PMTurkeyCOLPEm Resource

From: Comar, Manny
Sent: Thursday, November 01, 2012 5:05 PM
To: TurkeyCOL Resource
Subject: FW: DRAFT RAI Responses FPL Turkey Point 6 & 7 for eRAI 6006 Basic Geologic and Seismic Information
Attachments: Draft Revised Response for NRC RAI Letter No. 040, RAI 02.05.04-4 (eRAI 6006).pdf; Draft Revised Response for NRC RAI Letter No. 040, RAI 02.05.04-13 (eRAI 6006).pdf; Draft Revised Response for NRC RAI Letter No. 040, RAI 02.05.04-22 (eRAI 6006).pdf

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From: Franzone, Steve [mailto:Steve.Franzone@fpl.com]
Sent: Monday, September 24, 2012 9:08 PM
To: Comar, Manny
Cc: Burski, Raymond; Maher, William; Franzone, Steve
Subject: DRAFT RAI Responses FPL Turkey Point 6 & 7 for eRAI 6006 Basic Geologic and Seismic Information

Manny,

To support a future public meeting, FPL is providing draft revised responses for eRAI 6006 (RAI questions 02.05.04-4, 02.05.04-13 and 02.05.04-22) in the attached files:

If you have any questions, please contact me.
Thanks
Steve Franzone
NNP Licensing Manager - COLA
"Three Rules of Work: Out of clutter find simplicity; From discord find harmony; In the middle of difficulty lies opportunity." Albert Einstein
561.694.3209 (office)
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Hearing Identifier: TurkeyPoint_COL_Public
Email Number: 693

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Subject: FW: DRAFT RAI Responses FPL Turkey Point 6 & 7 for eRAI 6006 Basic Geologic and Seismic Information
Sent Date: 11/1/2012 5:05:15 PM
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From: Comar, Manny

Created By: Manny.Comar@nrc.gov

Recipients:
"TurkeyCOL Resource" <TurkeyCOL.Resource@nrc.gov>
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Files	**Size**	**Date & Time**
MESSAGE	1425	11/1/2012 5:05:17 PM
Draft Revised Response for NRC RAI Letter No. 040, RAI 02.05.04-4 (eRAI 6006).pdf	228784	
Draft Revised Response for NRC RAI Letter No. 040, RAI 02.05.04-13 (eRAI 6006).pdf	238923	
Draft Revised Response for NRC RAI Letter No. 040, RAI 02.05.04-22 (eRAI 6006).pdf	318284	

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NRC RAI Letter No. PTN-RAI-LTR-040

SRP Section: 02.05.04 - Stability of Subsurface Materials and Foundations

QUESTIONS from Geosciences and Geotechnical Engineering Branch 1 (RGS1)

NRC RAI Number: 02.05.04-4 (eRAI 6006)

FSAR Table 2.5.4-205 presents a summary of general physical and chemical properties test results for each subsurface layer. The staff noticed that no results were provided for the Fort Thompson formation (Layer 4). In accordance with NUREG-0800, Standard Review Plan, Chapter 2.5.4, "Stability of Subsurface Materials and Foundations," please provide these results or justify why these results are not needed.

FPL RESPONSE:

FSAR Table 2.5.4-205 includes the summary of general physical and chemical properties of samples on which grain size distribution and/or Atterberg limits tests were conducted. This table excludes any test results of rock core samples obtained from Fort Thompson and Arcadia strata. Since these are rock cores, there were no sieve analyses or Atterberg limits tests performed or required on samples from Fort Thompson and Arcadia strata. The results of unit weight and calcite content measurements on samples from Fort Thompson and Arcadia are summarized in FSAR Table 2.5.4-207 and FSAR Table 2.5.4-210, respectively. Note that 5 grain size distribution analyses are listed in FSAR Table 2.5.4-205 for the Key Largo Limestone stratum. Samples for these analyses were obtained from standard penetration tests (SPTs) performed at the top of the stratum. SPTs were used for sampling the overlying Miami Limestone stratum, and in many borings were continued into the upper few feet of the Key Largo Limestone before the sampling method was switched to rock coring.

