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

May 7, 2015

Vice President, Operations
Entergy Nuclear Operations, Inc.
Indian Point Energy Center
450 Broadway, GSB
P.O. Box 249
Buchanan, NY 10511-0249

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 - 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 NOS. MF3717 AND MF3718)

Dear Mr. Sir or Madam:

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 31, 2014, Entergy Nuclear Operations, Inc. (Entergy), responded to this request for Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point).

The NRC staff has reviewed the information provided related to the reevaluated seismic hazard for Indian Point 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 screening review 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".

Contigent upon NRC's review and acceptance of Entergy's expedited seismic evaluation process and seismic risk evaluation including the high frequency and spent fuel pool evaluations (i.e., Items (4), (6), (8), and (9)) for Indian Point, 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,

Nicholas DiFrancesco for

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

Docket Nos. 50-247 and 50-286

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

INDIAN POINT ENERGY CENTER, UNIT NOS. 2 AND 3

DOCKET NOS. 50-247 AND 50-286

1.0 INTRODUCTION

By letter dated March 12, 2012 (NRC, 2012a), the U.S. Nuclear Regulatory Commission (NRC or the 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 for screening purposes. High-frequency 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,

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

(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, 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 referred to as 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 (ac) 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 committed to follow the SPID to develop the SHSR for existing nuclear power plants. By letter dated September 12, 2013 (Ventosa, 2013), Entergy Nuclear Operations, Inc. (Entergy, the licensee) submitted at least partial site response information for Indian Point Nuclear Generating, Unit Nos. 2 and 3 (Indian Point,). By letters

dated March 31, 2014 (Ventosa, 2014a and 2014b), Entergy submitted its Seismic Hazard and Screening Report (SHSR) for Indian Point.

2.0 REGULATORY EVALUATION

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." 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. Generally plants with construction permits issued prior to May 21, 1971, were approved for construction based on draft GDC published by the Atomic Energy Commission (AEC). The construction permits for IP2 and IP3 were issued by the AEC on October 14, 1966, and August 13, 1969, and the operating licenses were issued on September 28, 1973, and December 12, 1975. The plant GDC are discussed in the Updated Final Safety Analysis Report (UFSAR) Chapter 1.3, "General Design Criteria," with more details given in the applicable UFSAR sections

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. Regarding the seismic design basis for Indian Point 1 and 2, the SHSR states:

> The original geologic and seismic siting investigations for Indian Point Unit 2 and 3 were performed in accordance with Appendix A to 10 CFR Part 100 as it existed prior to the original site construction permits used in November 1966. To the extent discussed in the Final Safety Analysis Report (FSAR) (Entergy, 2010 and Entergy 2011a), Indian Point Unit 2 and 3 meets General Design Criterion 2 in Appendix A to 10 CFR Part 50 which was not part of the original licensing basis. The Safe Shutdown Earthquake (SSE) ground motion was subsequently evaluated against criteria in Appendix A to 10 CFR Part 100 and found to be acceptable.

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) ground motion models. 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 31, 2014 (Ventosa, 2014), Entergy provided the SHSR for Indian Point. The licensee's SHSR indicated that the site GMRS exceeds the SSE for Indian Point over the frequency range of 1 to 10 Hertz (Hz). Therefore, the licensee will perform a seismic risk evaluation, high-frequency confirmation and SFP evaluation for Indian Point, Unit No. 2. For Unit No. 3, the licensee indicated that it had updated the Individual Plant Examination for External Events (IPEEE) plant-level high confidence of low probability of failure spectrum (IHS) for the plant and that this updated IHS exceeds the GMRS. However, the licensee acknowledged that since the NRC has not formally reviewed the updated IHS, Indian Point Unit No. 3 currently screens in for a risk evaluation. Further, the licensee indicated that since the GMRS exceeds the SSE above 10 Hz, that a high frequency confirmation and a SFP evaluation will be performed for Indian Point Unit No. 3.

