UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 22, 2016

Mr. Mano Nazar
President and Chief Nuclear Officer
Nuclear Division
NextEra Energy
P. O. Box 14000
Juno Beach, FL 33408-0420

SUBJECT: TURKEY POINT NUCLEAR GENERATING, UNIT NOS. 3 AND 4 - STAFF ASSESSMENT OF INFORMATION PROVIDED PURSUANT TO TITLE 10 OF THE *CODE OF FEDERAL REGULATIONS* PART 50, SECTION 50.54(f), SEISMIC HAZARD REEVALUATIONS FOR RECOMMENDATION 2.1 OF THE NEAR-TERM TASK FORCE REVIEW OF INSIGHTS FROM THE FUKUSHIMA DAI-ICHI ACCIDENT AND STAFF CLOSURE OF ACTIVITES ASSOCIATED WITH RECOMMENDATION 2.1, "SEISMIC" (CAC NOS. MF3709 AND MF3710)

Dear Mr. Nazar:

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued a request for information pursuant to Title 10 of the *Code of Federal Regulations*, Part 50, Section 50.54(f) (hereafter referred to as the 50.54(f) letter). The purpose of that request was to gather information concerning, in part, seismic hazards at each operating reactor site and to enable the NRC staff, using present-day NRC requirements and guidance, to determine whether licenses should be modified, suspended, or revoked.

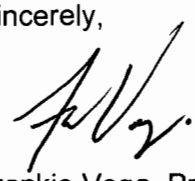
By letter dated March 27, 2014, Florida Power and Light Company (the licensee), responded to this request for Turkey Point Nuclear Generating, Unit Nos. 3 and 4 (Turkey Point).

The NRC staff has reviewed the information provided related to the reevaluated seismic hazard for Turkey Point and, as documented in the enclosed staff assessment, determined that you provided sufficient information in response to Enclosure 1, Items (1) - (9) of the 50.54(f) letter.

The NRC staff concludes that the licensee responded appropriately and has completed its response to Enclosure 1, of the 50.54(f) letter. Furthermore, the NRC staff review concluded that the reevaluated seismic hazard is bounded by the plants existing design-basis safe shutdown earthquake. As such, the NRC staff concludes that no further responses or regulatory actions associated with Phase 2 of Near-Term Task Force (NTTF) Recommendation 2.1 "Seismic" are needed for Turkey Point. This closes out the NRC's efforts associated with Phase 1 and 2 of NTTF Recommendation 2.1 "Seismic" (CAC Nos. MF3709 AND MF3710) for Turkey Point.

If you have any questions, please contact me at (301) 415-1617 or at Frankie.Vega@nrc.gov.

Sincerely,



Frankie Vega, Project Manager
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Docket Nos. 50-250 and 50-251

Enclosure:
Staff Assessment of Seismic
Hazard Evaluation and Screening Report

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STAFF ASSESSMENT BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO SEISMIC HAZARD AND SCREENING REPORT

TURKEY POINT NUCLEAR GENERATING, UNIT NOS. 3 AND 4

DOCKET NOS. 50-250 AND 50-251

1.0 INTRODUCTION

By letter dated March 12, 2012 (NRC, 2012a), the U.S. Nuclear Regulatory Commission (NRC or Commission) issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f) "Conditions of license" (hereafter referred to as the "50.54(f) letter"). The request and other regulatory actions were issued in connection with implementing lessons-learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant, as documented in the "Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident" (NRC, 2011b).[1] In particular, the NRC Near-Term Task Force (NTTF) Recommendation 2.1, and subsequent Staff Requirements Memoranda (SRM) associated with Commission Papers SECY-11-0124 (NRC, 2011c) and SECY-11-0137 (NRC, 2011d), instructed the NRC staff to issue requests for information to licensees pursuant to 10 CFR 50.54(f).

Enclosure 1 to the 50.54(f) letter requests that addressees perform a reevaluation of the seismic hazards at their sites using present-day NRC requirements and guidance to develop a ground motion response spectrum (GMRS).

The required response section of Enclosure 1 requests that each addressee provide the following information:

(1) Site-specific hazard curves (common fractiles and mean) over a range of spectral frequencies and annual exceedance frequencies,

(2) Site-specific, performance-based GMRS developed from the new site-specific seismic hazard curves at the control point elevation,

(3) Safe Shutdown Earthquake (SSE) ground motion values including specification of the control point elevation,

(4) Comparison of the GMRS and SSE. A high-frequency (HF) evaluation (if necessary),

[1] Issued as an enclosure to Commission Paper SECY-11-0093 (NRC, 2011a).

(5) Additional information such as insights from NTTF Recommendation 2.3 walkdown and estimates of plant seismic capacity developed from previous risk assessments to inform NRC screening and prioritization,

(6) Interim evaluation and actions taken or planned to address the higher seismic hazard relative to the design basis, as appropriate, prior to completion of the risk evaluation (if necessary),

(7) Statement if a seismic risk evaluation is necessary,

(8) Seismic risk evaluation (if necessary), and

(9) Spent fuel pool (SFP) evaluation (if necessary).

Present-day NRC requirements and guidance with respect to characterizing seismic hazards use a probabilistic approach in order to develop a risk-informed performance-based GMRS for the site. Regulatory Guide (RG) 1.208, A Performance-based Approach to Define the Site- Specific Earthquake Ground Motion (NRC, 2007), describes this approach. As described in the 50.54(f) letter, if the reevaluated seismic hazard, as characterized by the GMRS, is not bounded by the current plant design-basis SSE, further seismic risk evaluation of the plant is merited.

