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

December 15, 2015

Mr. Kevin K. Davison
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Welch, MN 55089-9642

SUBJECT: PRAIRIE ISLAND NUCLEAR GENERATING 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 (NTTF) REVIEW OF INSIGHTS FROM THE FUKUSHIMA DAI-ICHI ACCIDENT AND STAFF CLOSURE OF ACTIVITES ASSOCIATED WITH NTTF RECOMMENDATION 2.1, "SEISMIC" (TAC NOS. MF3784 AND MF3785)

Dear Mr. Davison:

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, Northern States Power Company, a Minnesota corporation (the licensee), doing business as Xcel Energy, responded to this request for Prairie Island Nuclear Generating Plant, Units 1 and 2 (PINGP).

The NRC staff has reviewed the information provided related to the reevaluated seismic hazard for PINGP 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 requiered for PINGP. This closes out the NRC's efforts associated with Phase 1 and 2 of NTTF Recommendation 2.1 "Seismic" (TAC Nos. MF3784 AND MF3785).

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. 50-282 and 50-306

Enclosure:
Staff Assessment of Seismic
Hazard Evaluation and Screening Report

cc w/encl: Distribution via Listserv

STAFF ASSESSMENT BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO SEISMIC HAZARD AND SCREENING REPORT

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2

DOCKET NOS. 50-282 AND 50-306

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,

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

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

(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 (GMM) 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 committed to following the SPID to develop the Seismic Hazard and Screening Report (SHSR) for existing nuclear power plants. By letter dated September 12, 2013 (Lynch, 2013), Northern States Power Company - Minnesota (NSPM, the licensee), doing business as Xcel Energy, submitted at least partial site response information for Prairie Island Nuclear Generating Plant, Units 1 and 2 (PINGP). By letter dated March 27, 2014 (Davison, 2014), ()the licensee submitted its SHSR for PINGP.

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 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 requested 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 (Davison, 2014), the licensee provided the SHSR for the PINGP site. The licensee's SHSR indicates that the site GMRS is bounded by the SSE for the PINGP over the frequency range of 1 to 10 Hz. As such, PINGP screens out of performing both a seismic risk evaluation and a SFP evaluation. The GMRS is also bounded by the SSE at frequencies above 10 Hz. Accordingly, the licensee indicated that a HF confirmation was not merited for PINGP.

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, and is bounded by the SSE over the frequency range of 1 to 100 Hertz (Hz). Therefore, a seismic risk evaluation, a SFP evaluation, and a HF confirmation are not merited for PINGP.

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 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 33 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 bases for PINGP. The licensee stated that the SSE for PINGP is anchored at a peak ground acceleration of 0.12g and has a Housner shape. The licensee stated that the SSE control point elevation is not identified in the Updated Safety Analysis Report (USAR) (PINGP, 2013) and, as such, based on guidance in the SPID, the licensee stated that the SSE control point is at the surface.

The NRC staff reviewed the licensee's description of its SSE in the SHSR for the PINGP site. Based on its review of the SHSR and the USAR, the NRC staff confirmed that the licensee's SSE is defined in terms of a PGA and a design response spectrum anchored at 0.12 g, as described by the licensee. Finally, based on review of the SHSR and the USAR, the NRC staff confirmed that the licensee's control point elevation for the PINGP site SSE is defined at the surface, consistent with 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). For its PSHA, the licensee used a minimum moment magnitude (M_w) of 5.0 as specified in the 50.54(f) letter. The licensee further stated that it included CEUS-SSC background sources out to a distance of 400 miles [640 km] and included the Commerce, New Madrid Fault System and Wabash Valley repeated large magnitude earthquake (RLME) sources, among others, that lie within 620 miles [1,000 km] of the site. The RLME sources are those source areas or faults for which more than one large magnitude ($M_w >= 6.5$) 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 sources. Consistent with the SPID, the licensee did not provide base rock seismic hazard curves in SHSR Section 2.2.2 because it performed a site response analysis 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 are 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 conditions at the PINGP 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 PINGP site. In addition, the NRC staff included all of the RLME sources falling within a 620 mi [1,000 km] radius of the site, which includes the Commerce, New Madrid Fault System and Wabash Valley RLME source. For each of the CEUS-SSC sources used in the PSHA, the NRC staff used the mid-continent 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 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 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

The licensee provided detailed site profile descriptions in Sections 2.3.1 and 2.3.2 of its SHSR based on information provided in the PINGP USAR (PINGP, 2013). The licensee stated that the site is underlain by approximately 180 ft. [55 m] of soils, including site fill and glacial outwash, overlying about 3,900 ft. [1,189 m] of firm sedimentary rock underlain by Precambrian basement rock.

