf

MHI,

The attachment contains the subject request for additional information (RAI). This RAI was sent to you in draft form. Your licensing review schedule assumes technically correct and complete responses within 30 days of receipt of RAIs. However, MHI requests and we grant 60 days to respond to the RAI. We will adjust the schedule accordingly.

Please submit your RAI response to the NRC Document Control Desk.

Thank you,

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REQUEST FOR ADDITIONAL INFORMATION 1025-7092

Issue Date: 4/29/2013

Application Title: US-APWR Design Certification - Docket Number 52-021

Operating Company: Mitsubishi Heavy Industries

Docket No. 52-021

Review Section: 03.07.02 - Seismic System Analysis
Application Section: 3.7.2

QUESTIONS

03.07.02-225

Figures 3.6, 3.7, and 3.8 in Section 3.2 of MUAP-11007 Revision 2 present comparison plots of the 5% damped acceleration response spectra (ARS) of the free-field within layer motion used as input for the soil-structure interaction (SSI) analyses of the reactor building (R/B) complex unsaturated and saturated soil profiles. It is the staff's understanding that these results are obtained from the deterministic one-dimensional site response analyses for the particular profiles discussed using as input the time history enveloping the smooth, broad banded outcrop response spectrum (enhanced RG 1.60 spectrum) defined as an outcrop spectrum at a depth of approximately 42' (Section 2.5.1). Staff notes the following from the referenced spectral plots in Figures 3.6, 3.7 and 3.8:

a) the amplification of the smooth input outcrop motion from the foundation depth to the surface is uniform (i.e., indicates no spectral peaks) from very low frequencies to high frequencies;

b) the de-amplification from the surface down to the foundation depth of the in-column spectra shows a major dip at the first column frequency of around 7 to 8 Hz;

c) the magnitude of this dip is extremely large (surface Sa of about 0.90g to 0.35g at about 8 Hz for the 270-200 site), or a reduction of over 60%;

d) no similar dip is apparent in the vertical spectra plots;

e) the dip in the H1 (North-South) and H2 (East-West) responses are different for the same site profile;

f) the behavior between the 270-200 and 270-500 profiles is essentially the same with an even greater difference between the H1 and H2 responses;

g) the behavior of the 560-500 profile also shows large dips at between 7 and 10 Hz.

The applicant did not provide a detailed description of how the in-column spectra at the ground surface and at 42' depth were generated from the certified seismic design response spectra (CSDRS). In order for the staff to evaluate the effects of groundwater level on the SSI response of the R/B complex, the applicant is requested to provide the following additional information:

(i) Reason (s) for and the design significance of the large dip between 7-10 Hz. in the horizontal in-column response spectra at the foundation depth for the three soil profiles considered for the evaluation.
(ii) For the 270-200 soil case, for both saturated and unsaturated conditions, provide a copy of the horizontal and vertical (H1, H2 and V) time histories that were used to generate the (1) spectra at the surface and (2) in-column spectra at the 42' foundation depth, both based on the CSDRS applied at a hypothetical outcrop at the 42' foundation depth. Also, identify which records were used as input to the SSI analyses.

03.07.02-226

Section 2.3 of MUAP-11007 (R2) indicates that the Poisson's ratio used in developing the P-wave velocity of the saturated soil profiles approaches values close to 0.48, and that this value is low enough "not to compromise the numerical stability of the SASSI results."

The applicant is requested to provide (i) the basis for concluding that the numerical stability of the SASSI results is not compromised and (ii) the details of any specific sensitivity study that show that the ACS-SASSI results for APWR SSI analysis are numerically stable for the selected site-independent soil profiles and the assumed values of Poisson's ratio.

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