By letter dated November 27, 2012 (Keithline, 2012), the Nuclear Energy Institute (NEI) submitted Electric Power Research Institute (EPRI) report "Seismic Evaluation Guidance: Screening, Prioritization, and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1 Seismic" (EPRI, 2012), hereafter called the SPID. The SPID supplements the 50.54(f) letter with guidance necessary to perform seismic reevaluations and report the results to NRC in a manner that will address the Requested Information Items in Enclosure 1 of the 50.54(f) letter. By letter dated February 15, 2013 (NRC, 2013b), the staff endorsed the SPID.

The required response section of Enclosure 1 to the 50.54(f) letter specifies that Central and Eastern United States (CEUS) licensees provide their Seismic Hazard and Screening Report (SHSR) by 1.5 years after issuance of the 50.54(f) letter. However, in order to complete its update of the EPRI seismic ground motion models (GMMs) for the CEUS (EPRI, 2013), industry proposed a six-month extension to March 31, 2014, for submitting the SHSR. Industry also proposed that licensees perform an expedited assessment, referred to as the Augmented Approach, for addressing the requested interim evaluation (Item (6) above), which would use a simplified assessment to demonstrate that certain key pieces of plant equipment for core cooling and containment functions, given a loss of all alternating current power, would be able to withstand a seismic hazard up to two times the design basis. Attachment 2 to the April 9, 2013, letter provides a revised schedule for plants needing to perform (1) the Augmented Approach by implementing the Expedited Seismic Evaluation Process and (2) a seismic risk evaluation. By letter dated May 7, 2013 (NRC, 2013a), the NRC determined that the modified schedule was acceptable and by letter dated August 28, 2013 (NRC, 2013c), the NRC determined that the updated GMM (EPRI, 2013) is an acceptable GMM for use by CEUS plants in developing a plant-specific GMRS.

By letter dated April 9, 2013 (Pietrangelo, 2013), industry agreed to follow the SPID to develop the SHSR for existing nuclear power plants. By letter dated September 9, 2013 (Kiley, 2013), Florida Power and Light (FPL, the licensee) submitted at least partial site response information for Turkey Point Nuclear Generating, Unit Nos. 3 and 4 (Turkey Point). By letter dated March 27, 2014 (Kiley, 2014), the licensee submitted its SHSR for Turkey Point.

2.0 REGULATORY BACKGROUND

The structures, systems, and components (SSCs) important to safety in operating nuclear power plants are designed either in accordance with, or meet the intent of Appendix A to 10 CFR Part 50, General Design Criteria (GDC) 2: "Design Bases for Protection Against Natural Phenomena;" and Appendix A to 10 CFR Part 100, "Reactor Site Criteria." The GDC 2 states that SSCs important to safety at nuclear power plants shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions.

For initial licensing, each licensee was required to develop and maintain design bases that, as defined by 10 CFR 50.2, identify the specific functions that an SSC of a facility must perform, and the specific values or ranges of values chosen for controlling parameters as reference bounds for the design. The design bases for the SSCs reflect appropriate consideration of the most severe natural phenomena that had been historically reported for the site and surrounding area. The design bases also considered limited accuracy, quantity, and period of time in which the historical data have been accumulated.

The seismic design bases for currently operating nuclear power plants were either developed in accordance with, or meet the intent of GDC 2 and 10 CFR Part 100, Appendix A. Although the regulatory requirements in Appendix A to 10 CFR Part 100 are fundamentally deterministic, the NRC process for determining the seismic design-basis ground motions for new reactor applications after January 10, 1997, as described in 10 CFR 100.23, requires that uncertainties be addressed through an appropriate analysis such as a probabilistic seismic hazard analysis (PSHA).

Section 50.54(f) of 10 CFR states that a licensee shall at any time before expiration of its license, upon request of the Commission, submit written statements, signed under oath or affirmation, to enable the Commission to determine whether or not the license should be modified, suspended, or revoked. On March 12, 2012, the NRC staff issued requests for licensees to reevaluate the seismic hazards at their sites using present-day NRC requirements and guidance, and identify actions planned to address plant-specific vulnerabilities associated with the updated seismic hazards.

Attachment 1 to Enclosure 1 of the 50.54(f) letter describes an acceptable approach for performing the seismic hazard reevaluation for plants located in the CEUS. Licensees are expected to use the CEUS Seismic Source Characterization (CEUS-SSC) model in NUREG- 2115 (NRC, 2012b) along with the appropriate EPRI (2004, 2006) GMMs. The SPID provides further guidance regarding the appropriate use of GMMs for the CEUS. Specifically, Section 2.3 of the SPID recommends the use of the updated GMM (EPRI 2013) and, as such, licensees used the NRC-endorsed updated EPRI GMM instead of the older EPRI (2004, 2006)

GMM to develop PSHA base rock hazard curves. Finally, Attachment 1 requests that licensees conduct an evaluation of the local site response in order to develop site-specific hazard curves and GMRS for comparison with the plant SSE.

2.1 Screening Evaluation Results

By letter dated March 27, 2014 (Kiley, 2014), the licensee provided its SHSR for Turkey Point. The licensee's SHSR indicates that the site GMRS is bounded by the SSE over the frequency range of 1 to 100 Hertz (Hz). As such, Turkey Point screens out of performing a seismic risk evaluation. A HF confirmation and SFP evaluation will also not be performed.

