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

January 22, 2016

Mr. Rafael Flores
Senior Vice President and Chief
Nuclear Officer
Attention: Regulatory Affairs
Luminant Generation Company, LLC
P.O. Box 1002
Glen Rose, TX 76043

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT, UNITS 1 AND 2 - 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. MF3937 AND MF3938)

Dear Mr. Flores:

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, Luminant Generation Company LLC (Luminant, the licensee), responded to this request for Comanche Peak Nuclear Power Plant, Units 1 and 2 (Comanche Peak).

The NRC staff has reviewed the information provided related to the reevaluated seismic hazard for CPNPP 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 Comanche Peak. This closes out the NRC's efforts associated with Phase 1 and 2 of NTTF Recommendation 2.1 "Seismic" (CAC Nos. MF3937 and MF3938) for Comanche Peak.

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

Sincerely,

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

Docket Nos. 50-445 and 50-446

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

COMANCHE PEAK NUCLEAR POWER PLANT, UNITS 1 AND 2

DOCKET NOS. 50-445 AND 50-446

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),

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[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) Selected risk evaluation approach (if 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 specified 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 (GMM) for the CEUS (EPRI, 2013), industry proposed a six-month extension to March 31, 2014, for submitting the SHSR. Industry developed guidance, 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 (ESEP) and (2) a seismic risk evaluation. By letter dated May 7, 2013 (NRC, 2013a), the NRC determined that the modified schedule was acceptable and in a 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 committed to following the SPID to develop the SHSR for existing nuclear power plants. By letter dated September 12, 2013 (Flores, 2013), Luminant Generation Company LLC (Luminant, the licensee) submitted at least partial site response information for Comanche Peak Nuclear Power Plant, Units 1 and 2 (CPNPP). By letter dated March 27, 2014 (Flores, 2014), Luminant submitted its SHSR.

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 (Flores, 2014), the licensee provided its SHSR for CPNPP. The licensee's SHSR indicates that the site GMRS is bounded by the SSE for CPNPP over the frequency range of 1 to 10 Hertz (Hz). As such, CPNPP screens out of performing a seismic risk evaluation, as well as a SFP evaluation. The GMRS is also bounded by the SSE at frequencies above 10 Hz. Therefore, the licensee indicated that a HF confirmation is not merited for CPNPP.

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 GRMS developed by the NRC staff, are bounded by the SSE for CPNPP over the frequency range of 1 to 100 Hz. Therefore, a seismic risk evaluation, a SFP evaluation and a HF confirmation are not merited for CPNPP.

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 characterizing the reevaluated seismic hazard.

3.1 Plant Seismic Design-Basis

Enclosure 1 of the 50.54(f) letter requests the licensee to 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 3.0 of its SHSR, the licensee described its seismic design-basis. The licensee considered the historic seismicity of the region to determine that the maximum potential earthquake would be an intensity VII event on the Modified Mercalli Scale, which would result in ground accelerations at the site of less than or equal to 0.10g. As stated in its Updated Final Safety Analysis Report (UFSAR) (Luminant, 2010), the licensee used the RG 1.60 design response spectrum shape and anchored the spectrum at 0.12g at a frequency of 33 Hz. Table 3.3-1 of this assessment shows the spectral acceleration values as a function of frequency for the 5 percent damped horizontal SSE. The licensee specified the SSE control point at the surface elevation of the CPNPP site.

