FPL.

L-2015-084
10 CFR 52.3

April 2, 2015

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

Re: Florida Power & Light Company
Proposed Turkey Point Units 6 and 7
Docket Nos. 52-040 and 52-041
Voluntary Revised Response to NRC Request for Additional Information Letter No. 007 (eRAI 4975) SRP Section 03.07.01 – Seismic Design Parameters

References:

1. NRC Letter to FPL dated September 23, 2010, Request for Additional Information Letter No. 007 Related to SRP Section 3.07.01 – Seismic Design Parameters for the Turkey Point Nuclear Plant Units 6 and 7 Combined License Application
2. FPL Letter L-2010-241 to NRC dated October 27, 2010, Response to NRC Request for Additional Information Letter No. 007 (eRAI 4975) Standard Review Plan Section 3.07.01 – Seismic Design Parameters

Florida Power & Light Company (FPL) provides, as an attachment to this letter, its revised responses to the Nuclear Regulatory Commission's (NRC) requests for additional information (RAI) 03.07.01-1, 03.07.01-6, 03.07.01-7, and 03.07.01-13 provided in References 1 and 2. The existing responses to the RAIs in the attachments have not changed as a result of the site response sensitivity analysis that was performed.

The data provided in the OSM, Attachment 4, Enclosure 2, is not easily convertible to PDF output files. Furthermore, since the NRC has requested the data to better evaluate software used by FPL in preparing its RAI response, converting the information to PDF output files would not satisfy the NRC's needs. Consequently, the information submitted herein does not comply with the requirements for electronic submission in NRC Guidance Document, "Guidance for Electronic Submissions to the NRC," dated May 27, 2011.

If you have any questions, or need additional information, please contact me at 561-691-7490.

D097
NRO

I declare under penalty of perjury that the foregoing is true and correct.

Executed on April 2, 2015

Sincerely,

William Maher
Senior Licensing Director – New Nuclear Projects

WDM/RFB

Attachment 1: FPL Revised Response to NRC RAI No. 03.07.01-1 (eRAI 4975)
Attachment 2: FPL Revised Response to NRC RAI No. 03.07.01-6 (eRAI 4975)
Attachment 3: FPL Revised Response to NRC RAI No. 03.07.01-7 (eRAI 4975)
Attachment 4: FPL Revised Response to NRC RAI No. 03.07.01-13 (eRAI 4975)

cc: w/o Attachment 4, Enclosure 2
PTN 6 & 7 Project Manager, AP1000 Projects Branch 1, USNRC DNRL/NRO
Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant 3 & 4

NRC RAI Letter No. PTN-RAI-LTR-007

SRP Section: 03.07.01 – Seismic Design Parameters

Question from Structural Engineering Branch 1

NRC RAI Number: 03.07.01-1 (e-RAI 4975)

Figure 2.7 in Section 2.2 of Appendix 3KK (a.k.a. TPG-1000-S2R-802) indicates an East-West cross-section of the plant. It indicates that the plant is to be located on approximately 19 feet of concrete. The concrete extends to the side of the NI approximately 40 feet on each side. Fill is apparently placed atop the lean concrete to the sides of the NI. Section 7.0 of Appendix 3KK indicates that the 3D SSI analyses were performed using the generic NI20 FEM constructed by Westinghouse to determine seismic loads to the plant. This generic NI20 FEM model includes assumed uniform site conditions in and around the plant, rather than the relatively complex site-specific soil profile. Please justify why the FEM used to perform the site-specific SSI analyses did not include the NI20 model amplified by the supporting concrete/side fills as part of the complete structural model to determine the potential impact of this modified configuration on the computed responses.

INTRODUCTION:

The existing response to this RAI has not changed as a result of the site response sensitivity analysis that was performed. The conclusions of the site-specific soil structure interaction analysis (TPG-1000-S2R-802 Revision 5) performed for the Turkey Point Units 6 & 7 remain valid.

FPL RESPONSE:

The FEM analysis was a 3D SASSI (System for Analysis of Soil Structure Interaction) analysis using the standard NI20 model and NEAR (soil column close to Nuclear Island) field soil profile (under the Nuclear Island) with infinite extension of lean concrete and backfill soil properties. The comparison of results between the Turkey Point site and the CSDRS (Certified Seismic Design Response Spectra) for the six key locations show a significant margin between the site response and the CSDRS envelope. Further, 2D SASSI parametric sensitivity analyses of the site-specific geological configuration and backfill condition were performed to assess the relatively complex site-specific soil profile. The comparison of results between the AP 2D model and bathtub model for the six key locations are shown in Figure 6-1 through Figure 6-6. The results for the AP1000 stick AP 2D model are similar to those for the bathtub model for most of the frequency ranges. Based on the comparison results, the effects of the lean concrete and backfill soil are minimal.