On May 9, 2014 (NRC, 2014), the NRC staff issued a letter providing the outcome of its 30-day screening and prioritization evaluation. As indicated in the letter, the NRC staff confirmed the licensee's screening results. The licensee's GMRS as well as the confirmatory GMRS, developed by the NRC staff, are bounded by the SSE for Turkey Point over the frequency range of 1 to 100 Hz. Therefore, a seismic risk evaluation, SFP evaluation, and a HF confirmation are not merited for Turkey Point.

3.0 TECHNICAL EVALUATION

The NRC staff evaluated the licensee's submittal to determine if the provided information responded appropriately to Enclosure 1 of the 50.54(f) letter with respect to the reevaluated seismic hazard.

3.1 Plant Seismic Design-Basis

Enclosure 1 of the 50.54(f) letter requests the licensee provide the SSE ground motion values, as well as the specification of the control point elevation(s) for comparison to the GMRS. For operating reactors licensed before 1997, the SSE is the plant licensing basis earthquake and is characterized by (1) a peak ground acceleration (PGA) value which anchors the response spectra at high frequencies (typically at 20 to 30 Hz for the existing fleet of nuclear power plants; (2) a response spectrum shape, which depicts the amplified response at all frequencies below the PGA; and (3) a control point where the SSE is defined.

In Section 3.1 of its SHSR, the licensee described its seismic design-basis. The licensee stated that the SSE response spectra for Turkey Point utilized a Housner spectral shape anchored at 0.15g (15 percent the acceleration of earth's gravity) for the design-basis earthquake. In addition, the licensee stated that the SSE control point is located at plant grade, which is at an elevation of +18 ft [5.5 m] above mean low water (low tide).

The NRC staff reviewed the licensee's description of its SSE for Turkey Point in its SHSR. With regard to the SSE for Turkey Point, based on its review of the SHSR and Updated Final Safety Analysis Report (UFSAR) (FPL, 2013), the NRC staff confirmed that the licensee's SSE is defined by a Housner spectral shape and anchored at a PGA of 0.15g. Finally, based on its review of the SHSR and UFSAR, the NRC staff confirmed the control point is consistent with the guidance provided in the SPID.

3.2 Probabilistic Seismic Hazard Analysis

In Section 2.2 of its SHSR, the licensee stated that, in accordance with the 50.54(f) letter and the SPID, it performed a PSHA using the CEUS-SSC model and the updated EPRI GMM for the CEUS (EPRI, 2013). The licensee used a minimum magnitude of **M** 5.0, as specified in the 50.54(f) letter. The licensee further stated that it included the CEUS-SSC background sources out to a distance of 400 miles [640 km] around the site and included the Charleston repeated large magnitude earthquake (RLME) source, which lies within 620 mi [1,000 km] of the site. The RLME sources are those source areas or faults for which more than one large magnitude (**M** ≥ 6.5) earthquake has occurred in the historical or paleo-earthquake (geologic evidence for prehistoric seismicity) record. The licensee used the Gulf versions of the updated EPRI GMM (EPRI, 2013) for each of the CEUS- SSC sources except for the Charleston source. For the Charleston RLME, the licensee used a combination of 75 percent of the Gulf version of the EPRI GMM and 25 percent of the mid-continent version of the EPRI GMM. Consistent with the SPID, the licensee did not provide its base rock seismic hazard curves in the SHSR since a site response analysis is necessary to determine the control point seismic hazard curves. The licensee provided its control point seismic hazard curves in Section 2.3.7 of its SHSR. The staff's review of the licensee's control point seismic hazard curves is provided in Section 3.3 of this staff assessment.

As part of its confirmatory analysis of the licensee's GMRS, the NRC staff performed PSHA calculations for base rock site conditions at the Turkey Point site. As input, the NRC staff used the CEUS-SSC model as documented in NUREG-2115 (NRC, 2012b) along with the updated EPRI GMM (EPRI, 2013). Consistent with the guidance provided in the SPID, the NRC staff included all CEUS-SSC background seismic sources within a 310 mi [500 km] radius of the Turkey Point site. In addition, the NRC staff included all of the RLME sources which lie within 620 mi [1,000 km] of the site, which includes the Charleston RLME source. For each of the CEUS-SSC sources used in the PSHA, the NRC staff used the Gulf version of the updated EPRI GMM (EPRI, 2013). The NRC staff used the resulting base rock seismic hazard curves together with a confirmatory site response analysis, described in the next section, to develop control point seismic hazard curves and a GMRS for comparison with the licensee's results. Based on review of the SHSR, the NRC staff concludes that the licensee appropriately followed the guidance provided in the SPID for selecting PSHA input models and parameters for the site. This includes the licensee's use and implementation of the CEUS-SSC model and the updated EPRI GMM.

3.3 Site Response Evaluation

After completing PSHA calculations for reference rock site conditions, Attachment 1 to Enclosure 1 of the 50.54(f) letter requests that the licensee provide a GMRS developed from the site-specific seismic hazard curves at the control point elevation. In addition, the 50.54(f) letter specifies that the subsurface site response model, for both soil and rock sites, should extend to sufficient depth to reach the generic or reference rock conditions as defined in the GMMs used in the PSHA. To develop site-specific hazard curves at the control point elevation, Attachment 1 requests that the licensee perform a site response analysis.