The NRC staff reviewed the licensee's description of the SSE for CPNPP and confirms that it is consistent with the information provided in the CPNPP UFSAR (Luminant, 2010). Furthermore, the NRC staff confirms that the licensee's SSE control point elevation determination is consistent with the information provided in the CPNPP UFSAR, as well the guidance provided in the SPID. Based on the review of the licensee' submittals and UFSAR, the NRC staff confirms that the licensee's SSE control point elevation determination is consistent with the information provided in the CPNPP UFSAR as well 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 New Madrid Fault System and six other repeated large magnitude earthquake (RLME) sources, which lie within 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 mid-continent version of the updated EPRI GMM (EPRI, 2013) for each of the CEUS-SSC background seismic sources. For the RLME sources, the licensee used either mid-continent or a combination of mid-continent and the Gulf models depending on the RLME source locations. Consistent with the SPID, the licensee did not provide its base rock seismic hazard curves in the SHSR as it used the site amplification approach referred to as Method 3. 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 its own PSHA calculations for base rock site conditions at the CPNPP 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, and licensee's approach, the NRC staff included all CEUS-SSC background seismic sources within a 310 mile (500 km) radius of the CPNPP site. In addition, the NRC staff included RLME sources which lie within 621 mi (1,000 km) of the site. Depending on the locations of the CEUS- SSC sources used in the PSHA, the NRC staff used either the mid-continent version or 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 its review of the SHSR, the NRC staff concludes that the licensee appropriately followed the guidance provided in the SPID for selecting the 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 base rock or 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 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 CPNPP site. According to the licensee, the site consists of approximately 5,300 ft (1,615 m) of firm, sedimentary rocks, mostly limestone of the Glen Rose Formation. In SHSR Table 2.3.1-1 provides a brief description of the subsurface materials, including thickness and other physical parameters such as shear wave velocity. The licensee noted that the shear wave velocity ranges from 3,019 to 6,680 ft/sec (920 to 2,036 m/sec) in the upper 200 ft (61 m), with an average of approximately 4,420 ft/sec (1,348 m/sec). The licensee stated that the SSE control point is at the surface and that base rock or reference rock is estimated to be at a depth of 5,300 ft (1,615 m) below the control point.

The licensee used the measured shear-wave velocities obtained from the CPNPP, Units 3 and 4 Combined Operating License (COL) FSAR (Luminant, 2009) to develop the base-case shear-wave velocity profile for the CPNPP site. In its SHSR, the licensee stated that CPNPP, Units 1 and 2 are collocated on the same Comanche plateau with Units 3 and 4 and are separated by only about 3,000 ft. Based on this close proximity, the uniformity of the subsurface geology, and the modern methods used to measure the shear wave velocities, the licensee determined that the subsurface data from Units 3 and 4 is appropriate for use to develop the base case velocity profile. To account for uncertainty in the shear wave velocity beneath the site, the licensee developed lower and upper base case profiles using scale factors of 1.25 to a depth of 393 ft (120 m) and 1.57 for the deeper layers.

The licensee stated that no site-specific dynamic material properties were determined in the initial siting of Units 1 and 2. Therefore, the licensee assumed that the behavior of the rock material in the upper 500 ft (152 m) could be modeled as either linear or non-linear. To model the non-linear behavior the licensee used the EPRI rock curves and for its alternative model the licensee used a linear analysis with low strain damping values of about 3 percent. The licensee assigned equal weights to both characterizations.

The licensee also considered the impact of kappa, or small strain damping, on the site response analysis. Kappa is measured in units of seconds (sec), and is the damping contributed by both intrinsic hysteretic damping and scattering due to wave propagation in a heterogeneous material. For the CPNPP site, the licensee applied the guidance in the SPID to estimate the base-case kappa for a firm CEUS rock site. Based on the average shear-wave velocities over the top 100 ft for each of the three base case profiles (middle, lower, and upper), the licensee estimated kappa values of 0.019, 0.025, and 0.015 sec, respectively. However, the licensee determined that this range was not sufficiently large and, as such, used kappa values of 0.020 sec for the middle base case along with 0.030 sec for the lower base case and 0.010 sec for the upper base case.

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 in accordance with Appendix B of the SPID. In addition, as stated in SHSR Section 2.3.2, the licensee randomized the depth to bedrock by ±1,590 ft (485 m).

3.3.2 Site Response Method and Results

In Section 2.3.4 of its SHSR, the licensee stated that it followed the guidance in Appendix B of the SPID to develop input ground motions for the site response analysis, and in Section 2.3.5 of its SHSR, the licensee described its implementation of the random vibration theory (RVT) approach to perform its site response calculations. Finally, Section 2.3.6 of the SHSR shows the resulting amplification function and associated uncertainties for eleven input loading levels for the base case profile and the EPRI rock shear modulus and damping curves.

In order to develop the 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. Appendix A to the SHSR provides the tabulated values of mean and fractile seismic hazard curves and site response amplification functions.