The licensee provided a brief description of the subsurface materials in terms of geologic units and thickness in its SHSR. Seismic velocities associated with subsurface materials by the licensee are 2,150 feet per second (fps) [655 meters per second (m/s)] for the site fill, 2,860 fps [872 m/s] for the glacial outwash, 5,020 fps [1,560 m/s] for the firm sedimentary rock, and 11,200 fps [3,410 m/s] for the Precambrian basement. In the SHSR, the licensee indicated that the information was gathered from geophysical investigations at the PINGP site and are documented in a site engineering change document.

To characterize the subsurface geology, the licensee developed three site base case profiles. The middle, or best estimate, profile was developed using compressional-wave refraction surveys and assumed Poisson ratios. Upper and lower base case profiles were developed using a scale factor of 1.25 for the fill and glacial outwash and 1.57 for the firm sedimentary rock. The licensee noted that these scale factors reflect a log standard deviation of 0.20 and 0.35, consistent with guidance in the SPID. Figure 3.3-1 of this assessment shows the licensee's three shear-wave velocity base case profiles.

In Section 2.3.2.1 of its SHSR, the licensee stated that no site-specific dynamic material properties were available for the PINGP site soil and firm rocks. Therefore, the licensee followed the SPID guidance and assumed the response of the subsurface material to dynamic loading could be modeled as either linear or non-linear. In one characterization, the licensee used the EPRI soil and rock shear modulus and damping curves to represent the upper range of nonlinearity. The licensee assumed that the Peninsular Range shear modulus and damping curves for the upper soil combined with a linear analysis with a constant damping value of approximately 3 percent for the rock was an equally plausible alternative for the upper 500 ft [152 m].

The licensee also considered the impact of kappa, or small strain damping, on site response. Kappa is measured in units of seconds (s), and is the damping contributed by both intrinsic hysteretic damping as well as scattering due to wave propagation in heterogeneous material. For PINGP, with approximately 4,100 ft. [1,250 m] of fill, soil and firm rock over hard rock, the licensee assumed low-strain damping over the upper 500 ft. [152 m] with constant damping of 1.25 for the remaining firm rock in addition to a hard rock kappa value of 0.006s for hard rock. The resulting kappa for the best, upper and lower cases are 0.030s, 0.040s and 0.021s respectively. The licensee stated that it accommodated epistemic uncertainty in kappa using two sets of modulus reduction and hysteretic damping curves for the soils.

To account for randomness in material properties across the plant site, the licensee stated that it randomized its base case shear-wave velocity profiles using the guidance in the SPID. In addition, as stated in Section 2.3.2 of its SHSR, the licensee randomized the depth to bedrock by ±1,230 ft. [±375 m], which corresponds to 30 percent of the total profile thickness. The licensee stated that this randomization did not represent the actual uncertainty to in depth to base rock, but was used to broaden the spectral peaks.

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, 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 functions and associated uncertainties for the cases analyzed. Amplification functions are shown for eleven input loading levels for the base case profile and the EPRI soil and rock shear modulus and damping curves as well as the base case profile with the Peninsular Range shear modulus and damping curves for the soil.

In order to develop probabilistic site-specific control point hazard curves, as requested in Requested Information Item 1 of the 50.54(f) letter, the licensee used Method 3, described in Appendix B-6.0 of the SPID. The licensee's use of Method 3 involved computing the site-specific control point elevation hazard curves for a broad range of spectral accelerations by combining the site-specific bedrock hazard curves, determined from the PSHA (Section 3.2 of this assessment), and the amplification functions and their associated uncertainties, determined from the site response analysis.

3.3.3 Staff Confirmatory Analysis

To confirm the licensee's site response analysis, the NRC staff performed site response calculations for the PINGP site. The NRC staff independently developed three base case shear-wave velocity profiles from information provided in the USAR and the General Atomics

Site Parameter Study (GA-SPS, 1974). The NRC staff developed three separate profiles in order to capture the epistemic uncertainty in the modeled profiles. The staff's base case shear-wave velocity profiles are shown along with the licensee's base case profiles in Figure 3.3-1 of this assessment. The staff's shear wave velocity profiles agree well with those submitted by the licensee with only minor differences in the location of the interface between soil and sedimentary rock and the staff's selection of a broader range for the shear-wave velocity uncertainty in the upper 180 ft. [55 m] of the profile compared to the licensee's profile.

