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

July 8, 2015

Mr. Peter A. Gardner
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SUBJECT: MONTICELLO NUCLEAR GENERATING PLANT - 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 (TAC NO. MF3958)

Dear Mr. Gardner:

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 May 14, 2014, Northern States Power Company, a Minnesota Corporation (NSPM, the licensee), doing business as Xcel Energy, responded to this request for Monticello Nuclear Generating Plant (Monticello).

The NRC staff has reviewed the information provided related to the reevaluated seismic hazard for Monticello and, as documented in the enclosed staff assessment, determined that you provided sufficient information in response to Enclosure 1, Items (1) – (3), (5), (7) and the comparison portion of Item (4) of the 50.54(f) letter. Further, the staff concludes that the licensee's reevaluated seismic hazard is suitable for other actions associated with Near-Term Task Force Recommendation 2.1, "Seismic".

Contingent upon the NRC staff's review and acceptance of the licensee's expedited seismic evaluation process and seismic risk evaluation including the high frequency confirmation and spent fuel pool evaluation (i.e., Items (4), (6), (8), and (9)) for Monticello, the Seismic Hazard Evaluation identified in Enclosure 1 of the 50.54(f) letter will be completed.

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

Sincerely,

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

Docket No. 50-263

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

MONTICELLO NUCLEAR GENERATING PLANT

DOCKET NO. 50-263

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. High-frequency 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) 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 the 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 (Pietrangelo, 2013) 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 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 12, 2013 (Fili, 2013a), Northern States Power Company, a Minnesota Corporation, doing business as Xcel Energy (the licensee, NSPM) requested an extension to submit partial site response information. By letter dated October 31, 2013 (Fili, 2013b), the licensee submitted at least partial site response information for Monticello Nuclear Generating Plant (Monticello). By letter dated March 31, 2014 (Fili, 2014a), the licensee requested an extension to complete the Seismic Hazard and Screening. By letter dated May 14, 2014 (Fili, 2014b), the licensee 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 described 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 provided further guidance regarding the appropriate use of GMMs for the CEUS. Specifically, Section 2.3 of the SPID recommended 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 May 14, 2014 (Fili, 2014b), the licensee provided the SHSR for Monticello. The licensee's SHSR indicated that the site GMRS exceeds the SSE. As such, the licensee stated that a seismic risk evaluation, as well as a SFP evaluation will be performed. Additionally, due to exceedances at frequencies above 10 Hertz (Hz), the licensee indicated that a high-frequency confirmation will be performed.

By letter dated May 9, 2014 (NRC, 2014), the staff issued a letter providing the outcome of its 30-day screening and prioritization evaluation. In the letter, the staff characterized Monticello as conditionally screened-in, because the licensee had requested an extension to submit its SHSR. On August 20, 2014 (NRC, 2014), the staff issued the outcome of its final seismic screening and prioritization based on the licensee's May 14, 2014, submittal. As indicated in the letter, the staff confirmed the licensee's screening results based on both the licensee's GMRS and staff's confirmatory GMRS exceeding the SSE in the frequency range of 1 to 10 Hz, and also in the frequency range above 10 Hz. Therefore, a plant seismic risk evaluation, SFP evaluation, and high-frequency confirmation for Monticello is merited.

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 ground motion 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-basis for Monticello. The licensee stated that all Class I structures and equipment were analyzed to ensure that a safe shutdown can be made during an earthquake with ground accelerations of 0.06 g (operating basis earthquake) and 0.12 g (design-basis or maximum earthquake). The shape of the SSE is based on a smoothed interpolation of the response spectrum from one of the horizontal components of 1952 Taft earthquake. For the emergency filtration train building, the licensee stated that it used a RG 1.60 (NRC, 1973) design response spectrum as the spectral shape for the SSE. Because the SSE based on the Taft earthquake response spectrum is used for the majority of the Class I structures and because it is enveloped by the RG 1.60 spectrum, the licensee used this SSE for comparison with the GMRS. The licensee specified that because the updated safety analysis report (USAR) does not explicitly define the SSE control point, it followed the guidance in Section 2.4.2 of the SPID to define the control point at the highest soil elevation where a safety-related structure is founded. The licensee stated that the control point is located at the surface, elevation 930 ft (283 m).