Detailed site response analyses were not typically performed for many of the older operating plants; therefore, Appendix B of the SPID provides detailed guidance on the development of site-specific amplification factors (including the treatment of uncertainty) for sites that do not have detailed, measured soil and rock parameters to extensive depths.

The purpose of the site response analysis is to determine the site amplification that will occur as a result of bedrock ground motions propagating upwards through the soil/rock column to the surface. The critical parameters that determine what frequencies of ground motion are affected by the upward propagation of base rock or bedrock motions are the layering of soil and/or soft rock, the thicknesses of these layers, the shear-wave velocities and low-strain damping of the layers, and the degree to which the shear modulus and damping change with increasing input bedrock amplitude.

3.3.1 Site Base Case Profiles

In its SHSR, the licensee indicated that it performed a site response analysis for the Turkey Point site. The site consists of approximately 2 to 6 ft. [0.6 to 1.8 m] of organic muck (peaty soil) overlying Miami Limestone. The licensee noted that the upper 70 ft [21 m] of bedrock contains small voids, solution channels, and random zones of harder and softer rock. Beneath the limestone formations are the Tamiami and Peace River soil units, which overly deeper sedimentary rock layers. In Table 2.3.1-1 of its SHSR, the licensee provided a brief description of the subsurface materials in terms of the geologic units and layer thicknesses. To estimate the shear wave velocities for each of the layers, the licensee used on site measurements from Unit Nos. 3 and 4 for the upper layers and measurements for the proposed Unit Nos. 6 and 7 for the deeper layers. To capture the uncertainty in the subsurface shear wave velocities, the licensee developed three base-case shear-wave velocity profiles using a scale factor of 1.57, which is equivalent to a natural log standard deviation of 0.35 to estimate the lower and upper base profiles.

The licensee stated that no recent site-specific nonlinear dynamic material properties were available for Turkey Point. Therefore, the licensee followed the SPID guidance and selected two alternative characterizations of nonlinear dynamic material behavior. The licensee assumed that the materials over the upper 500 ft (152 m) could be modeled with varying degrees of nonlinearity. For the more non-linear case, the licensee applied the EPRI soil and rock curves over the upper 500 ft (152 m) of the profile. For the more linear case, the licensee used the Peninsular Range curves for the soil layers and assumed that the rock materials would behave linearly under all conditions and applied a constant damping value equal to the low- strain value of the EPRI rock curves.

The licensee also considered the impact of kappa, or small strain damping, on site response. Kappa is measured in units of seconds (sec), and is the damping contributed by both intrinsic hysteretic damping as well as scattering due to wave propagation in heterogeneous material. The licensee used the low strain damping values from the dynamic material properties curves to estimate kappa. In addition, the licensee added an additional 0.006 sec to account for the damping in the reference rock. The licensee's calculated kappa values for the best-estimate, upper, and lower base case profiles are 0.027, 0.020, and 0.039 sec, respectively.

To account for randomness in material properties across the plant site in its site response calculations, the licensee stated that it randomized its base case shear-wave velocity profiles following guidance in Appendix B of the SPID. In addition, as stated in Section 2.3.2 of its SHSR, the licensee randomized the depth to reference rock by ±1,190 ft (362 m), which represents 30 percent of the total profile thickness. The licensee stated that this depth randomization does not represent uncertainty in the depth to reference rock over the plant area, but is used to develop a realistic broadening of spectral peaks.

3.3.2 Site Response Method and Results

In SHSR Section 2.3.4, the licensee stated that it followed the guidance in Appendix B of the SPID to develop input ground motions for site response analysis, and in Section 2.3.5, the licensee described it implementation of the random vibration theory (RVT) approach to perform its site response calculations. The licensee stated that this approach is consistent with present-day guidance and methodology. Furthermore, the licensee stated that its site response approach is also consistent with the SPID in terms of incorporating epistemic uncertainty in shear-wave velocity, kappa, non-linear dynamic material properties, and source spectra for sites with limited at-site information.

In order to develop probabilistic site-specific control point hazard curves requested in Requested Information Item 1 of the 50.54(f) letter, the licensee used Method 3, which is described in Appendix B of the SPID. The licensee's use of Method 3 involved computing the site-specific control point hazard curve for a broad range of spectral accelerations given the site- specific bedrock hazard curve and the site-specific estimates of soil or soft-rock response and associated uncertainties. The licensee provided its resulting control point hazard curves for the seven specified oscillator frequencies in SHSR Figure 2.3.7-1 and Appendix A.

3.3.3 Staff Confirmatory Analysis

To confirm the licensee's site response analysis, the NRC staff performed site response calculations for the Turkey Point site. The NRC staff performed site response calculations for the Turkey Point site using a similar method that the licensee used by employing the RVT approach and developing input Fourier amplitude spectra, in accordance with Appendix B of the SPID guidance. The NRC staff also incorporated epistemic uncertainty in shear-wave velocity, non-linear dynamic material properties, and source spectra for sites with limited at-site information.

