Exelon Generation

NP-11-0025
June 17, 2011

10 CFR 52, Subpart A

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Exelon Nuclear Texas Holdings, LLC
Victoria County Station Early Site Permit Application
Response to Request for Additional Information Letter No. 07
NRC Docket No. 52-042

Attached are responses to NRC staff questions included in Request for Additional Information (RAI) Letter No. 07, dated April 8, 2011, related to Early Site Permit Application (ESPA), Part 2, Sections 02.04.06, 02.05.02, and 11.02. NRC RAI Letter No. 07 contained twenty Questions. This submittal comprises a partial response to RAI Letter No. 07, and includes responses to the following Question:

02.05.02-6c

When a change to the ESPA is indicated by a Question response, the change will be incorporated into the next routine revision of the ESPA, planned for no later than March 31, 2012.

Of the remaining nineteen (19) RAIs associated with RAI Letter No. 07, responses to seven (7) Questions were submitted to the NRC in Exelon Letter NP-11-0016, dated May 5, 2011, and responses to seven (7) Questions were submitted to the NRC in Exelon Letter NP-11-0020, dated May 23, 2011. The response to RAI Questions 02.04.06-3 and 02.05.02-10 will be provided by July 7, 2011. The response to RAI Questions 02.05.02-3a, 02.05.02-3b, and 02.05.02-3c will be provided by August 5, 2011. These response times are consistent with the response times described in NRC RAI Letter No. 07, dated April 8, 2011.

No new regulatory commitments are contained in this submittal.

If any additional information is needed, please contact David J. Distel at (610) 765-5517.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 17th day of June, 2011.

Respectfully,

Marilyn C. Kray
Vice President, Nuclear Project Development

Attachments:
1. Question 02.05.02-6c

cc: USNRC, Director, Office of New Reactors/NRLPO (w/Attachment)
USNRC, Project Manager, VCS, Division of New Reactor Licensing (w/Attachment)
USNRC Region IV, Regional Administrator (w/Attachment)

RAI 02.05.02-6c:

Question:

In SSAR Section 2.5.2.5, the applicant describes its characterization of the seismic wave transmission characteristics for the VCS site. In accordance with 10 CFR 100.23, the staff requests the applicant provide additional information regarding the applicant's site-specific seismic wave transmission characterization.

c) Please describe the resonant features shown in SSAR Figures 2.5.2-58, -63, and -68 and whether they result from the truncated soil column used by the applicant to model the site's seismic-wave transmission.

Response:

SSAR Figures 2.5.2-58, -63, -68, and -73 show the log-mean site amplification factors at the GMRS horizons of two representative locations in the power block, Units 1 and 2, for low frequency (LF) and high frequency (HF) rock input motions for hazard levels of both 10^{-4} and 10^{-5} annual frequencies of exceedance. At each of the two locations, 60 randomized soil profiles were used in site response analyses to develop the site amplification factors. It is noted that the locations of the soils profiles were originally identified in accordance with the reactor unit designation, i.e., Units 1 and 2, during the development of a combined operating license application for VCS. For the ESP application, the designation by units has been retained, to be consistent with the analyses that provide input to this response. Specifically, Units 1 and 2 refer to the western part and eastern part of the power block, respectively. The GMRS horizon is defined at the top of SAND 4 layer, which is at 99 foot depth for Unit 1, and 102 foot depth for Unit 2, below the minimum power block finished site grade (El. 95 ft, NAVD 88). The randomized soil profiles for Units 1 and 2 were generated using the base case soil column data at the respective locations. The mean responses obtained are enveloped to develop the GMRS for the plant site.