3.3.3 Staff Confirmatory Analysis

To confirm the licensee's site response analysis, the NRC staff performed site response calculations for the CPNPP site. The NRC staff independently developed a shear-wave velocity profile, damping values, and modeled the potential nonlinear behavior of the rocks. For its site response calculations, the NRC staff employed the RVT approach and developed input ground motions in accordance with Appendix B of the SPID. Similar to the licensee's approach, the NRC staff's shear wave velocity profile is adapted directly from the CPNPP, Units 3 and 4 COL FSAR as the operating plant is close to the COL site, and the site geology is uniform. Since the licensee also used the same measurements, the two base case velocity profiles are almost identical. Unlike the licensee, however, the NRC staff used a single base case velocity profile, because there is sufficient data to construct a reliable shear wave velocity profile. To capture the uncertainty in the depth to base rock beneath the site, the staff used a natural log sigma of 0.1 resulting in a basement uncertainty of about ± 650 feet (200 m). Figure 3.3-1 of this assessment shows a comparison of the licensee's and NRC staff's shear wave velocity profiles for the CPNPP site, which for the middle base case profile are very similar. The only differences are observed at a depth below 4500 ft (1370 m). While the NRC staff's velocity model follows the profile used for the CPNPP, Units 3 and 4 COL, the licensee's model has a smoother velocity gradient. Because these varying velocity layers are at a significant depth and relatively thin, this minor difference does not result in any significant impact in the site response calcualtions.

The NRC staff also used the SPID guidance in developing the appropriate dynamic properties for the upper 390 ft (120 m) of the site. The NRC staff used two alternative degradation curves, EPRI soil and Peninsular curves, as described in the SPID guidance for the sedimentary rocks from the surface down to a depth of 390 ft. Below 390 ft (120 m), the staff's model used only the linear option, where much higher velocity rocks are observed. The NRC staff assigned a damping value of 1 percent for the rocks from 390 ft (120 m) to 4500 ft (1370 m) and 0.5 percent to the sedimentary rocks below. For the basement rock below the sedimentary section the NRC staff assumed a damping value of 0.1 percent. Using the SPID guidance, the NRC staff estimated the total site kappa value to be about 0.020 sec, which is consistent with the licensee's value for its best estimate base case profile

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 2 of the 11 input loading levels. As shown in Figure 3.3-2, the NRC staff's and licensee's amplification factors follow a similar trend; however, the staff's amplification factors are somewhat larger between 1 to 5 Hz. Figure 3.3-3 of this assessment shows a comparison of the staff's and licensee's control point hazard curves for 1 Hz, 10 Hz and PGA. As shown in Figure 3.3-3, the licensee's control point hazard curves are slightly higher than the NRC staff's curves for these three frequencies. 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 CPNPP 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 calculated the 10^{-4} and 10^{-5} UHRS using the results of its confirmatory PSHA and site response analyses, as 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 determined by the NRC staff. As shown in Figure 3.4-1, the licensee's GMRS is very similar to the staff's confirmatory GMRS.

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 characterized the reevaluated hazard for the CPNPP 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 CPNPP, Units 1 and 2 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 of 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 CPNPP site is bounded by the SSE in the 1 to 100 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 Agencywide Documents Access and Management System (ADAMS). Publicly-available ADAMS documents may be accessed through http://www.nrc.gov/reading-rm/adams.html.

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Figure 3.3-1 Plot of Staff's and Licensee's Base Case Shear-Wave Velocity Profiles for the CPNPP site