For its confirmatory site response analysis, the NRC staff essentially used the base case shear- wave velocity profile developed for the Turkey Point Unit Nos. 6 and 7 COL (FPL, 2014). The NRC staff notes that the close proximity of Turkey Point Unit Nos. 3 and 4 to the proposed site for Turkey Point, Unit Nos. 6 and 7, as well as the relative uniformity of the site geology, supports the use of the more recent shear wave velocity measurements for use at the older units. For the upper 20 ft [6 m] of fill material, the staff used a shear wave velocity of 1,000 ft/sec [305 m/s], which is slightly higher than the shear wave velocity used by the licensee of 896 ft/sec [273 m/s] for the fill. Below 20 ft [6 m], the staff used the shear wave velocity profile developed for Turkey Point, Unit Nos. 6 and 7, which extends to a depth of about 10,000 ft [3050 m] before reaching the base or reference rock velocity of 9,200 ft/sec [2,800 m/s]. Figure

3.3-1 of this assessment shows the staff's base case velocity profile as well as the licensee's three base case profiles. The licensee extended its three base case profiles down to approximately 4,000 ft [1,219 m] while the NRC staff, using the velocity profile for the proposed Unit Nos. 6 and 7 site has a much deeper profile. In addition, due to the extensive subsurface geophysical profiling performed for the proposed site, the NRC staff used only a single base case velocity profile rather than develop three profiles.

Following the approach recommended by the SPID, the NRC staff assumed both linear and non-linear behavior for the materials beneath the Turkey Point site in response to a range of input motions. Similar to the licensee, the NRC staff used used two sets of shear modulus degradation and hysteretic damping curves over the upper 500 ft [152 m]. The NRC staff used the EPRI soil curves for the gravel, sand, and silt layers and the EPRI rock curves for the limestone layers to model the upper range of material non-linearity. For the alternative more linear model, the NRC staff used the Peninsular curves for the soils and linear behavior with small strain damping from the EPRI rock curves for the limestone. Below a depth of 500 ft [152 m], the NRC staff assumed linear behavior for the rock with no damping.

To determine the site kappa, the NRC staff used a Q value of 40 over the upper 4000 ft [1220 m] and a Q of 80 for the rock below 4000 ft [1220 m]. Using these Q values, the NRC staff estimated a base case site kappa value of 0.029 sec. To capture the uncertainty in kappa, the NRC staff used upper and lower site kappa values of 0.04 sec and 0.018 sec, which are based on using a log standard deviation value of 0.4 and constraining kappa to be no larger than 0.04 sec. These kappa values are consistent the licensee's kappa values for Profiles 1, 2 and 3 of 0.027, 0.039, and 0.020, respectively.

Figure 3.3-2 of this assessment shows a comparison of the NRC staff's and licensee's median site amplification functions and uncertainties (±1 standard deviation) for two of the eleven input loading levels and Figure 3.3-3 of this assessment shows a comparison of the licensee's and the staff's control point hazard curves. As shown in Figure 3.3-2, the staff's and licensee's amplification factors are very similar. In addition, the NRC staff's control point hazard curves, shown in Figure 3.3-3, are similar to the licensee's curves with the exception of the licensee's 1 Hz hazard curve, which is slightly higher than the staff's 1 Hz curve. Appendix B of the SPID provides guidance for performing site response analyses, including capturing the uncertainty for sites with less subsurface data; however, the guidance is neither entirely prescriptive nor comprehensive. As such, various approaches in performing site response analyses, including the modeling of uncertainty, are acceptable for the 50.54(f) response.

In summary, the NRC staff concludes that the licensee's site response was conducted using present-day guidance and methodology, including the NRC-endorsed SPID. The NRC staff performed independent calculations, which confirmed that the licensee's amplification factors and control point hazard curves adequately characterize the site response, including the uncertainty associated with the subsurface material properties, for the Turkey Point site.

3.4 Ground Motion Response Spectra

In Section 2.4 of its SHSR, the licensee stated that it used the control point hazard curves described in SHSR Section 2.3.7 to develop the 10^{-4} and 10^{-5} (mean annual frequency of

exceedance) uniform hazard response spectra (UHRS) and then computed the GMRS using the criteria in RG 1.208.

The NRC staff independently obtained the 10^{-4} and 10^{-5} UHRS using the results of its confirmatory PSHA and site response calculations described in Sections 3.2 and 3.3 of this staff assessment, respectively. Figure 3.4-1 of this assessment shows a comparison of the GMRS determined by the licensee to that determine by the NRC staff. As shown in Figure 3.4-1, the licensee's GMRS shape is generally similar to the licensee's GMRS across the entire frequency range.

The NRC staff confirms that the licensee used the present-day guidance and methodology outlined in RG 1.208 and the SPID to calculate the horizontal GMRS as requested in the 50.54(f) letter. The NRC staff performed both a PSHA and site response confirmatory analysis and achieved results consistent with the licensee's horizontal GMRS. As such, the NRC staff concludes that the GMRS determined by the licensee adequately characterizes the reevaluated hazard for the Turkey Point site. Therefore, this GMRS is suitable for use in subsequent evaluations and confirmations, as needed, for the response to the 50.54(f) letter.

4.0 CONCLUSION

The NRC staff reviewed the information provided by the licensee for the reevaluated seismic hazard for the Turkey Point site. Based on its review, the NRC staff concludes that the licensee conducted the hazard reevaluation using present-day methodologies and regulatory guidance, it appropriately characterized the site given the information available, and met the intent of the guidance for determining the reevaluated seismic hazard. Based upon the preceding analysis, the NRC staff concludes that the licensee provided an acceptable response to Requested Information Items (1) - (3) and (5) – (7), and the comparison portion to Item (4) identified in Enclosure 1 of the 50.54(f) letter.