In response to this RAI, a new set of limited site response analyses was performed using the base case soil columns with best estimate soil properties for each unit and LF and HF rock input motions at the 10^{-4} and 10^{-5} hazard levels. The site amplification factor results from the new limited site response analyses are plotted in Figure 1 through Figure 4. For comparison purpose, the corresponding log-mean site amplification factors calculated using the randomized soil profiles (SSAR Figures 2.5.2-58, -63, -68, and -73) are also plotted in the figures. As shown in all four figures, the site amplification factors calculated using the base case soil columns are very similar and close to the log-mean site amplification factors calculated using the randomized soil profiles. Of interest is that the peaks of the site amplifications occur at about the same frequencies for all four input rock motions (LF and HF at 10^{-4} and 10^{-5} hazard levels) at both locations (Units 1 and 2). Because the base case soil columns effectively replicate the site amplification characteristics as represented by the mean response of the randomized profiles, it is reasonable to use the base case soil columns, in lieu of the randomized profiles, to develop the response to address this RAI question. In addition, due to similar nature of the soil amplifications in terms of peaks and valleys for the HF and LF input motions at both hazard levels and the similar responses from the two locations, Units 1 and 2, the results of the base case soil column for Unit 1 for the 10^{-4} LF input motion are used to extract additional responses as described below.

The resonant features associated with the first four peaks of the site amplification factors below a frequency of 0.7 Hz are evaluated by examining transfer functions between various horizons using the base case soil column of Unit 1 with the 10^{-4} LF input motion. The frequency domain harmonic transfer function between the top of the soil column (GMRS horizon) and rock input motion (outcrop at 8016 ft depth from the GMRS horizon of Unit 1) shows the first peak at a frequency of about 0.12 Hz. This is about the same frequency as the first peak of the site amplifications as shown in Figure 1. Therefore, it is concluded that the first peak of the site amplifications is the result of the resonant feature of the entire soil column (8016 ft). Examining the transfer functions from other depths, it is noted that the second, the third and the fourth peaks of the site amplification factors are the resonant features of the top portion with approximate column height of 2016 ft, 816 ft, and 516 ft. This evaluation confirms that due to the stratigraphy of the site with soil layers having contrasting shear wave velocities, the site response includes multiple resonance frequencies each corresponding to a different part of the soil column with higher frequencies controlled by the upper part of the soil column.

In order to evaluate the effect of the truncation depth, the two base case soil profiles for Units 1 and 2 were extended to a depth of 12115 ft from the minimum power block finished site grade (El. 95 ft, NAVD 88); with an additional 4000 ft added to the base case soil columns using the deep velocity data provided in SSAR Table 2.5.4-52. The analyses for the extended base case soil columns at both locations were repeated using the 10^{-4} and 10^{-5} HF and LF input motions, similar to the derivation of the GMRS, to develop acceleration response spectra (ARS). The resulting ARS are compared with the GMRS in Figure 5. As shown in this figure, change of the soil column height by 50% has only a small effect on the results and the resulting spectrum is generally less than GMRS. The small differences can be attributed to the fact that the results using base case soil columns do not consider the variation of soil properties as was considered in the randomized soil profiles for the GMRS calculation.

The results of the additional evaluations presented herein describe the nature of the resonant frequencies and confirm adequacy of the GMRS.

Associated ESPA Revisions:

No ESPA revision is required as a result of this response.