This response is PLANT SPECIFIC.

References:

None

ASSOCIATED COLA REVISIONS:

None

ASSOCIATED ENCLOSURES:

None

NRC RAI Letter No. PTN-RAI-LTR-040

SRP Section: 02.05.04 - Stability of Subsurface Materials and Foundations

QUESTIONS from Geosciences and Geotechnical Engineering Branch 1 (RGS1)

NRC RAI Number: 02.05.04-13 (eRAI 6006)

Page 2.5.4-46 mentions an MSE wall that will be use around the perimeter of the plant area. It was stated in the FSAR that this wall is designed to retain the soil mass and resist loading resulting from the probable maximum hurricane. In accordance with NUREG-0800, Standard Review Plan, Chapter 2.5.4, "Stability of Subsurface Materials and Foundations," please indicate whether the safety of any Seismic category 1 structures is dependent on the MSE wall. Also, please provide a description of this wall's design in the FSAR.

FPL RESPONSE:

The mechanically-stabilized earth (MSE) wall will be constructed around the perimeter of the Units 6 &7 plant area, as shown in plan view in FSAR Figure 2.5.4-201 and in section view in FSAR Figure 2.5.4-221. The construction of the MSE wall will be standard for this type of retaining-wall, with successive lifts of compacted, controlled select structural fill reinforced with either strip- or grid-type reinforcement between lifts. The finished height of the MSE wall will range from approximately 20 to 21.5 feet. From the MSE wall, the finished grade will slope gradually upward for some distance towards Units 6 & 7 to an elevation approximately five feet higher than the top of the retaining wall, as shown in FSAR Figure 2.5.4-221. Modular facing panels will form the outside face of the MSE wall. The MSE wall will be designed to retain the soil mass (under static and seismic conditions) and resist loading resulting from the probable maximum hurricane. Final design of the MSE wall will take place during the design phase prior to construction.

The safety classification of the mechanically-stabilized earth (MSE) retaining wall around the Turkey Point Units 6 & 7 plant area is dependent on its function as well as on the effect its failure could have on safety-related (SR) or important-to-safety (ITS) Structures, Systems, and Components (SSCs). The MSE wall is not required to maintain the function of any Seismic Category 1 structures. For the purpose of this response, the SSCs of interest for Units 6 & 7 are those located in the Nuclear Island and other associated SR SSCs, within the scope of the AP1 000 Design Certification Document (DCD). The distance from the retaining wall to SSCs of interest for Units 6 & 7 is greater than 500 feet (See FSAR Figure 2.5.4-201) which is very large compared to the height of the wall, and thus a failure of the wall could not affect the SSCs of interest.

This response is PLANT SPECIFIC.

References:

None

ASSOCIATED COLA REVISIONS:

FSAR Subsection 2.5.4.5.1 will be revised in a future COLA revision as follows:

Significant earthwork is required to establish finish grades at the Units 6 & 7 project area, especially to raise the power block to finish grade (as high as El. +25.5 feet at the center of the power block area) and to provide for backfilling around the embedded major power block structures including Seismic Category I structures. The grade change is achieved by constructing a mechanically stabilized earth (MSE) retaining wall around the perimeter of the plant area. ~~The base of the MSE wall is set at El. 0 feet, and the top of the MSE wall ranges from El. =1=20 to =1=21.5 feet. The wall is designed to retain the soil mass and resist loading resulting from the probable maximum hurricane~~. **The MSE wall will be constructed around the perimeter of the Units 6 & 7 plant area, as shown in plan view in FSAR Figure 2.5.4-201 and in section view in FSAR Figure 2.5.4-22. The construction of the MSE wall will be standard for this type of retaining-wall, with successive lifts of compacted, controlled select structural fill reinforced with either strip- or grid-type reinforcement between lifts. The finished height of the MSE wall will range from approximately 20 to 21 .5 feet. From the MSE wall, the finished grade would slope gradually upward for some distance towards Units 6 & 7 to an elevation approximately five feet higher than the top of the retaining wall, as shown in FSAR Figure 2.5.4-221. Modular facing panels will form the outside face of the MSE wall. The MSE wall will be designed to retain the soil mass (under static and seismic conditions) and resist loading resulting from the probable maximum hurricane.**