Similar to the approach used by the licensee, the NRC staff used the SPID guidance to characterize the dynamic material behavior of the base case profiles. The NRC staff assumed that the material in the upper 500 ft. [152 m] could behave both linearly and non-linearly under a range of loading conditions. For soils, the EPRI soil curves were used to model the more non-linear response and the Peninsular curves were used to represent the alternative, more linear, case. For rock, the NRC staff used the EPRI rock curves to represent the non-linear response , and the alternative linear behavior was modeled using a constant shear modulus value and damping values equal to the small strain damping from the EPRI rock curves.

Using the guidance provided in the SPID for the determination of site kappa, the NRC staff used the small strain damping in the material curves for the upper 500 ft. of the profile along with constant 1.25 percent damping in the remaining profile to calculate site kappa values. The kappa values resulting from the staff's three base case profiles are 0.026, 0.04 and 0.016 sec for the base, lower and upper case velocity profiles respectively. These values include the 0.006 sec contribution from the base rock. To model the uncertainty in kappa, the NRC staff used a natural log standard deviation of 0.35 to calculate lower and upper values of kappa for each profile. This approach results in nine kappa values for the staff's site response analysis, which range from 0.01 to 0.063 sec.

The median site amplification and associated uncertainty for 2 of the 11 loading levels are shown in Figure 3.3-2 of this assessment. Both the staff's and licensee's site amplifications are similar in shape with minor differences at peak amplification that are due to the differences in the velocity profiles and treatment of uncertainty for kappa between the staff's and licensee's analyses.

As shown in Figure 3-3-3 of this assessment, these differences in site response have only a moderate impact on the control point seismic hazard curves and the resulting GMRS, as discussed below. 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 PINGP 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 and staff's GMRS shape are similar with minor differences for frequencies above 15 Hz. As described above in Section 3.3, the NRC staff concludes that these differences over this frequency range are primarily due to the differences in the site response analyses performed by the licensee and NRC staff. The NRC staff concludes that these differences are acceptable for this application because the licenseefollowed the guidance provided in the SPID with respect to both the PSHA and site response analysis for the PINGP site.

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 PINGP 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 PINGP 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) – (7), 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 PINGP 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 and has completed its response 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 PINGP Site