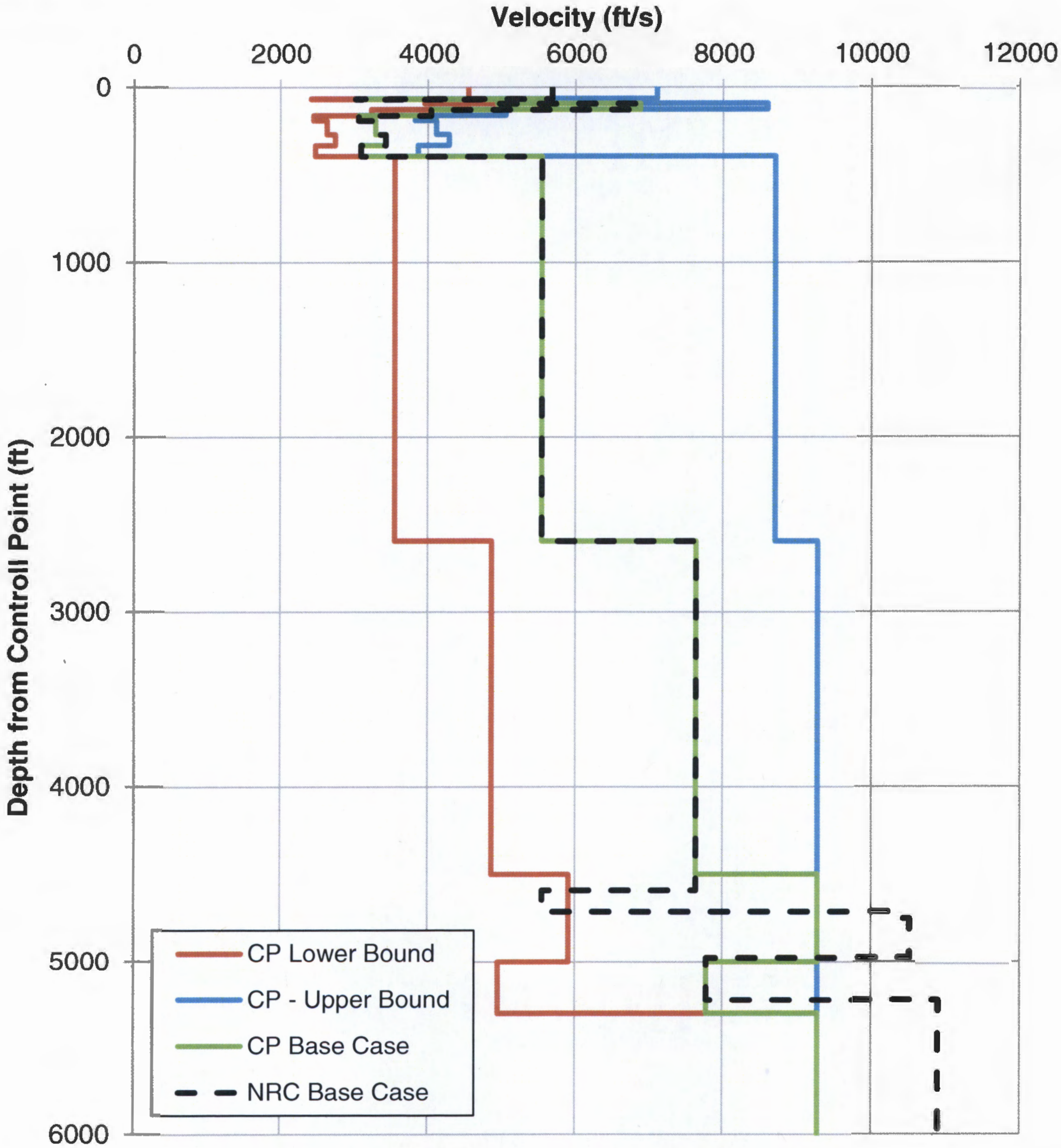


Figure 3.3-2 Plot Comparing the Staff's and the License's Median Amplification Functions and Uncertainties for the CPNPP site