ASSOCIATED ENCLOSURES:

None

NRC RAI Letter No. PTN-RAI-LTR-040

SRP Section: 02.05.04 - Stability of Subsurface Materials and Foundations

QUESTIONS from Geosciences and Geotechnical Engineering Branch 1 (RGS1)

NRC RAI Number: 02.05.04-22 (eRAI 6006)

The lateral earth pressure diagram shown in Figure 2.5.4-240 shows a plot corresponding to the dynamic lateral earth pressure. The shape of this plot appears to be consistent with the shape for dynamic pressure considering a rigid structural wall (see ASCE 4). In Section 2.5.4.10.4.2 “Seismic Lateral Earth Pressures”, the active seismic pressure was computed using the Mononobe-Okabe equation. The last sentence of the section indicates that at-rest pressure as a function of depth for below-grade walls is developed consistent with Reference 277 (ASCE-4) using the design ground motion. It is noted that the pressure developed using the ASCE-4 methodology uses the zpa value from the input motion.

Figure 2.5.2-252 shows the input motion (GMRS) developed for the site, the GMRS is located at Elevation -35. In this Figure the zpa is approximately 0.058g. However, the elevation of the GMRS is considerably lower than the surface of the soils adjacent to the basement walls that are to be evaluated for seismic lateral earth pressure. In accordance with NUREG-0800, Standard Review Plan, Chapter 2.5.4, "Stability of Subsurface Materials and Foundations," please clarify on the definition of the design ground motion, and how that motion is consistent with Appendix S to 10CFR50.

FPL RESPONSE:

FSAR Figure 2.5.2-253 and FSAR Table 2.5.2-228 show the zero period acceleration (zpa) for the GMRS as about 0.058g. This zpa value was not considered appropriate when computing lateral earth pressure because it was developed for El. -35 feet. The Design Response Spectra (DRS) at 5% damping, calculated at the ground surface for the near Nuclear Island (NI) and far from NI soil sites, were considered appropriate for computing lateral earth pressure, using the envelope of low frequency (LF) and high frequency (HF) acceleration response spectra (ARS) at 10^{-4} and 10^{-5} annual probability of exceedance. These ARS envelopes and the DRS are plotted in Figures 1 and 2 for the near NI and far from NI soil sites, respectively. From Figures 1 and 2, the peak ground acceleration at the ground surface is equal to approximately 0.0824g and 0.0806g (DRS at 100 Hz) for the near NI and far from NI soil sites, respectively.

Regarding the computation of active seismic pressure using the Mononobe-Okabe equation, according to Whitman (Reference 1), use of horizontal ground acceleration for design at the base level of the wall may result in underestimating the movements; Reference 1 states that it seems best to use the acceleration at the surface of the backfill, or an average between the surface and the base of the wall. Thus, an acceleration of 0.1g, rather than the peak ground acceleration of 0.0824g (near NI) or 0.0806g (far from NI), is conservatively used in the Mononobe-Okabe equation.

Similarly, for the computation of at-rest seismic pressure using the ASCE 4-98 method, an acceleration of 0.1g, rather than the peak ground acceleration of 0.0824g (near NI) or 0.0806g (far from NI), is conservatively used.