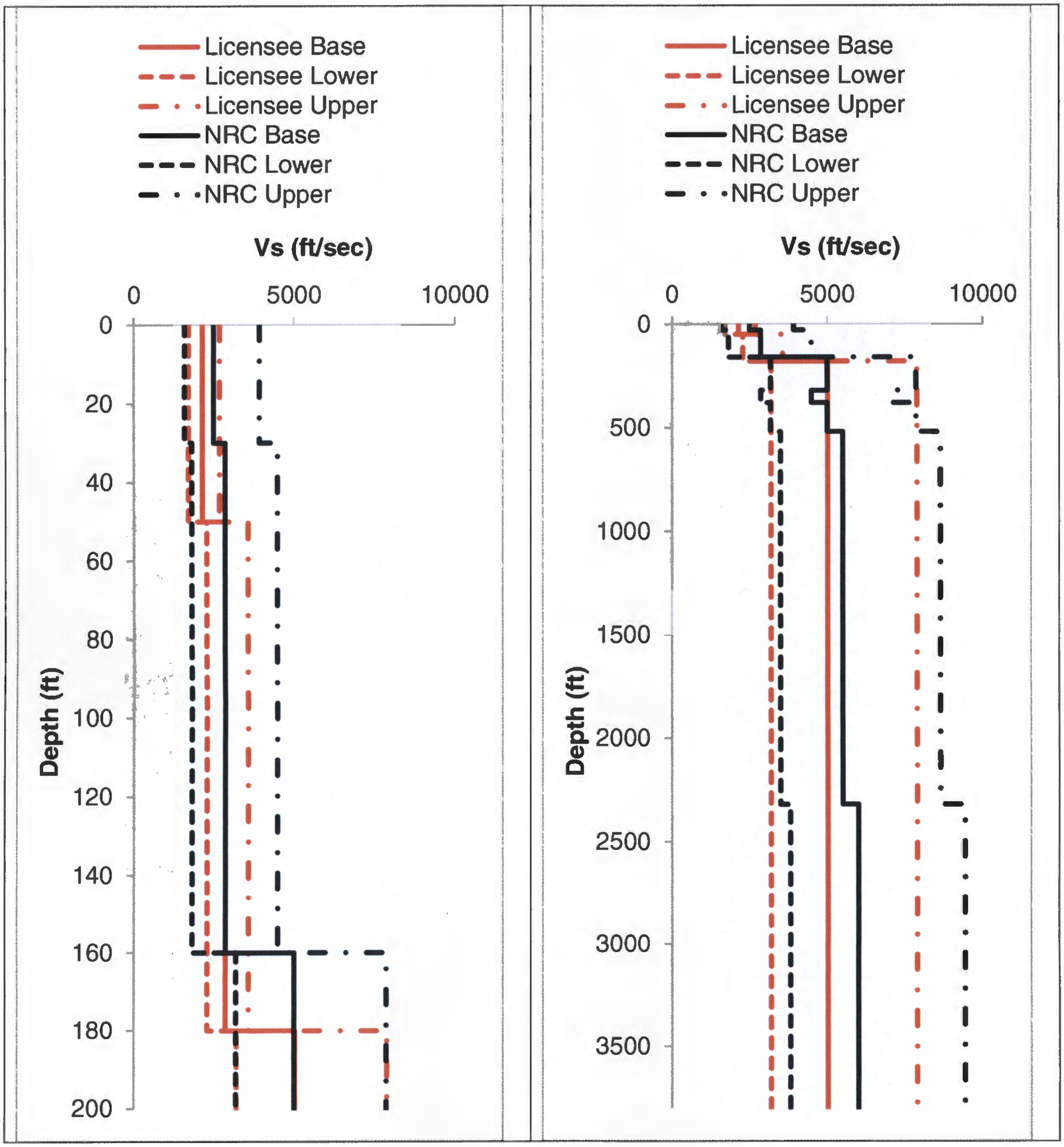


Figure 3.3- 2 Plot Comparing the Staff's and the License's Median Amplification Functions and Uncertainties for two input loading levels for the PINGP Site