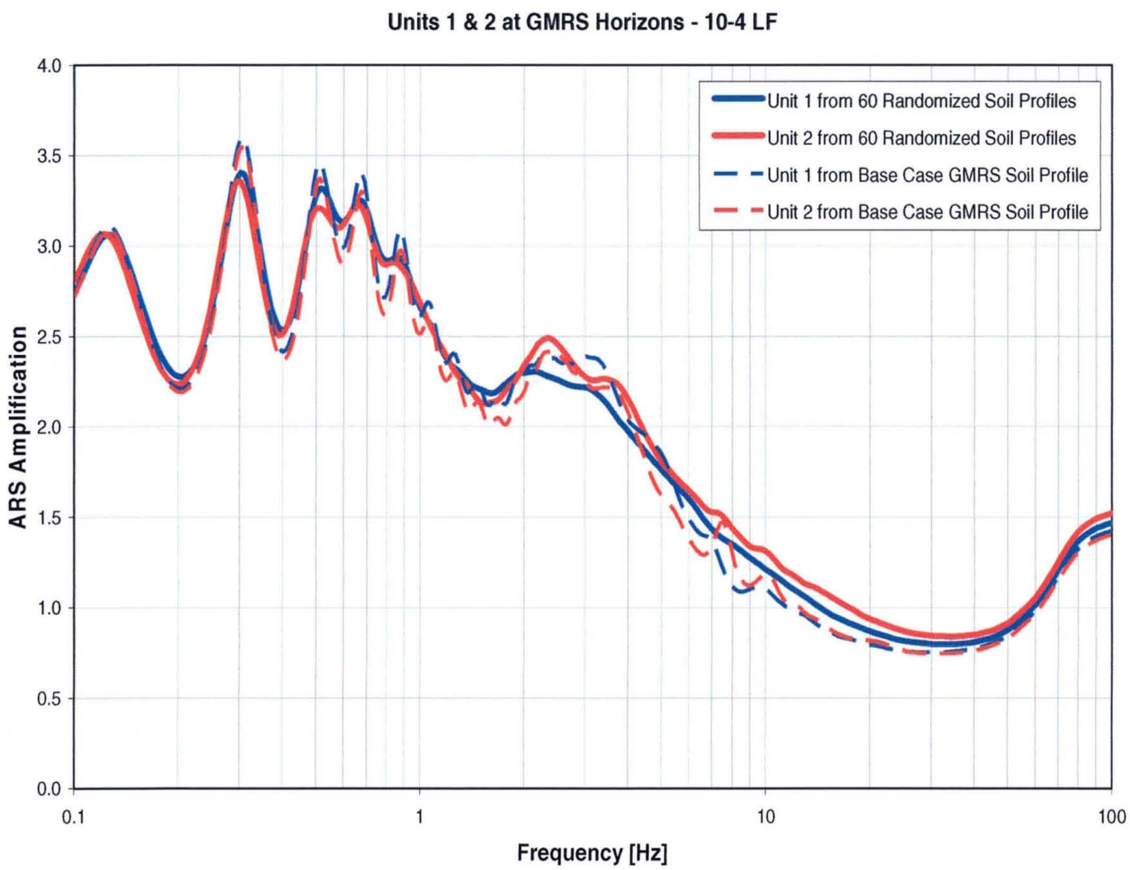

Figure 1. Site Amplifications at GMRS horizons for 10^{-4} LF Input Motion

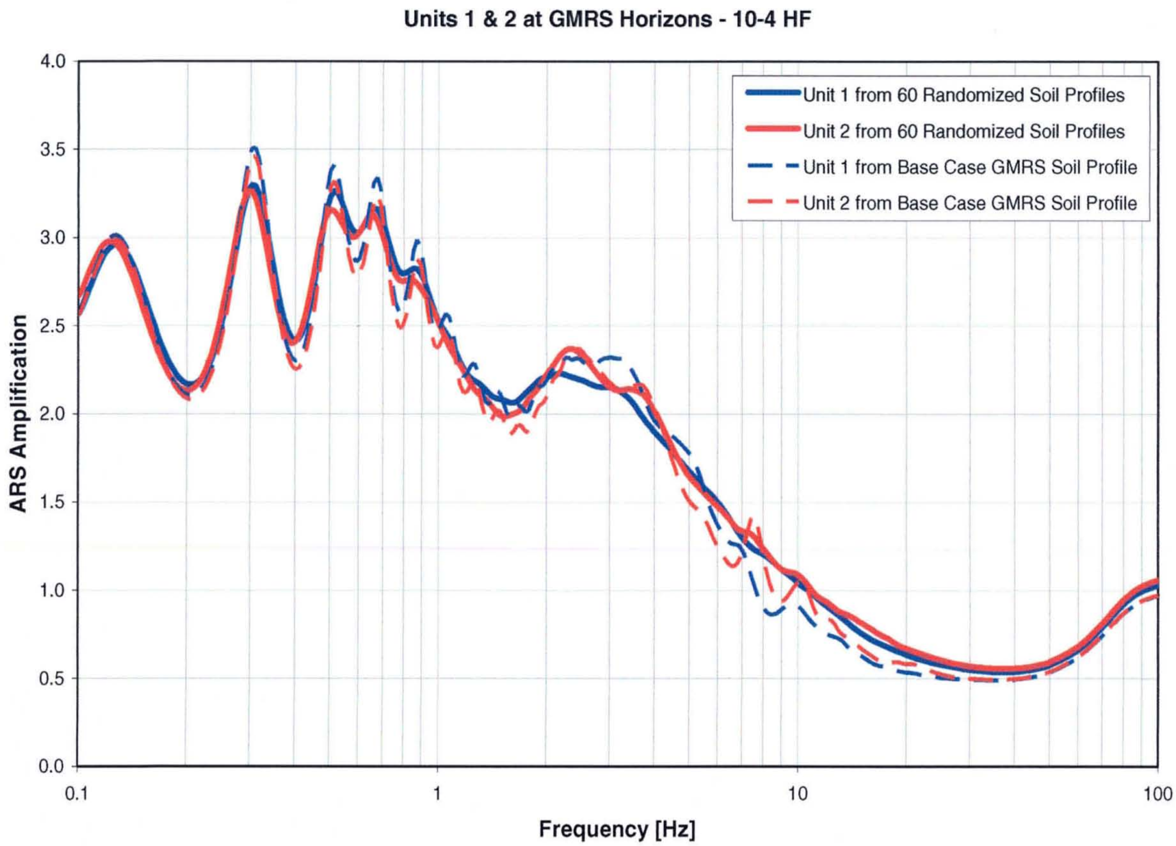