Figure 1: 5% Damping ARS at Ground Surface – Near NI, Envelope of LF and HF

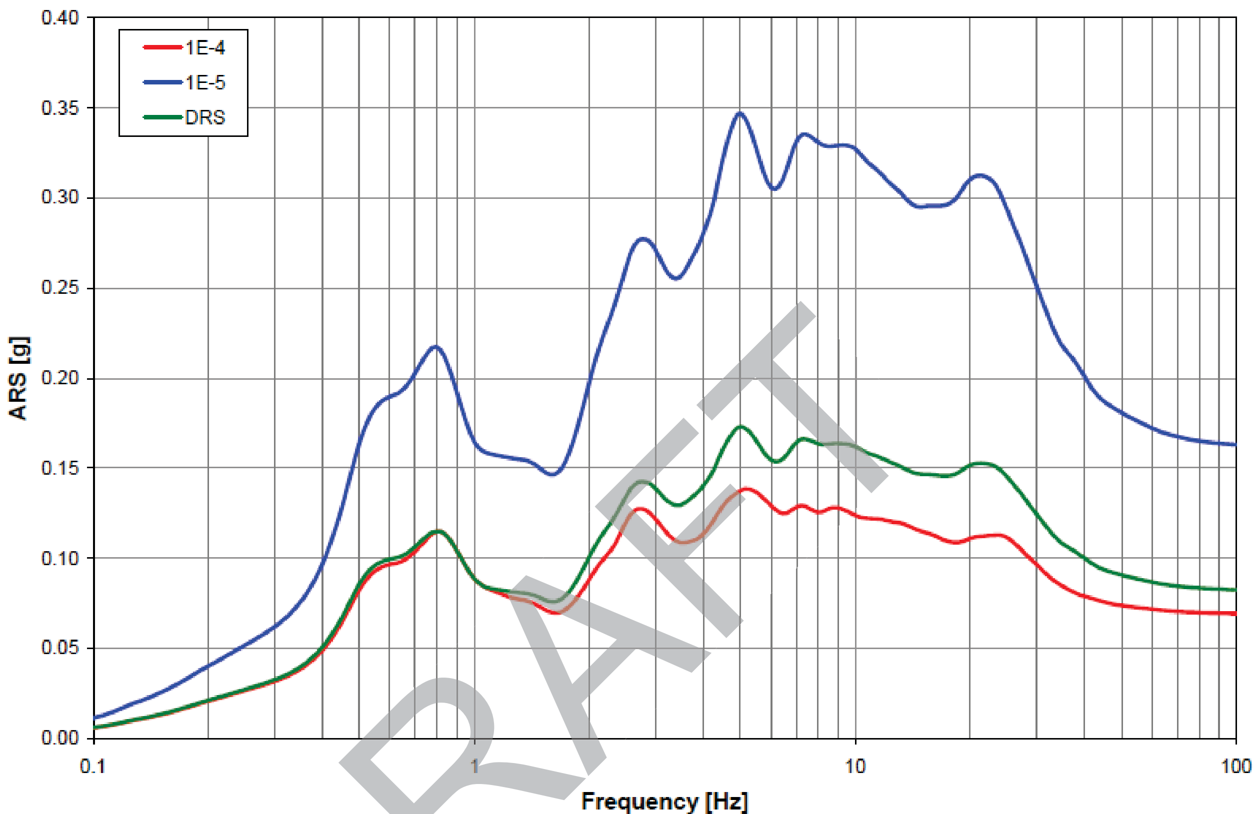
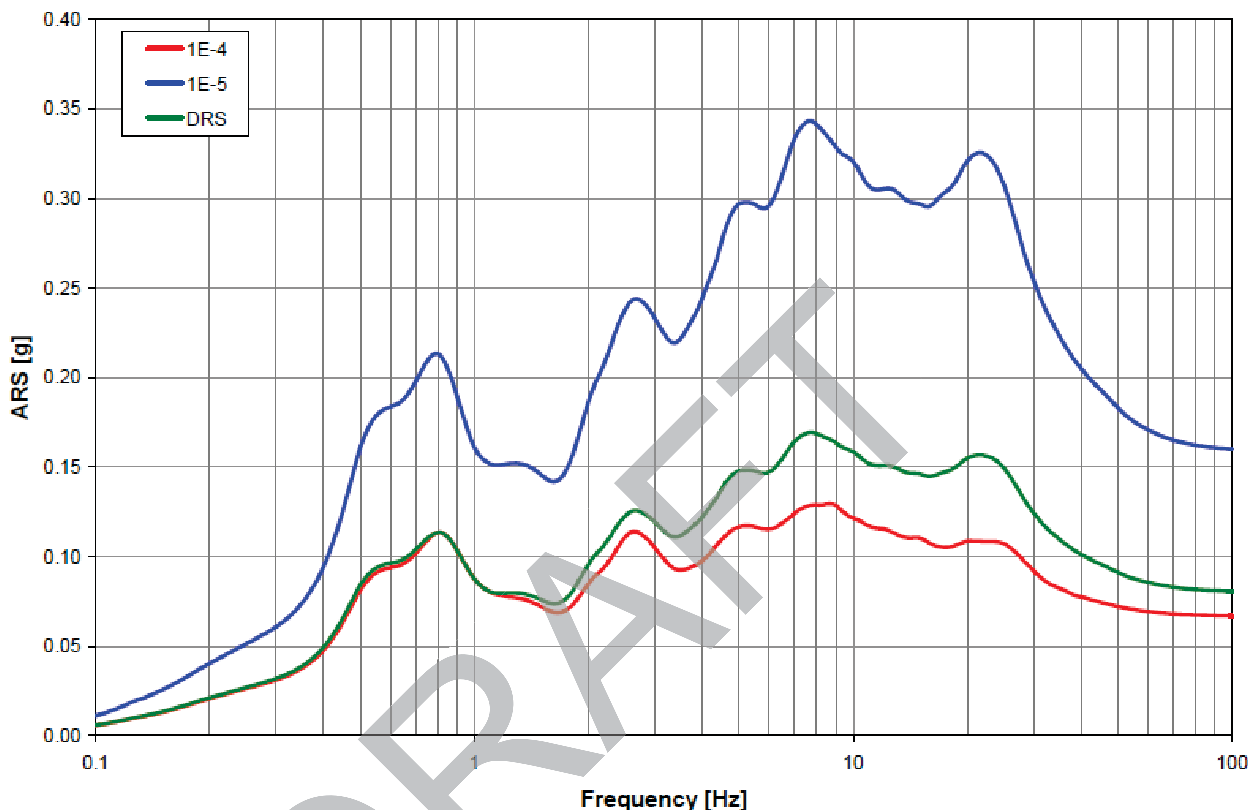