In reaching this determination, the NRC staff confirms the licensee's conclusion that the licensee's GMRS for the Turkey Point site is bounded by the SSE in the 1 to 10 Hz range, and also above 10 Hz range. As such, a seismic risk evaluation (Item 8), SFP evaluation (Item 9), and HF confirmation (Item 4) are not merited. Based upon the preceding analysis, the NRC staff concludes that the licensee responded appropriately to Enclosure 1, of the 50.54(f) letter.

REFERENCES

Note: ADAMS Accession Nos. refers to documents available through NRC's Agency wide Documents Access and Management System (ADAMS). Publicly-available ADAMS documents may be accessed through http://www.nrc.gov/reading-rm/adams.html.

U.S. Nuclear Regulatory Commission Documents and Publications

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Figure 3.3-1 Plot of Staff's and Licensee's Base Case Shear-Wave Velocity Profiles for the A) upper 500 ft depth and B) full profile at the Turkey Point site

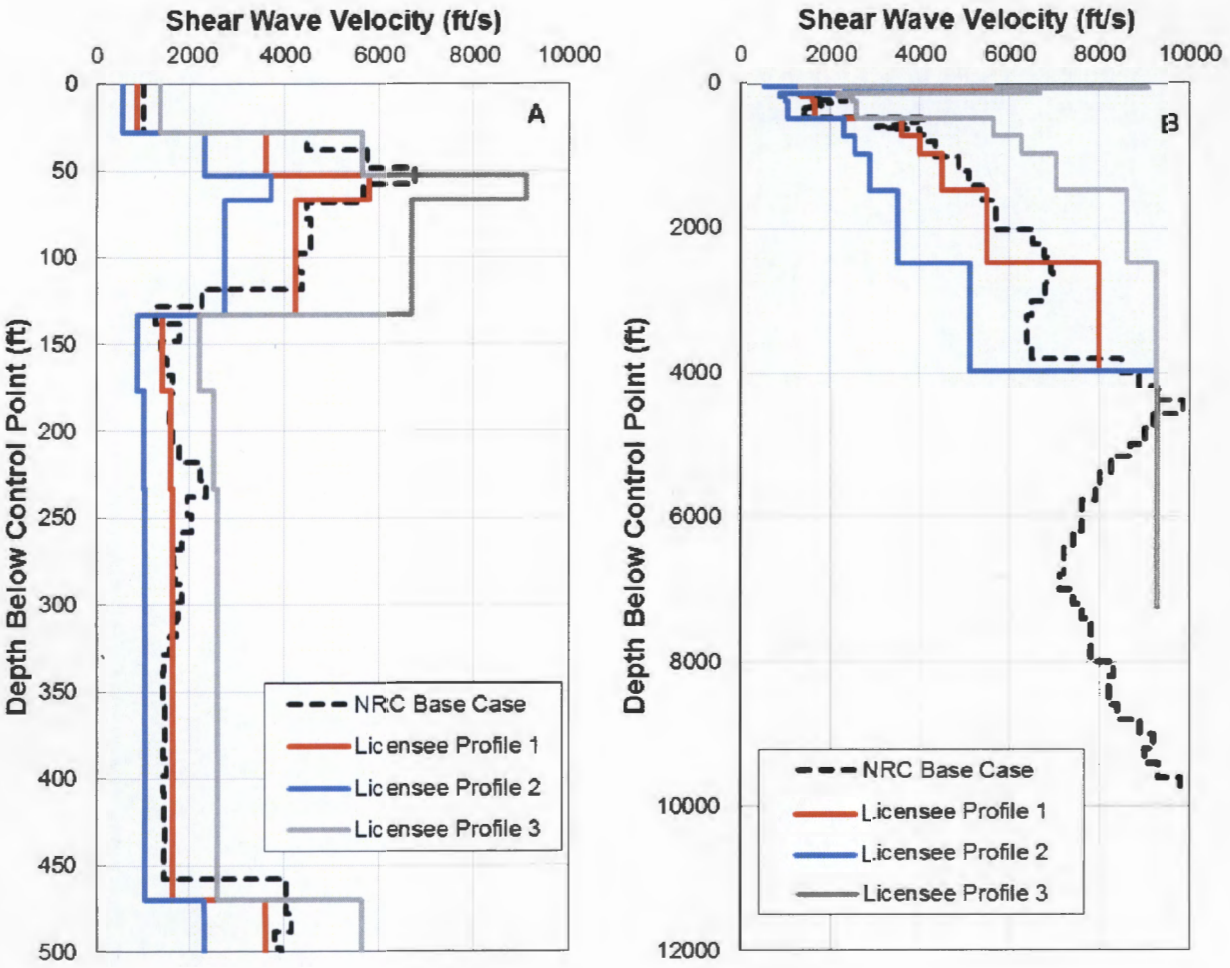
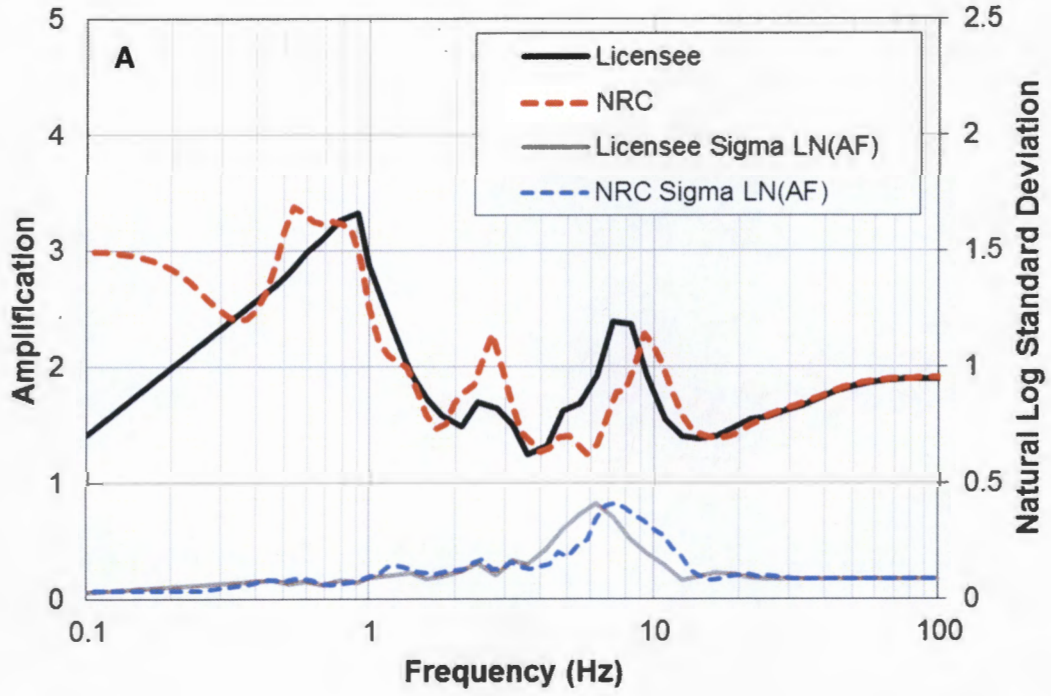