Based on the review of the licensee's submittal and the USAR, the staff confirms that the licensee's SSE control point elevation determination is consistent with information provided in the Monticello USAR as well as guidance 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 cutoff 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 mi (640 km) around the site and included the Commerce, New Madrid Fault System, and Wabash Valley Repeated Large Magnitude Earthquake (RLME) sources, which lie within 620 mi (1,000 km) of Monticello. 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 for each of the CEUS-SSC sources. Consistent with the SPID, the licensee did not provide its base rock seismic hazard curves 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 the SHSR. The NRC 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 condtions at the Monticello site. As input, the 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 staff included all CEUS-SSC background seismic sources within a 310 mi (500 km) radius of the Monticello site. In addition, the staff included the Commerce, New Madrid Fault System, and Wabash Valley RLME sources, which lie within 620 km (1,000 mi) of the Monticello site. For each of the CEUS-SSC sources used in the PSHA, the staff used the mid-continent version of the updated EPRI GMM.

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 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 base rock conditions as defined in the GMM used in the PSHA. To develop site-specific hazard curves at the control point elevation, Attachment 1 requests that licensees 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 would 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 these layers, and the degree to which the shear modulus and damping change with increasing input bedrock amplitude. To develop site-specific hazard curves at the control point, the licensee performed a site response analysis.

3.3.1 Site Base Case Profiles

In its SHSR, the licensee indicated that it performed a site response analysis for Monticello. According to the licensee, the site rests on 60 ft (18 m) of sands with gravel and a few layers of clay and silt. Below this is about 15 ft (4.6 m) of firm sedimentary rock atop weathered granite and diabase with a thickness of 35 ft (10.7 m). According to the licensee, bedrock is encountered at a depth of about 110 ft (33.5 m).

The licensee provided site profile descriptions in Sections 2.3.1 and 2.3.2 of its SHSR based on information in the Monticello USAR (NSPM, 2005), including boring logs. Because limited detailed geophysical data that was collected at the site during initial construction, the licensee used a set of downhole and crosshole shear-wave velocity measurements from the nearby Independent Spent Fuel Storage Installation, but averaged the two measurements due to differences in velocities at comparable depths.

Using the average of the measured shear wave velocities, along with the guidance provided in the SPID, the licensee developed its best-estimate profile. The licensee assumed that reference rock, defined by a shear-wave velocity of 9,285 ft/s (2,830 m/s), occurs at a depth of 110 ft (33.5 m) below the control point. Following the guidance in the SPID, from the best-estimate profile, the licensee developed upper and lower base case profiles using a scale factor of 1.25 for the upper 10 ft (3 m) and 1.57 below that depth, which reflects a natural log standard deviation of 0.2 and 0.35.

Because the seismic velocities of the site are different from the generic reference rock velocity used in the PSHA, a site-specific model of shear modulus degradation and damping is required. For the upper 60 ft (18.3 m) of firm soil material at the site, the licensee assumed the behavior could be modeled with either EPRI cohesionless soil or Peninsular Range (PR) G/Gmax and hysteretic damping curves. The licensee determined that the material behavior of the deeper firm rock at the site could be modeled as either linear or nonlinear. The licensee used the EPRI soil and rock curves (model M1) to represent nonlinearity at the site and the PR curves for soils combined with linear analyses (model M2) for an equally plausible less nonlinear response across loading level. For the linear analyses, the licensee used low strain damping from the EPRI rock curves as the constant damping in the upper 50 ft (15 m) in the profile.

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. For the Monticello site, the 110 ft (33.5 m) of soils and firm rock contribute about 0.003s in addition to the basement rock value of 0.006s for a total kappa for the best-case profile of 0.009s. Total kappa values determined by the licensee for the upper and lower estimates are 0.010s and 0.008s, respectively.