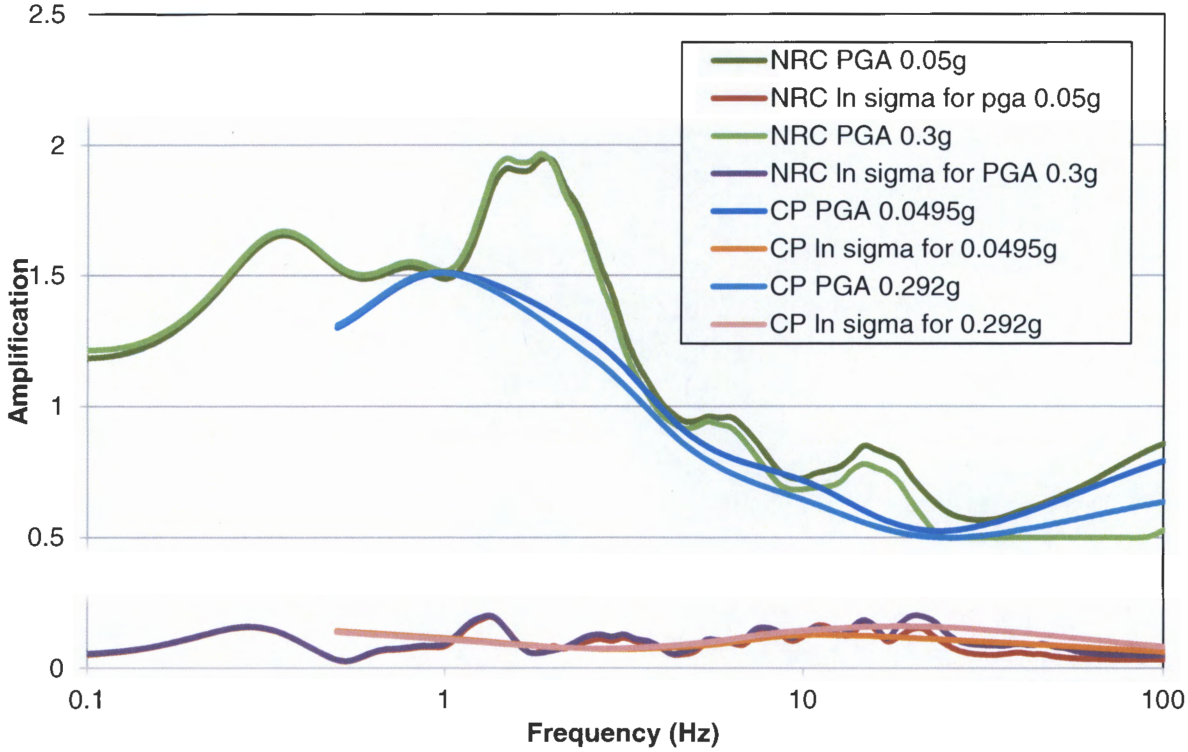


Figure 3.3-3 Plot Comparing the Staff's and the Licensee's Mean Control Point Hazard Curves at t a Variety of Frequencies for the CPNPP site