Figure 3.3-2 Plot Comparing the Staff's and the License's Median Amplification Functions and Uncertainties for the Turkey Point site using the Base Case velocity profile and upper range material non-linearity, A) Rock PGA = 0.01 g, B) Rock PGA = 0.10 g.



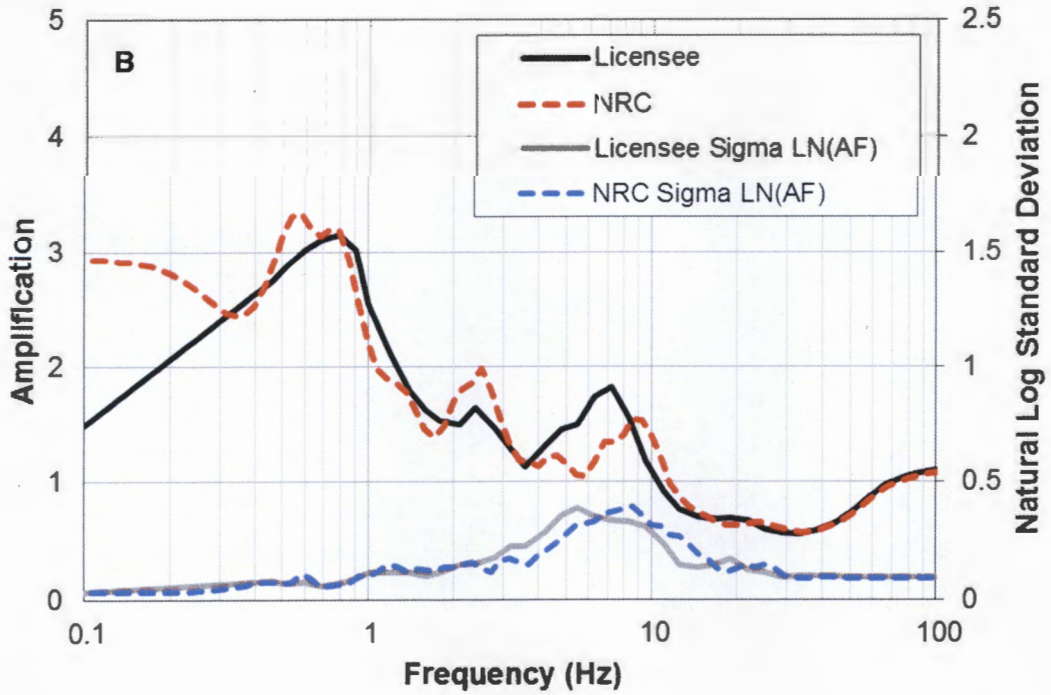


Figure 3.3-3 Plot Comparing the Staff's and the Licensee's Mean Control Point Hazard Curves at a Variety of Frequencies for the Turkey Point site