Figure 2: 5% Damping ARS at Ground Surface – Far from NI, Envelope of LF and HF



This response is PLANT SPECIFIC.

References:

1. Whitman, R.V. "Seismic Design of Earth Retaining Structures," *Proc. 2nd International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics*, St. Louis, MO, pp. 1767-1778, 1991.

ASSOCIATED COLA REVISIONS:

FSAR Subsection 2.5.4.10.4 will be revised in a future COLA revision as follows.

2.5.4.10.4 Earth Pressures

The static and seismic active and at-rest lateral earth pressures acting on underground structure below-grade walls are addressed in this subsection. The analysis of seismic earth pressure is addressed generically. Note that active earth pressures apply to yielding walls such as steel sheet pile walls, MSE walls, and, to a lesser extent, more rigid concrete slurry (diaphragm) walls, which are used primarily as temporary ground support in construction.

At-rest earth pressures occur in the case of non-yielding walls, such as the rigid, below-grade walls of underground structures (e.g., for the containment/auxiliary buildings, control buildings, etc.).

Increases in lateral earth pressures resulting from compaction close-in to below grade structures are not considered here. These increases are controlled at the construction stage by limiting the size of compaction equipment and its proximity to below-grade walls. Note that the magnitude of compaction-induced earth pressure increases can only be assessed once a range of allowable equipment sizes and types are selected/specified.

For the seismic active **and at-rest** earth pressure case**s**, earthquake-induced horizontal ground accelerations are accounted for by employing the factor $k_h g$. Here, $k_h = 0.1$ is used. Vertical ground accelerations (k_v g) are considered negligible (Reference 276). **The zero period acceleration for the design response spectrum is 0.0824g near the nuclear island and 0.0806g far from the nuclear island. Thus, using 0.1g for lateral earth pressure computations is conservative.**

ASSOCIATED ENCLOSURES:

None