On May 9, 2014 (NRC, 2014), the staff issued a letter providing the outcome of its 30-day screening and prioritization evaluation. As indicated in the letter, the staff concluded that Indian Point Unit No. 2 screens in for performing a seismic risk evaluation. Regarding the screening assessment for Indian Point Unit No. 3, the licensee referred to plant capacity updates that were originally transmitted for information to the NRC by letter dated June 26, 2013 (Entergy, 2013). The licensee referred to this information along with a comparison of the GMRS with the updated plant capacity to conclude Indian Point Unit No. 3 screens out to perform further risk evaluations. This information was provide as part of the licensee's IPEEE adequacy review documented in the SHSR. The updated plant capacity reassessment evaluated a number of high seismic risk contributors however, this information was not reflected in the seismic probabilistic risk assessment that was developed for the IPEEE evaluation. This was determined by the staff not to meet the IPEEE adequacy criteria in the SPID guidance. Therefore, Indian Point Unit No. 3 screens in for performing a seismic risk evaluation. The licensee was informed of this final screening decision by letter dated November 21, 2014 (NRC, 2014). In addition, since the licensee's GMRS, as well as the confirmatory GMRS, developed by the staff, exceeds the SSE for Indian Point Unit Nos. 2 and 3 for all frequencies greater than 3 Hz, a high-frequency confirmation and SFP evaluation are 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 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 licensees 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 GMMs 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.

The licensee stated that the rocks underlying the Indian Point site are composed primarily of crystalline metamorphic rock with a shear wave velocity greater than 9,280 ft/sec (2,828 m/sec), which is considered hard rock according to guidance in the SPID. Therefore, the licensee did not perform a site response analysis for the Indian Point site. As such, the licensee used the hard rock hazard curves from the PSHA as its control point hazard curves for determining the GMRS for the Indian Point site. To evaluate the licensee's conclusion that Indian Point is a hard rock site and, as such, does not need a site response evaluation, the staff performed the following confirmatory analysis.

3.1.1 Staff Confirmatory Analysis

The Indian Point site is underlain by a complexly deformed sequence of metamorphosed sedimentary or igneous rocks of early Paleozoic to Precambrian age. The uppermost (youngest) of these units is the Manhattan Schist. This unit is underlain by the Inwood marble, the Lowerre quartzite, the Yonkers-Pound Ridge granite and the Fordham gniess (UFSAR and Entergy, 2010a and Entergy (2011a)). Indian Point Unit Nos. 2 and 3 are founded in the Inwood marble unit. The Inwood marble consists of a layered sequence of dolomitic and calcitic marbles with occasional lenses of schist. In the UFSAR, the Inwood is described as exhibiting a distinct layered structure, striking north-south to northeast-southwest, dipping to the east and exhibiting a jointed character. All descriptions of the Inwood marble describe it as being a "firm rock". As noted above, the licensee concluded that the shear-wave velocity in the foundation Inwood marble unit is equal to, or exceeds, the reference rock velocity of 9,280 ft/sec (2,828 m/sec). No direct shear-wave velocity measurements exist within the Inwood marble near the Unit 2 or 3 reactors (Entergy (2010, 2011)) as such, the staff examined other nearby geophysical investigations.

Between 2005 and 2007 comprehensive hydrogeologic investigations were performed at the Indian Point site (GZA-GeoEnvironmental Consultants Report to Entergy, 2008). These investigations were initiated to understand groundwater flow and contaminant transport at the site. Numerous borings were advanced to study the site geology, hydrology and aquifer

properties. Some of the test borings provided estimates of rock quality designation (RQD) index for the bedrock (inferred to be Inwood marble) in the vicinity of Units 2 and 3 that, consistent with the description of the Inwood marble as firm or hard rock, range from RQD values of 60 to 100 for the bedrock. In addition, as part of the hydrogeologic investigation, direct shear-wave measurements were obtained in the Inwood marble at a location about 700 ft (213 m) to the east-south-east of Unit No. 3 (near the site warehouse). These data consist of 13 profiles that sampled the uppermost portion of the bedrock (inferred to be the Inwood marble). The average bedrock shear-wave velocity of the profiles was approximately 4,900 ft/sec (1,494 m/sec), which is considerably less than the reference rock velocity of 9,280 ft/sec (2,828 m/sec).