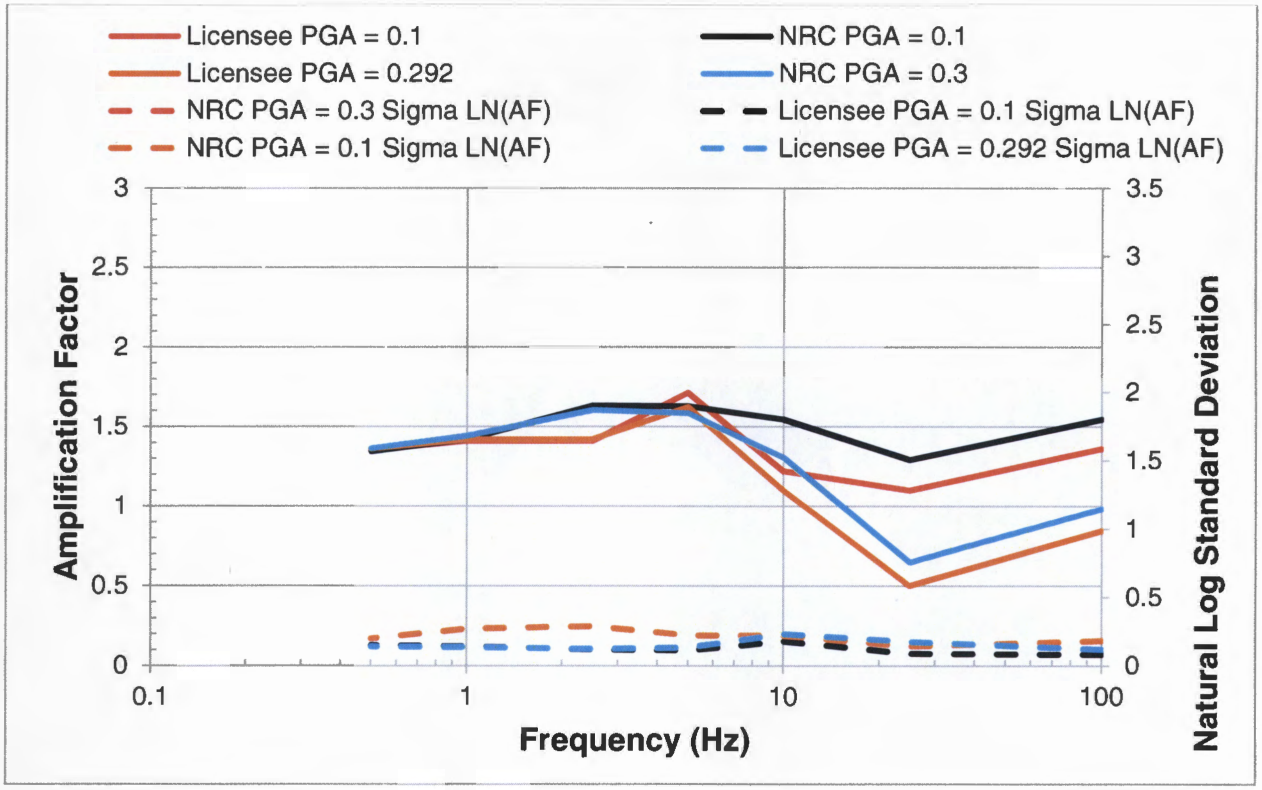


Figure 3.3-3 Plot Comparing the Staff's and the Licensee's Mean Control Point Hazard Curves at a Variety of Frequencies for the PINGP Site