To account for aleatory variability in material properties across the plant site in its site response calculations, the licensee stated that it randomized its base case profiles in accordance with Appendix B of the SPID. For the profiles with reference rock at a depth of 110 ft (33.5 m), the licensee stated that it also randomized the depth to reference rock ±22 ft (6.7 m), which corresponds to 20 percent of the shallow depth to bedrock. The licensee stated that this randomization did not represent actual uncertainty in the depth to reference rock, but was used to broaden the spectral peak.

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 eleven input loading levels for the each base case profile. Consistent with the SPID, the licensee used a minimum median amplification value of 0.5 in the analysis.

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 reference rock hazard curves, determined from the initial PSHA (Section 3.2 of this assessment), and the amplification function and their associated uncertainties, determined from the site response analysis.

3.3.3 Staff Confirmatory Analysis

The staff performed independent calculations to confirm 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 Monticello site. The staff independently developed three base case shear-wave velocity profiles from information provided in the USAR. 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 with those submitted by the licensee with only a minor difference in the estimated depth to bedrock.

Similar to the approach used by the licensee, the staff used the SPID guidance to characterize the dynamic material behavior of the base case profiles. The staff assumed that the material in the soils could behave both linearly and non-linearly under alternate loading conditions. For soil type material the EPRI soil curves were used to model the non-linear response and the Peninsular curves were used to represent linear behavior. For materials considered to be rock, the staff used EPRI rock curves to represent non-linear response and linear behavior was modeled by a constant shear modulus value and damping set 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 staff used the small strain damping in the material curves for the all material above the basement rock. The kappa values resulting for the staff's three base case profiles are 0.007, 0.008 and 0.006, which are similar to the values estimated by the licensee. The staff also considered uncertainty in kappa by applying an upper and lower bound based on a three point distribution with a sigma(ln) of 0.35. In addition, to account for aleatory variability in material properties across the plant site in site response calculations, the staff randomized its base case shear-wave velocity profiles following the SPID guidance provided in Appendix B of the SPID.

In order to calculate control point hazard curves for the Monticello site, the licensee and staff developed median amplification functions for the site for several different loading levels, representing the possible hazard at the Monticello site. The licensee's and staff's median site amplification functions and associated uncertainty for two separate loading levels are shown in Figure 3.3-2 of this assessment. It can be seen that both the staff's and licensee's site amplifications are similar in shape with only a slight differences for the higher frequencies. Figure 3.3-3 of this assessment shows the licensee's and staff's control point hazard curves resulting from the convolution of the site amplification with the PSHA rock hazard curves. As shown in Figure 3.3-3, the licensee's and staff's results are very similar.

In summary, the staff concludes that the licensee's site response was conducted using present-day guidance and methodology, including the NRC-endorsed SPID. The staff performed independent calculations which confirm 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 Monticello site.

3.4 Ground Motion Response Sprectra

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) an 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 analysis, 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 staff. As shown in Figure 3.4-1 below, the licensee's GMRS shape is generally similar to that calculated by the staff. At frequencies where the amplitude of the GMRS determined by the licensee is different from that determined by the staff, the licensee's generally exceeds that of the staff. These differences in GMRS are the result of differences in the site response analyses performed by the licensee and staff as discussed in Section 3.3 above. The NRC staff concludes that these differences are acceptable for this application because the licensee followed the guidance provided in the SPID with respect to both the PSHA and site response analysis for the Monticello 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 Monticello site. Therefore, this GMRS is suitable for use in subsequent evaluations and confirmations, as needed, for the licensee's 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 Monticello site. Based on its review, the NRC staff concludes that the licensee conducted the seismic hazard reevaluation using present-day methodologies and regulatory guidance, appropriately characterized the site given the information available, and met the intent of the guidance for determining the reevaluated seismic hazard. Based on the preceding analysis, the NRC staff concludes that the licensee provided an acceptable response to Requested Information Items (1) – (3), (5), and (7) and the comparison portion of Item (4), identified in Enclosure 1 of the 50.54(f) letter. Further, the licensee's reevaluated seismic hazard is acceptable to address other actions associated with NTTF R2.1 Recommendation: "Seismic".