Prior to the on-site hydrogeologic investigations, geotechnical investigations were conducted by the licensee in 2003 and 2004 to support modifications to the Unit 2 Spent Fuel Building (SFB) (Tectonic Engineering, 2004). A shallow P-wave refraction profile was acquired near the Unit 2 SFB as part of those studies, which show shallow P-wave velocities of 12,500 to 13,900 ft/sec (3,810 to 4,236 m/sec). The staff used Poisson's ratio values (0.28 to 0.34) appropriate for this type of material and near-surface conditions in order to develop shear-wave velocities for these shallower depths of the Inwood, which range from 6,150 to 7,680 ft/sec (1,874 to 2,340 m/sec). As part of these geotechnical investigations, two unconfined compressive strength tests were also conducted by the licensee on bedrock material recovered from rock coring. The staff used these unconfined compressive strengths of 10,000 to 20,000 psi to estimate shear-wave velocities of 7,900 to 9,600 ft/sec (2,408 to 2,926 m/sec). In addition, as part of the geotechnical investigations, shallow P-wave velocity measurements were obtained by the licensee near the Independent Fuel Storage Installation, which is also located some distance away to the north from the Units 2 and 3 reactor facilities. These measurements show P-wave velocities ranging from 14,000 to 17,000 ft/sec (4,260 to 5,180 m/sec), which corresponds to shear-wave velocities of 6,900 to 9,400 ft/sec (2,103 to 2,865 m/sec).

The staff used the information summarized above to develop a range of near-surface firm rock shear velocity estimates for the Indian Point site. As these velocities range from 4,900 to 9,600 ft/sec (1,493 to 2,926 m/sec), the staff developed three base cases with velocity values at the control point of 4,900, 6,800 and 8,400 ft/sec (1494, 2073, and 2561 m/sec) for the lower, best estimate and upper base cases, respectively. The staff then used the SPID template velocity profiles for firm rock site conditions to extrapolate the near surface velocities to depth. Figure 3.3.1 of this assessment shows the three base case velocity profiles developed by the staff.

Consistent with the guidance in the SPID, the staff assumed two alternative characterizations to represent the range in dynamic material behavior for the rock material covered by the three base case profiles. The first model used by the staff applies the modulus degradation and damping characteristics of the EPRI (1993) rock curves while the second model assumes that the rock behaves linearly with a constant low strain damping value of one percent.

To account for the damping (kappa) contributed by both intrinsic hysteretic damping, as well as scattering, due to wave propagation in heterogeneous material, the staff assumed only the contribution from the reference rock of 0.006 sec. This assumption is consistent with the very stiff and relative shallow (less than 120 ft (37 m)) base case profiles developed by the staff for the Indian Point site. Under this approach, the variability in low-strain damping is captured by the two different dynamic material property models described in the preceding paragraph.

After randomizing each of the three base case profiles and implementing the random vibration theory (RVT) approach to perform the site response calculations, the staff developed site amplification functions. These amplification functions and associated uncertainties for two input loading levels are shown in Figure 3-3.2 of this assessment. The amplification functions produced using the staff's three base case models are very close to unity and the uncertainty is also relatively low, which is consistent with the licensee's determination that a site response analysis for this site is not warranted. Because the licensee did not perform a site response analysis, its amplification function is one and the uncertainty in the amplification function is zero.

The NRC staff applied Approach 3, as described in Appendix B of the SPID, to compute the probabilistic site-specific control point hazard curves. Figure 3.3-3 of this assessment compares the NRC staff control point hazard curves in comparison to the licensee's hard rock hazard curves, presented in Section 2.3.7 of the SHSR submittal. As shown in Figure 3.3-3, the impact of the staff including the stiff near-surface materials in its site response analyses is generally minimal on the control point seismic hazard curves for mean annual exceedance frequencies greater than $1x10^{-6}$ per year.

In conclusion, as shown in Figure 3.3-3 of this assessment and discussed below, the staff's site response analysis does not produce significantly different control point seismic hazard curves or the resulting GMRS. 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 this application.

In summary, the staff concludes that the licensee's evaluation was conducted using present-day guidance and methodology, including the SPID. The staff performed independent calculations which confirmed that the licensee's control point hazard curves adequately characterize the hazard for Indian Point.