This response is PLANT SPECIFIC.

References:

None

ASSOCIATED COLA REVISIONS:

No additional changes to COLA Revision 6 have been identified as a result of this revised RAI response.

ASSOCIATED ENCLOSURES:

None

NRC RAI Letter No. PTN-RAI-LTR-007

SRP Section: 03.07.01 – Seismic Design

Question from Structural Engineering Branch 1

NRC RAI Number: 03.07.01-6 (eRAI 4975)

Section 5.1 of Appendix 3KK, SASSI Stick Model describes the 2D model of NI used to perform sensitivity analyses of the site. Please describe the details of the bathtub model used in the calculations, such as whether the 19-foot-thick concrete foundation mat is included in the SSI model and whether the configuration of the fill to the side of the NI is included. Please provide information as well on the free-field soil columns and ground motions used in the 2D calculations.

INTRODUCTION:

The existing response to this RAI has not changed as a result of the site response sensitivity analysis that was performed. The conclusions of the site-specific soil structure interaction analysis (TPG-1000-S2R-802 Revision 5) performed for the Turkey Point Units 6 & 7 remain valid.

FPL RESPONSE:

The 19 foot thick concrete foundation mat and the fill to the side of NI is shown in Figure 5-2 and detailed in Figure 2-7. The soil and backfill material properties are shown in Table 3-1 and Table 3-2. Table 3-1 is the free-field soil columns property below the bathtub and on the side of the bathtub. Table 3-2 is the lean concrete and backfill soil inside the bathtub. In Figure 2-7, EF-1 and EF-2 are the backfill soil material as shown in Table 3-2 layer 1-8; LC is the lean concrete as shown in Table 3-2 layer 9-12. Lean concrete is the 19 foot thick concrete foundation mat in the bathtub model. The ground motions used in the 2D calculations are shown in Figure 4-4 through Figure 4-6.

This response is PLANT SPECIFIC.

References:

None

ASSOCIATED COLA REVISIONS:

No additional changes to COLA Revision 6 have been identified as a result of this revised RAI response.

ASSOCIATED ENCLOSURES:

None

NRC RAI Letter No. PTN-RAI-LTR-007

SRP Section: 03.07.01 – Seismic Design Parameters

Question from Structural Engineering Branch 1

NRC RAI Number: 03.07.01-7 (e-RAI 4975)

Section 6.0 of Appendix 3 KK, 2D SASSI Analysis Results presents a comparison of computed 2D SASSI results with the 3D generic design spectra developed for the six key locations of the NI. Given the potential differences in radiation damping between 2D and 3D calculations, please provide justification on why such comparisons shown in Figures 6-1 through 6-6 are appropriate to make.

INTRODUCTION:

The existing response to this RAI has not changed as a result of the site response sensitivity analysis that was performed. The conclusions of the site-specific soil structure interaction analysis (TPG-1000-S2R-802 Revision 5) performed for the Turkey Point Units 6 & 7 remain valid.

FPL RESPONSE:

The appropriate comparison is made in Section 6.0 between the 2D site-specific results and AP1000 2D generic results. Figure 6-1 through Figure 6-6 presents the comparisons of the 2D bathtub model, shown in Figure 5-2 (TP_2D) and the generic 2D model AP2D, shown in Figure 5-1 (TP_AP). The ssienv_ap2d is the 2D generic envelope of the six soil cases. The comparison of the two 2D models and the 2D generic envelope is shown in these figures. The responses of the six key locations between the two models are significantly lower than the 2D generic envelope. The generic 3D NI20 envelope (ssienv) was not compared with the 2D response spectra.

This response is PLANT SPECIFIC.

References:

None

ASSOCIATED COLA REVISIONS:

No additional changes to COLA Revision 6 have been identified as a result of this revised RAI response.

ASSOCIATED ENCLOSURES:

None

SRP Section: 03.07.01 – Seismic Design Parameters

Question from Structural Engineering Branch 1

NRC RAI Number: 03.07.01-13 (eRAI 4975)

Section 3JJ.4, Spectral Matching of Acceleration Time Histories, indicates that seed records were selected from the database given in NUREG/CR-6728 for the LF de-aggregation results for magnitudes > 7 and distances > 500 km. However, the TAP024 record was selected from the Chi-Chi seismic event, which was indicated to be about 100 km from the recording station. Please indicate why this particular record was selected as opposed to another more distant event. In addition, please indicate whether these records have appropriate characteristics to match the damping associated with SSI and not just the 5% damped spectra.