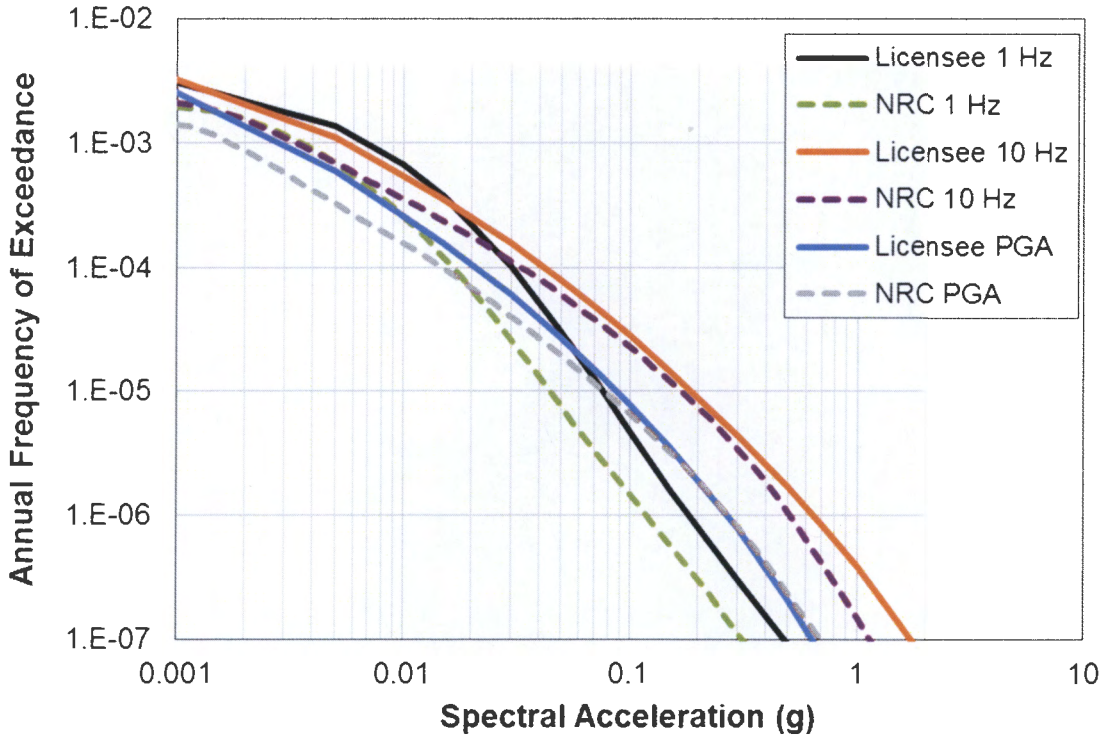
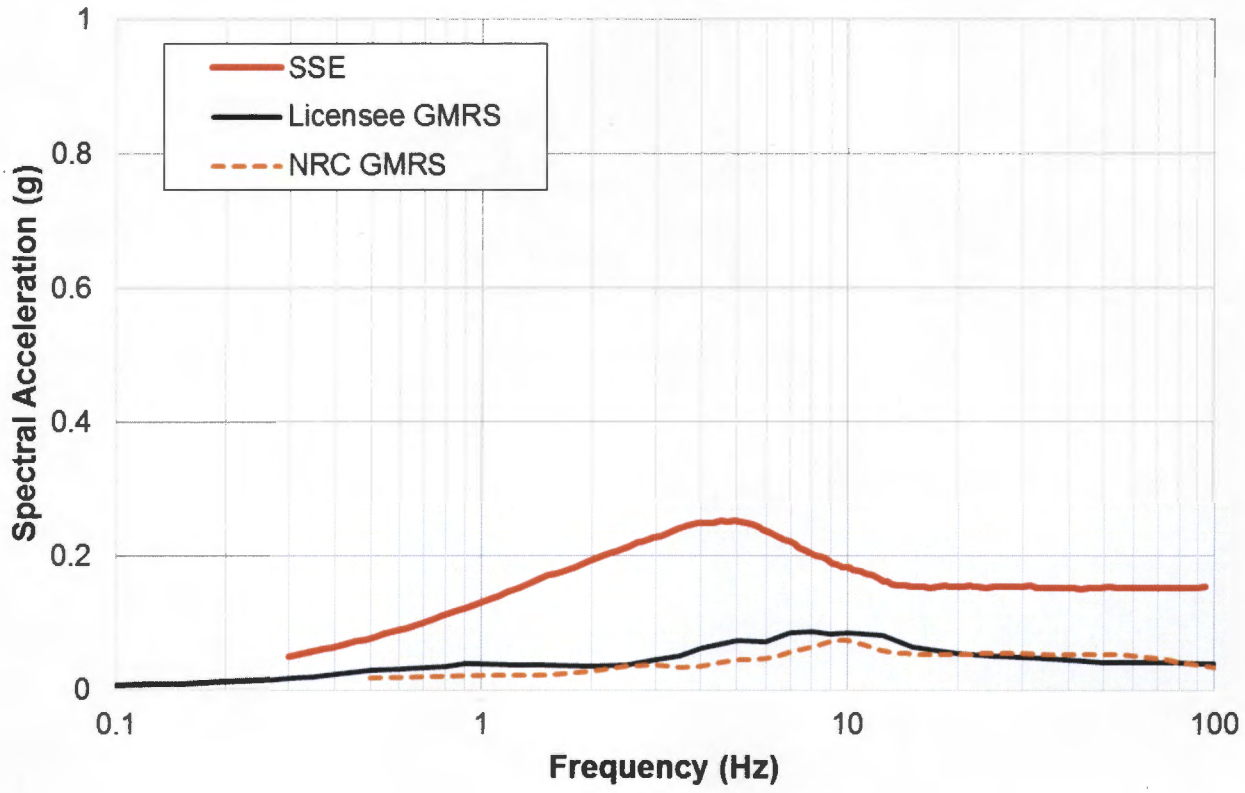


Figure 3.4-1 Comparison of the Staff's GMRS with Licensee's GMRS and SSE for the Turkey Point site.



If you have any questions, please contact me at (301) 415-1617 or at Frankie.Vega@nrc.gov.

Sincerely,

/RA/

Frankie Vega, Project Manager
Hazards Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket Nos. 50-250 and 50-251

Enclosure:
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