3.2 Ground Motion Response Spectra

In Section 2.4 of the SHSRs, the licensee stated that it used the control point hazard curves, described in SHSR Section 2.3.7 for both Units 2 and 3, 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 staff independently calculated the 10^{-4} and 10^{-5} UHRS using the results of its confirmatory PSHA, 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 of this assessment, the staff's GMRS is very similar to the licensee's in both amplitude and shape. Both the licensee's and staff's GMRS exceed the SSE for both Indian Point Units 2 and 3 for all frequencies above 3 Hz. The 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 staff performed a PSHA confirmatory

analysis and achieved results consistent with the licensee's results. As such, the staff concludes that the control point hazard curves (and GMRS) determined by the licensee adequately characterize the seismic hazard for the Indian Point, Units 2 and 3 site. Therefore, the licensee's hazard results are 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 Indian Point. Based on its review, the 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), (5), (7), and the screening review 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 Recommendation 2.1, "Seismic".

In reaching this determination, staff concludes that the GMRS exceeds the SSE for Indian Point Unit Nos. 2 and 3 over the frequency range of 3 to 100 Hz. As such, the licensee will perform a plant seismic risk evaluation, which will include a high-frequency confirmation, and a SFP evaluation. NRC review and acceptance of Entergy's ESEP interim evaluation and the seismic risk evaluation with the high frequency and SFP evaluations (i.e., Items (4), (6), (8), and (9)) for Indian Point, Units 2 and 3 will complete the Seismic Hazard Evaluation identified in Enclosure 1 of the 50.54(f) letter.

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Note: ADAMS Accession Nos. refer 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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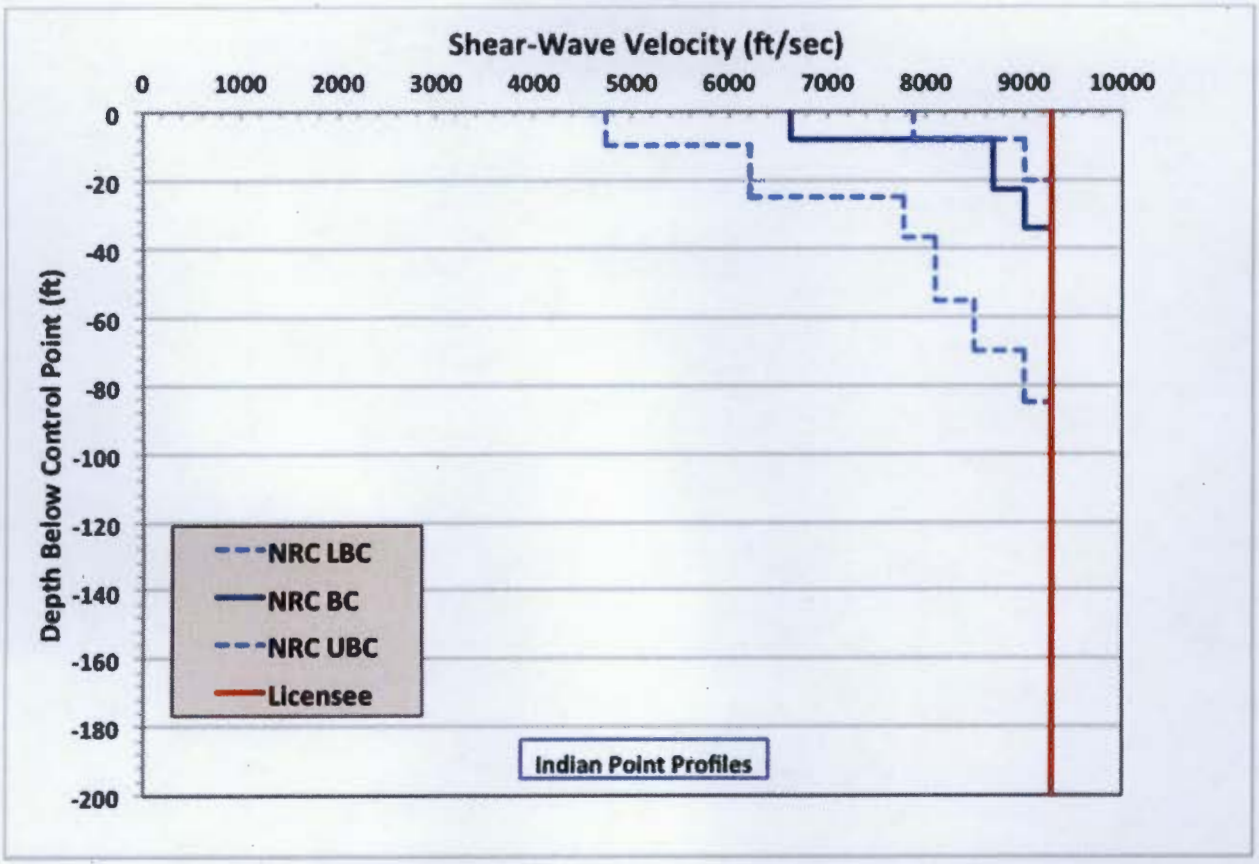