Figure 2. Site Amplifications at GMRS horizons for 10^{-4} HF Input Motion

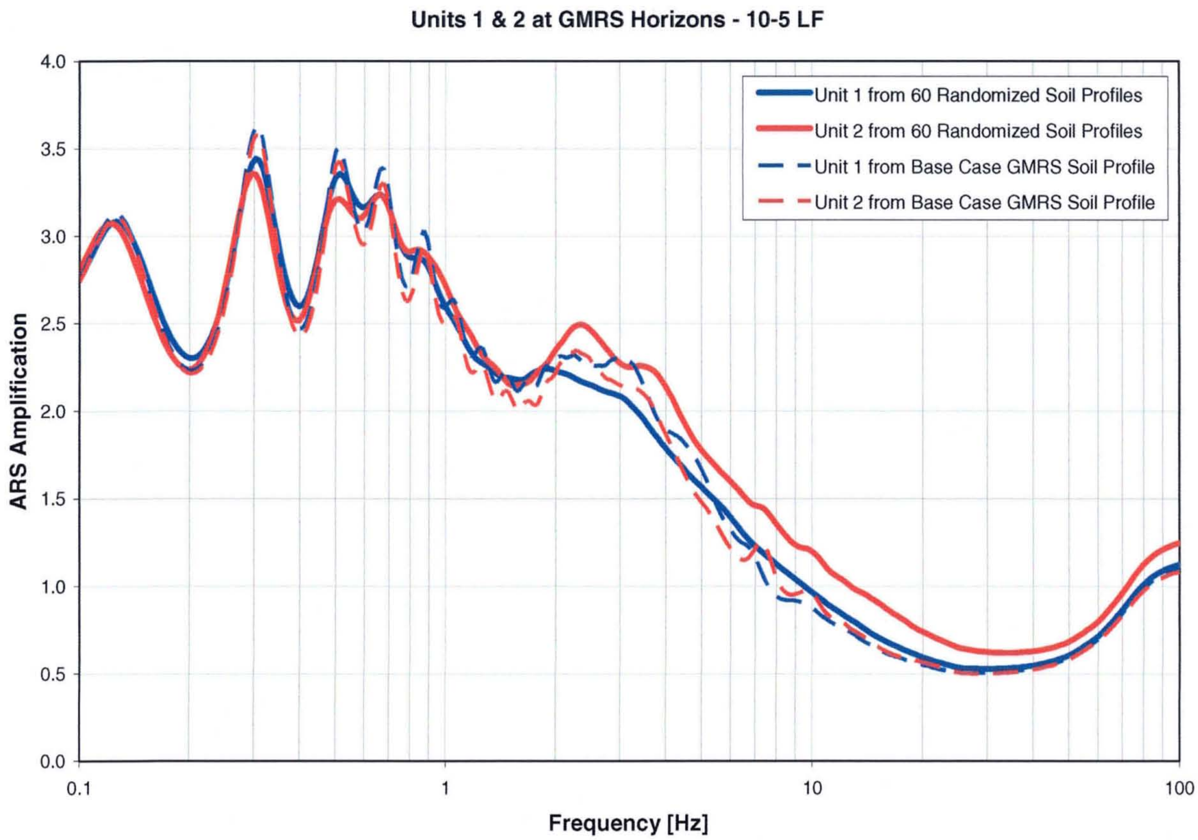