INTRODUCTION:

FPL submitted a response to RAI 03.07.01 -13 in Reference 1 and provided the corresponding digital files for the Seed and Spectrum Compatible Time Histories in Reference 2. Subsequent to References 1 and 2, additional subsurface investigations were conducted at the Turkey Point Units 6 & 7 site during the summer of 2013. In addition, sensitivity studies have been performed as described in Reference 3 which confirm that the data from the additional subsurface investigations do not require changes to the ground motion response spectra (GMRS) and foundation input response spectra (FIRS) and that the conclusions from the site-specific soil structure Interaction (SSI) analyses performed for Turkey Point Units 6 & 7 are still valid. Therefore, the technical information provided in the response to RAI 03.07.01 -13 and the corresponding digital files for the Seed and Spectrum Compatible Time Histories remain unchanged from the information provided in References 1 and 2.

This submittal provides a re-transmittal of the response to RAI 03.07.01 -13 and the corresponding digital files for the Seed and Spectrum Compatible Time Histories (see Enclosures 1 and 2) as follows.

FPL RESPONSE:

Guidance for the selection of the seed input time history for the spectral matching procedure was obtained from the deaggregation results of the probabilistic seismic hazard analysis (PSHA) and the availability of candidate strong ground motion time histories. Based on the low-frequency (i.e., 1-2.5 Hz) deaggregation results, the mean magnitude and distance values for annual exceedance frequencies of 10-4 to 10-6 are approximately a magnitude 7.25 and a distance between 550 - 600 km (Reference 6). Note that these mean values are computed based on the contribution from seismic sources with distances greater than 100 km based on the percentage contribution to the total hazard of these more distant sources being greater than 5% of the total hazard (Reference 5).

The selection of the candidate seed input time history for any spectral matching procedure should be based on the controlling event for a given site. However, the lack of empirical strong ground motion time histories in the eastern US (CEUS) significantly

limits the availability of candidate time histories for large magnitude earthquakes (ie., M > 7) at large distances (i.e., > 500 km).

The time history database contained in NUREG/CR-6728 (Reference 4) was compiled to provide time histories that could be used as seed input time histories for either a spectral matching or spectral scaling analysis. This database of time histories was developed for both the western US (WUS) and eastern US (CEUS) regions based on defined magnitude and distance bins of engineering interest. The WUS magnitude-distance bins were populated from the database of empirically recorded strong ground motions time histories. For the CEUS magnitude-distance bins, the dearth of empirical strong ground motion time histories required the population of these bins to be based on modifying empirically recorded WUS time histories to have spectral shapes more appropriate for the CEUS (i.e., to increase their response spectral amplitudes in the 10Hz to 100 Hz frequency range relative to the WUS spectra with the same PGA). The largest magnitude and distance bin in this database is one for events with magnitudes> 7 and distances between 100 - 200 km. Based on the deaggregation results, the candidate time histories were selected from this largest magnitude-distance bin.

The 15 sets of three component time histories that are given in the noted magnitude-distance bin span the magnitude and distance ranges of 7.3 -7.6 and 100 -165 km, respectively. An additional consideration that was implemented in the selection procedure was to select a seed input time history set that was not significantly bandpass filtered as part of the original data processing. The selection of a candidate seed input time history that is severely bandpass filtered for the spectral matching procedure can lead to a spectrum-compatible time history that has significantly different non-stationary characteristics arising from the need to increase the spectral amplitudes over a large frequency range, especially at the lower frequency range (e.g., less than 1 Hz).

Based on these considerations, the recording from the station TAP024 from the 1999 Chi-Chi earthquake was selected as the candidate seed input time history. This earthquake had a magnitude of 7.6 and the TAP024 recording station was located 100.2 km from the fault plane. The bandpass filter corners were 0.02 Hz and 50.0 Hz, which is the largest frequency range between the two filter corners of any of the 15 candidate seed time histories within this magnitude-distance bin. Although the distance of 100.2 km is the smallest within the database bin, the larger frequency range between filter corners and larger magnitude made the TAP024 recording an acceptable seed input time history for the spectral matching analysis.

These three-component seed input time histories were modified to be spectrum compatible to corresponding 5% spectral damped target spectra (ie., horizontal and vertical). The spectral matching procedure followed the guidelines and requirements given in NUREG/CR-6728 all for a spectral damping level of 5%. The applicability of these spectrum compatible time histories for spectral damping levels other than 5% has not been, but could be, evaluated with the development of any required target spectra for other spectral damping levels.

This response is PLANT SPECIFIC.