In reaching this determination, the NRC staff confirmed the licensee's conclusion that the licensee's GMRS exceeds the SSE for the Monticello site in the frequency range of 1 to 10 Hz, and also in the frequency range above 10 Hz. As such, a seismic risk evaluation, SFP evaluation and high-frequency confirmation are merited. The licensee indicated that the high frequency confirmation would be performed as part of its seismic risk evaluation. The NRC review and acceptance of the NSPM plant seismic risk evaluation with the high frequency confirmation, and also an interim ESEP evaluation and SFP evaluation (i.e., Items (4), (6), (8), and (9)) for Monticello will complete Seismic Hazard Evaluation identified in Enclosure 1 of the 50.54(f).

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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 Monticello Site

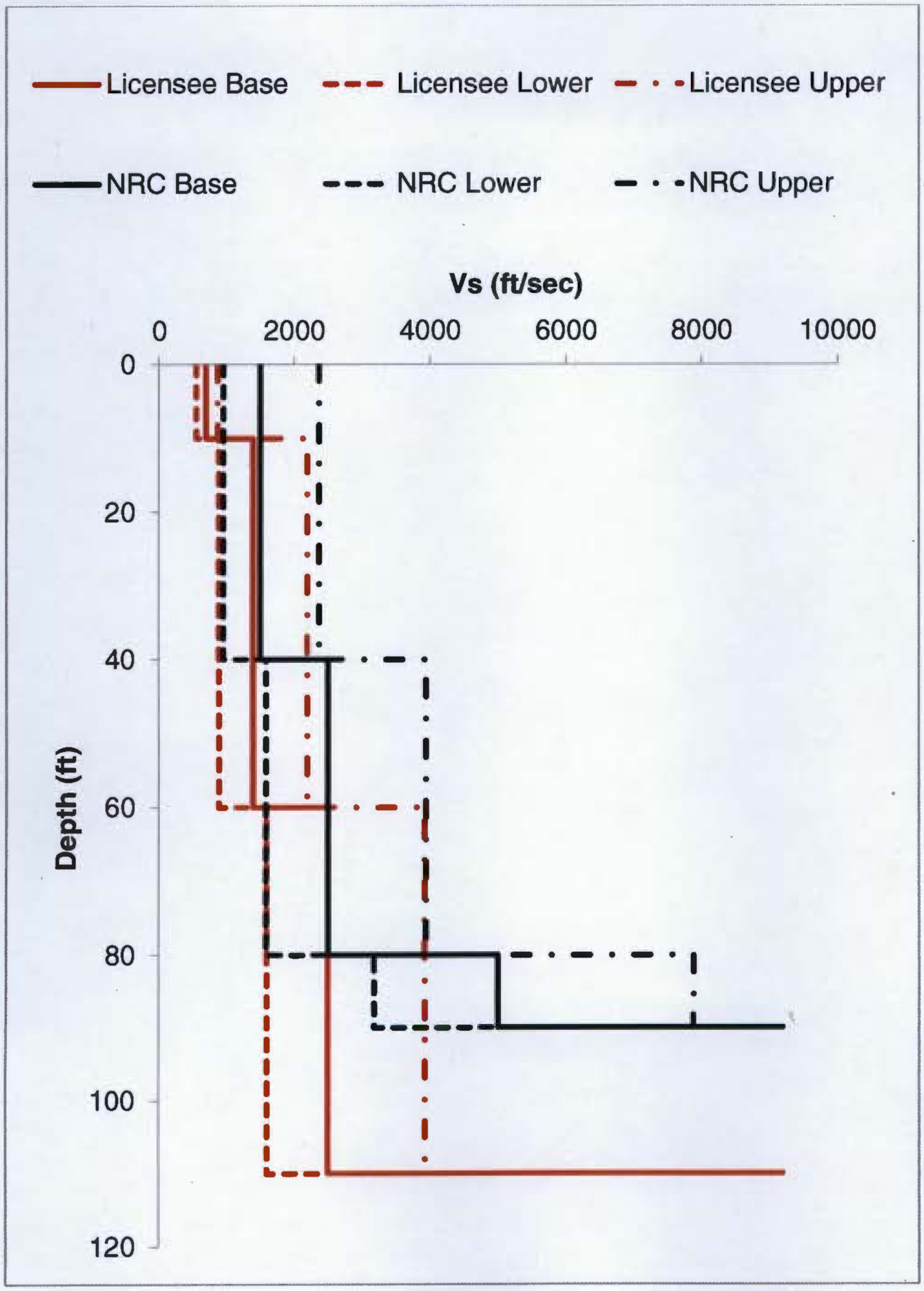


Figure 3.3- 1 Plot Comparing the Staff's and the Licensee's Median Amplification Functions and Uncertainties for the Monticello site.