Figure 3.3-1 Plot of Staff's and Licensee's Base Case Shear-Wave Velocity Profiles

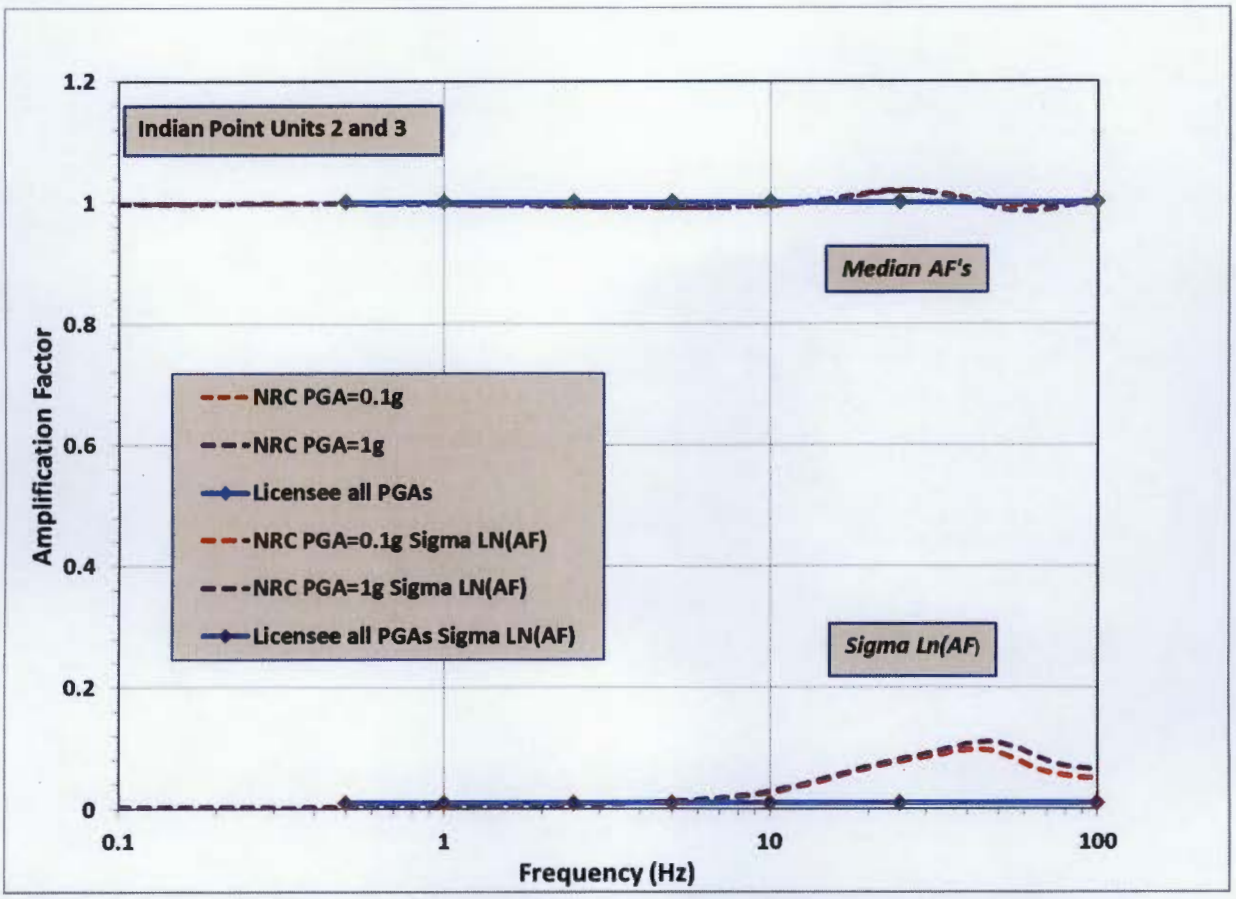

Figure 3.3-2 Comparison of the Licensee's and NRC Staff's Median Amplification Functions and Uncertainties (Sigma Ln(AF)).