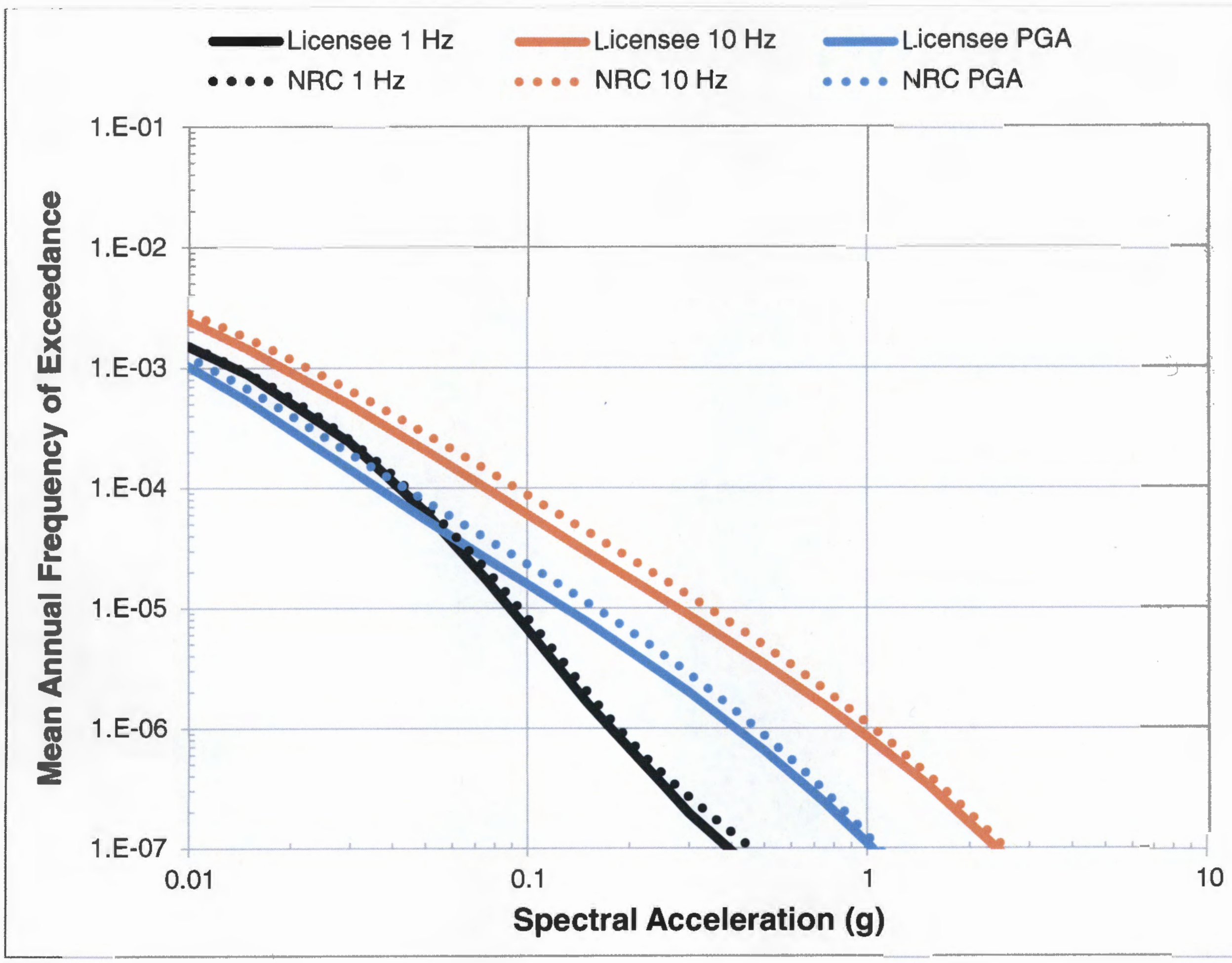
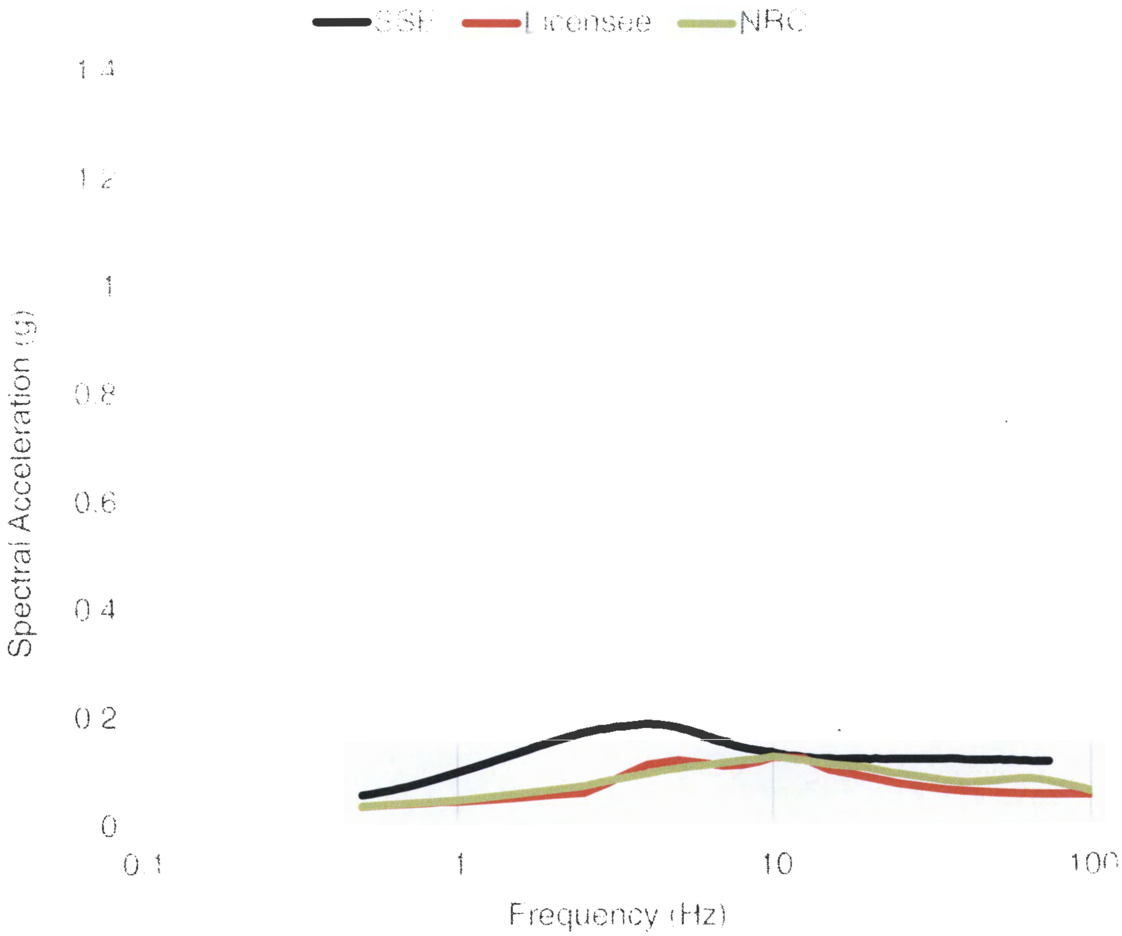


Figure 3.4-1 Comparison of the Staff's GMRS with Licensee's GMRS and the SSE for the PINGP site



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. 50-282 and 50-306

Enclosure:
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Hazard Evaluation and Screening Report

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