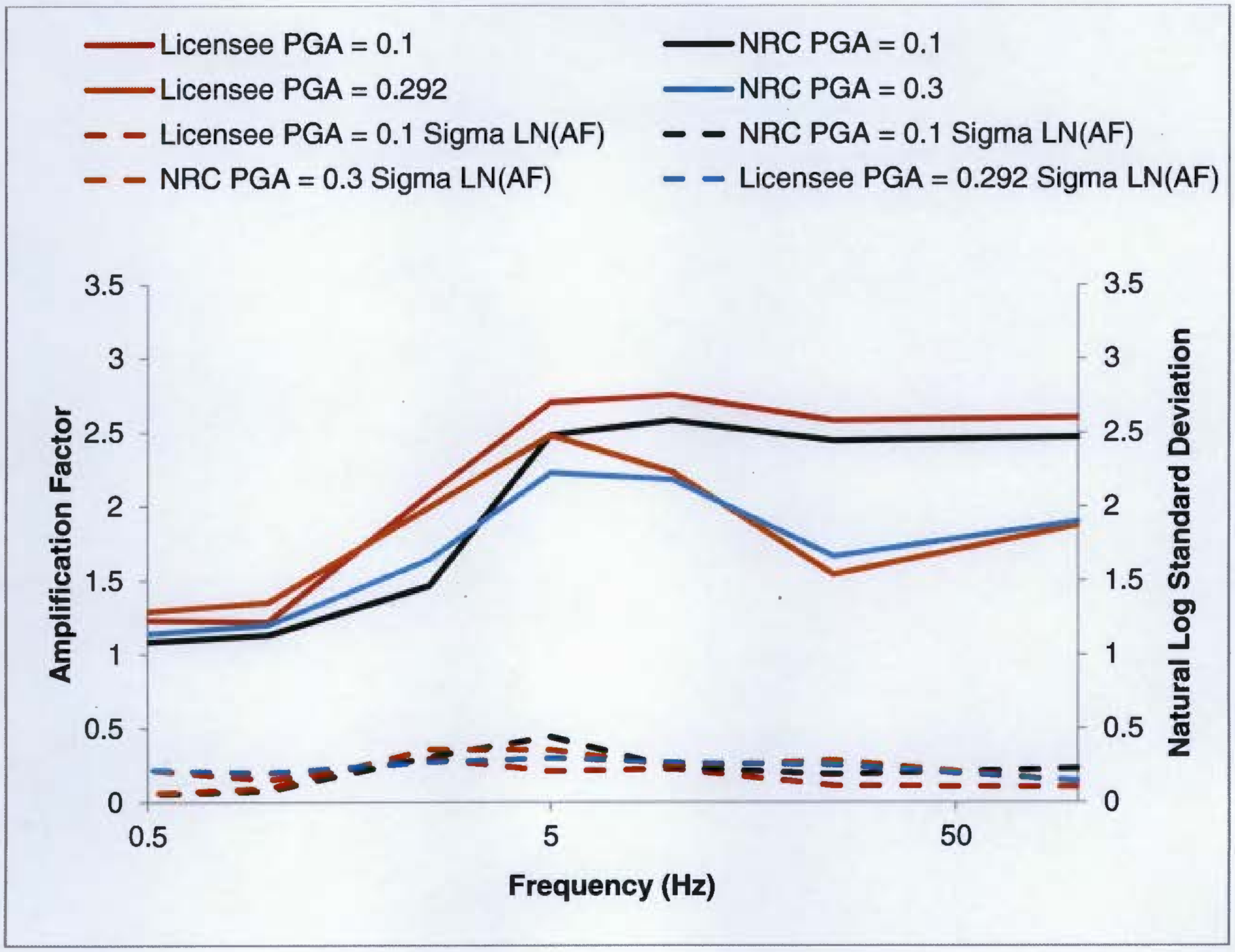


Figure 3.3-2 Plot Comparing the Staff's and the Licensee's Mean Control Point Hazard Curves at a Variety of Frequencies for the Monticello site