References:

1. FPL Letter L-2010-241 to NRC dated October 27, 2010, Response to NRC Request for Additional Information Letter No. 007 (eRAI 4975) Standard Review Plan Section 3.07.01 - Seismic Design Parameters
2. FPL Letter L-2012-203 to NRC dated May 2, 2012, Submittal of Digital Seed and Spectrum Compatible Time Histories for NRC Request for Additional Information Letter No. 007 (eRAI 4975) Standard Review Plan Section 3.07.01 - Seismic Design Parameters
3. FPL Letter L-2015-085 to NRC dated April 2, 2015, Revised Response to NRC Request for Additional Information Letter No. 61 (eRAI 6432) Standard Review Plan Section 03.07.01 - Seismic Design Parameters
4. Risk Engineering Inc. (2001). "Technical Basis for Revision of Regulatory -Guidance on Design Ground Motions: Hazard- and Risk-Consistent Ground Motion Spectra Guidelines," NUREG/CR-6728, U.S. Nuclear Regulatory Commission, Washington, D.C., 2001
5. Nuclear Regulatory Commission (2007), "A Performance-Based Approach to Define the Site Specific Earthquake Ground Motion," Reg. Guide 1.208, March, 2007
6. Risk Engineering Inc. (2008). "Deaggregation of 10-4, 10-5, and 10-6 Rock seismic hazard for the Turkey Point Site (Task 9)," 0822-ACR-032, Rev. 3, December 2008

ASSOCIATED COLA REVISIONS:

No additional changes to COLA Revision 6 have been identified as a result of this revised response.

ASSOCIATED ENCLOSURES:

Enclosure 1: List of Florida Power & Light Company (FPL) Seed and Spectrum Compatible Time Histories

Enclosure 2: Supporting Data for NRC RAI 03.07.01-13 Digital Seed and Spectrum Compatible Time Histories (3 copies)

ENCLOSURE 1

Florida Power & Light Company (FPL) Seed and Spectrum Compatible Time Histories

(2 Pages Including Cover)

List of Florida Power & Light Company (FPL) Seed and Spectrum Compatible Time Histories

Calculation 25409-000-K0C-0000-00030-000_Digital Files

Horizontal Target Spectrum:

FIRS-Hor.tgt

Vertical Target Spectrum:

FIRS-Ver.tgt

Seed Input Acceleration Time Histories

TAP024-Sbc.acc

TAP024-Wbc.acc

TAP024-Vbc.acc

Final Matched Acceleration Time Histories:

FIRS-H1.acc

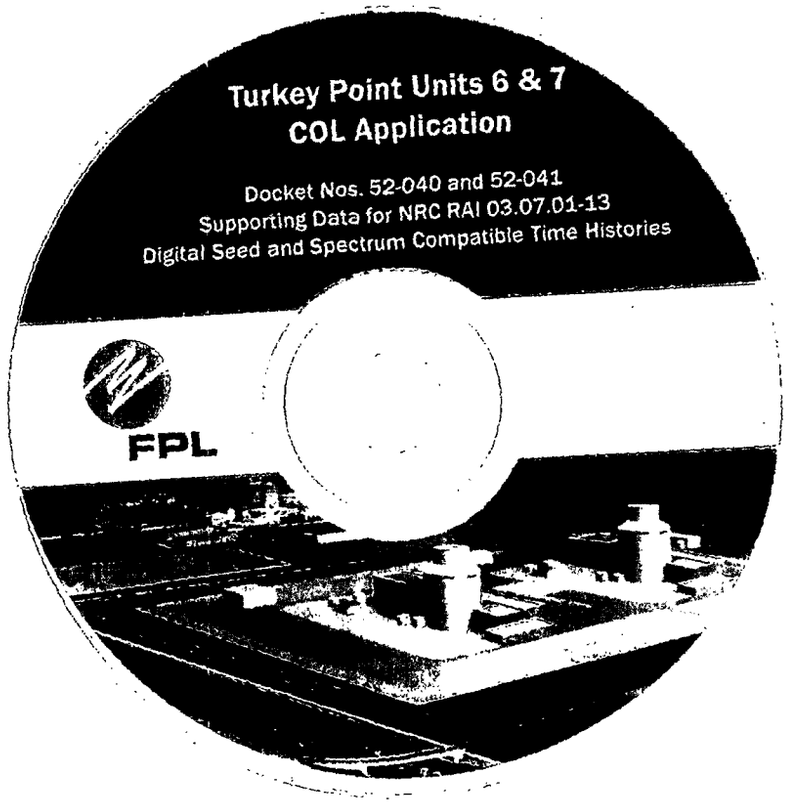
FIRS-H2.acc

FIRS-UP.acc

ENCLOSURE 2

Supporting Data for NRC RAI 03.07.01-13 Digital Seed and Spectrum Compatible Time Histories

(2 Pages Including Cover)


Turkey Point Units 6 & 7
COL Application
Docket Nos. 52-040 and 52-041
Supporting Data for NRC RAI 03.07.01-13
Digital Seed and Spectrum Compatible Time Histories
FPL