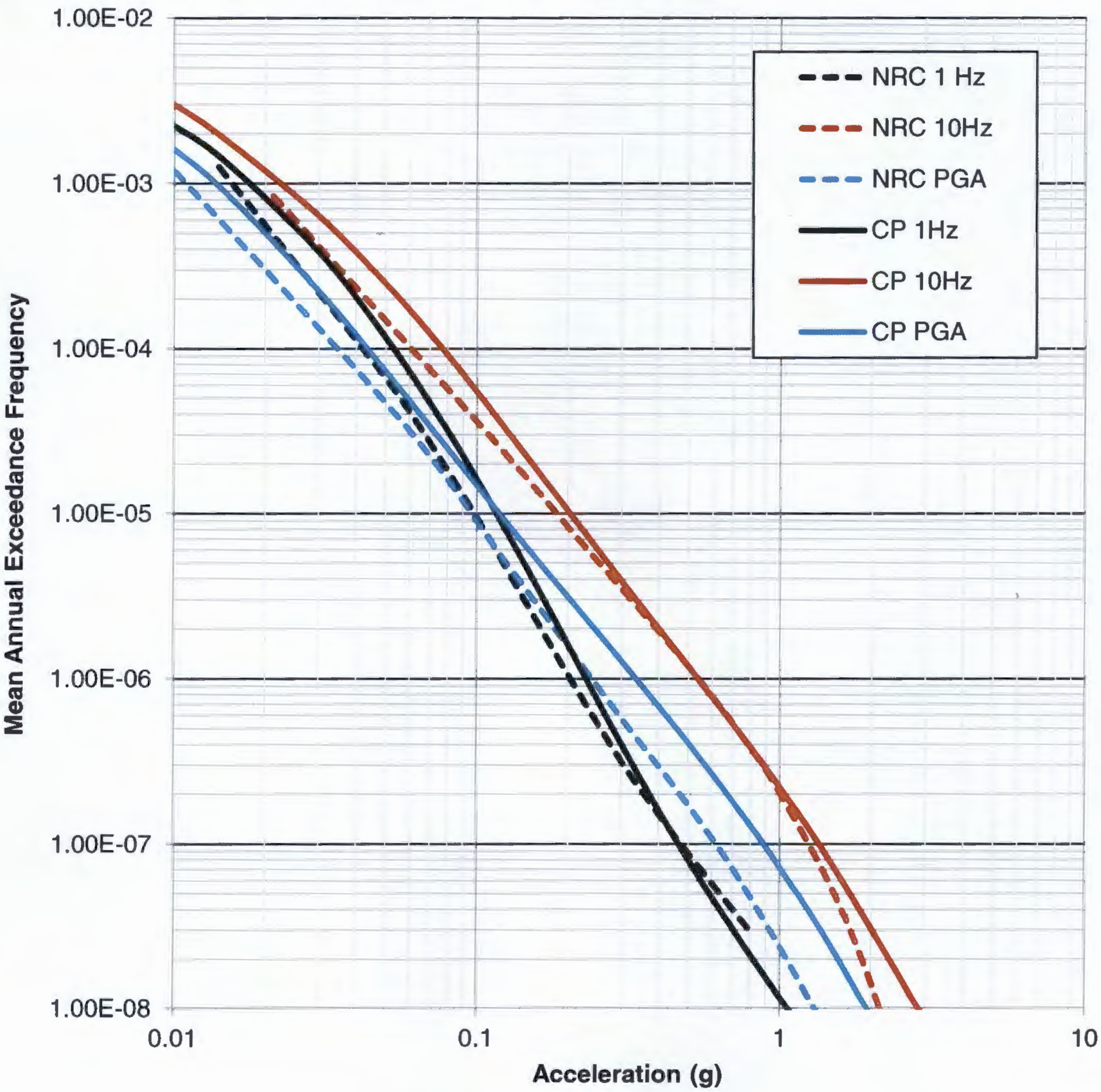
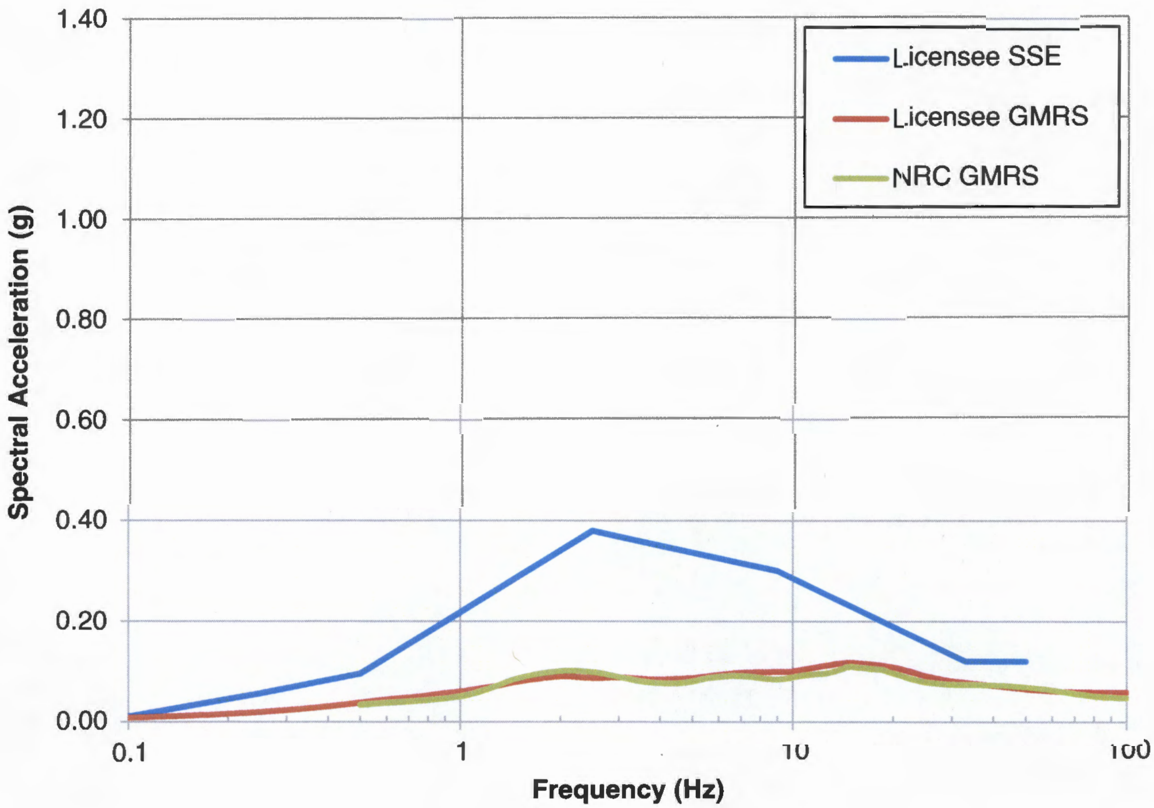


Figure 3.4-1 Comparison of the Staff's GMRS with Licensee's GMRS and the SSE for the CPNPP site



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. 50-445 and 50-446

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