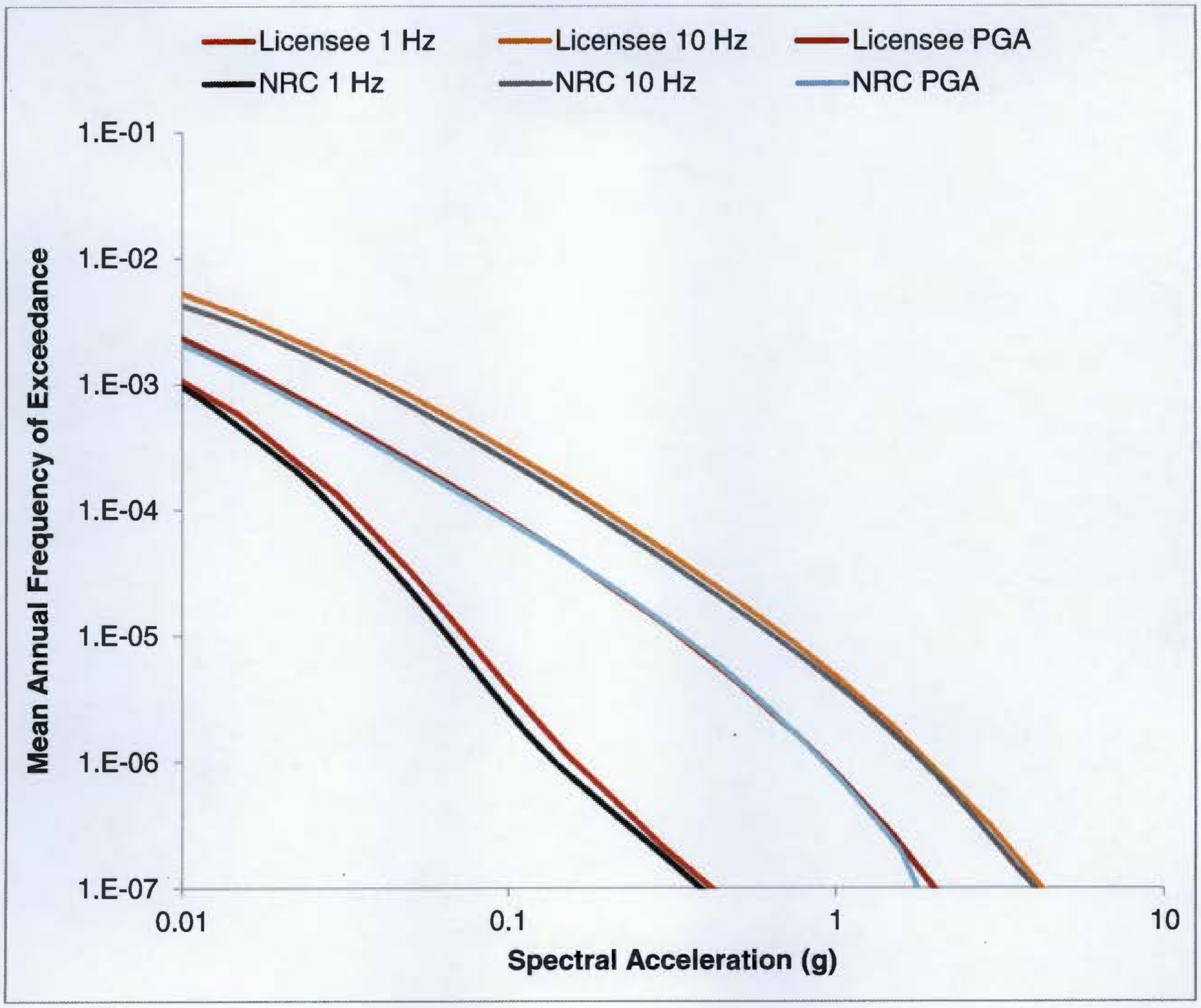
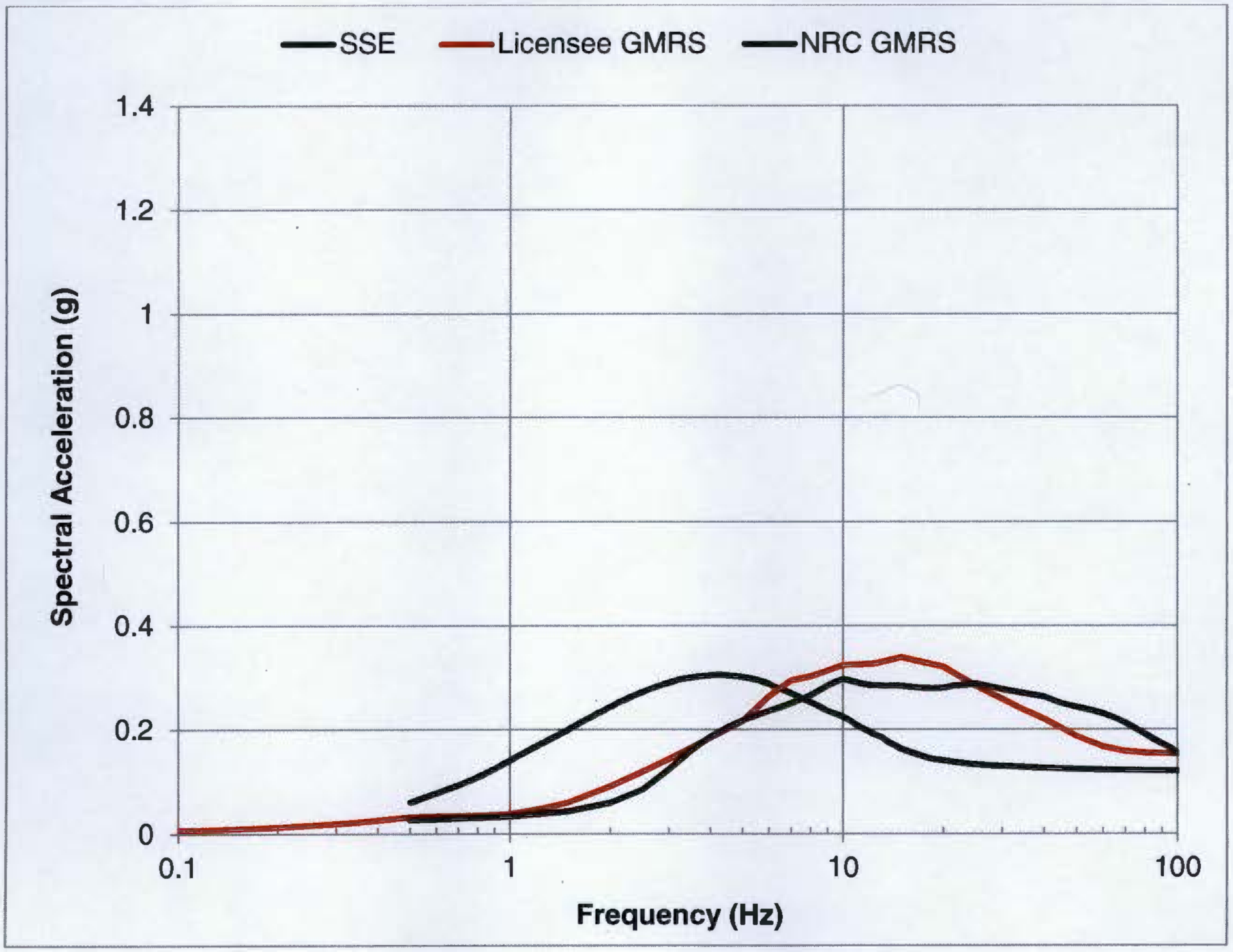


Figure 3.4-1 Comparison of the Staff's GMRS with Licensee's GMRS and the SSE for the Monticello site



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

Sincerely,

/RA/

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

Docket No. 50-263

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