Figure 3. Site Amplifications at GMRS horizons for 10^{-5} LF Input Motion

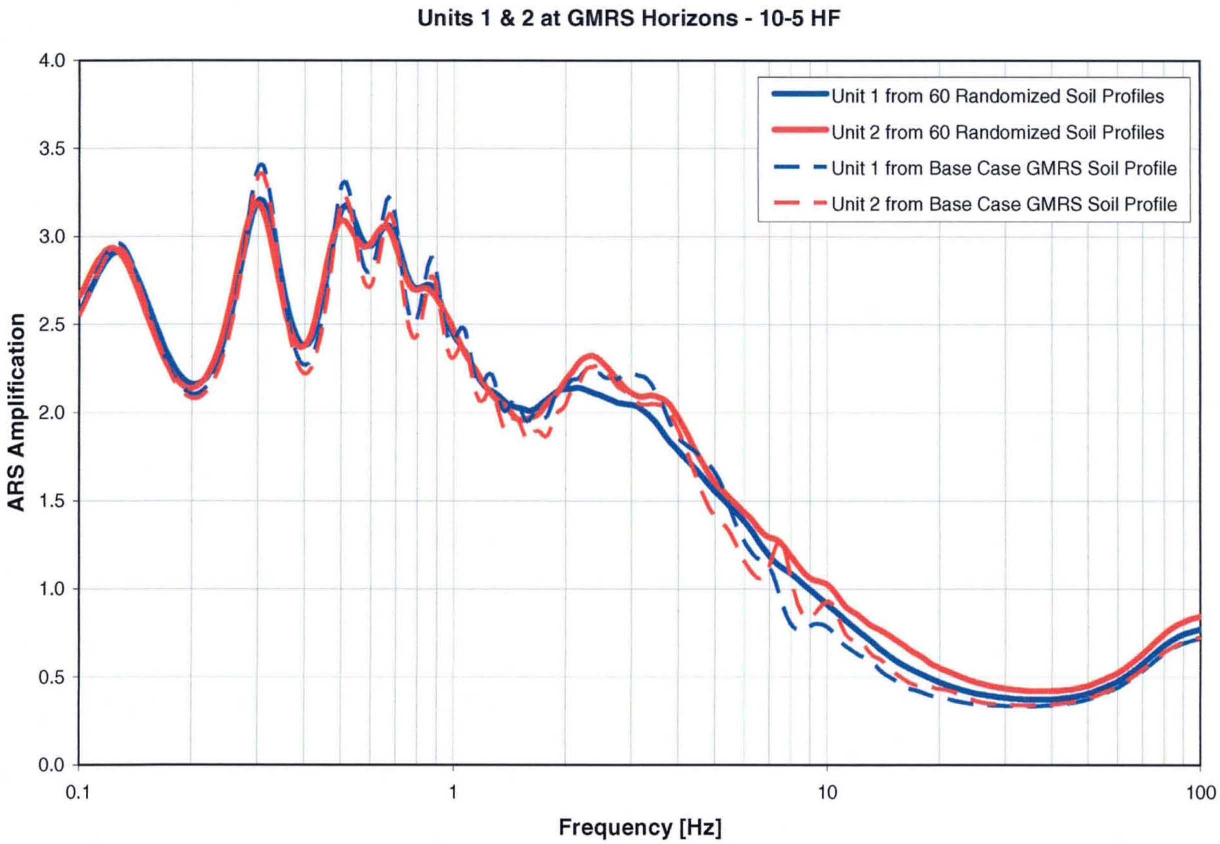

Figure 4. Site Amplifications at GMRS horizons for 10^{-5} HF Input Motion

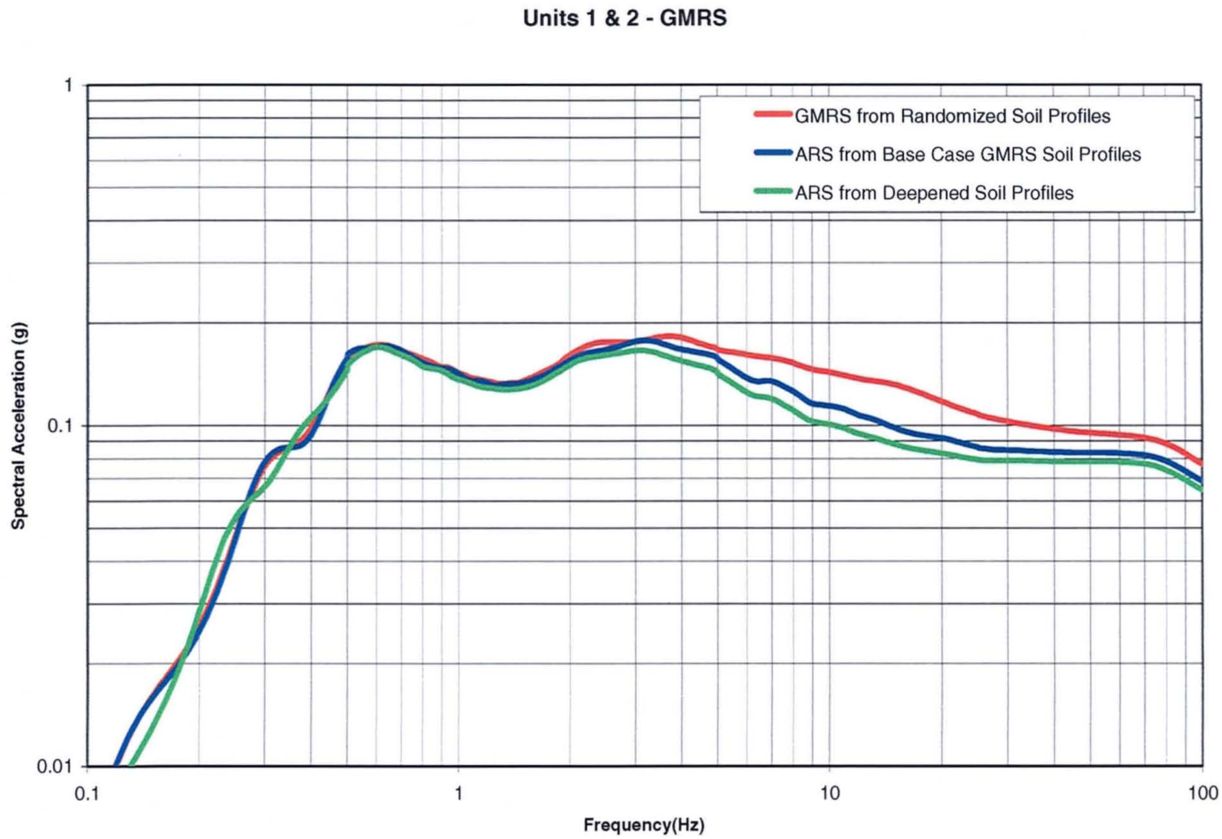

Figure 5. Comparison of GMRS and ARS at GMRS Horizons