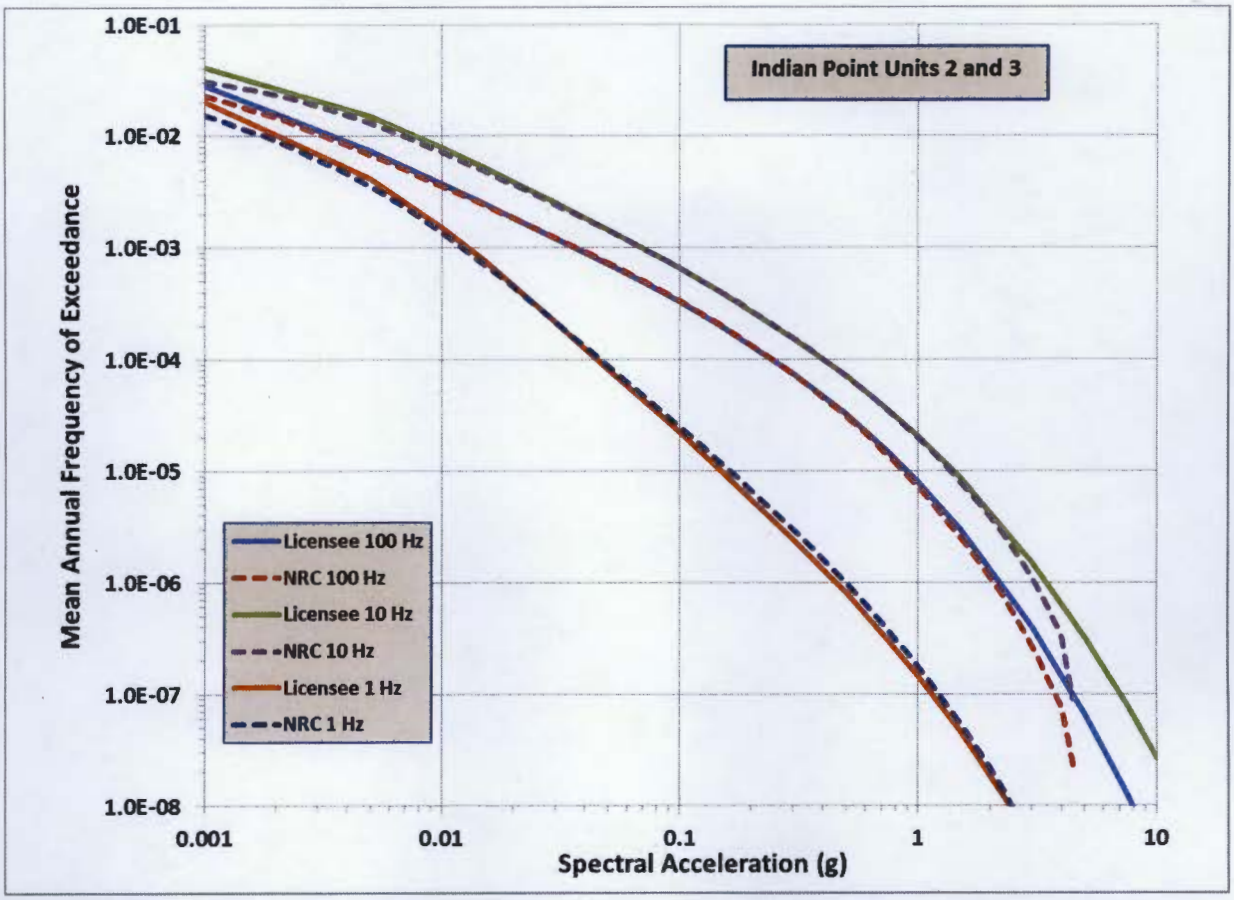

Figure 3.3-3 Comparison of NRC Staff's and the Licensee's Mean Control Point Hazard Curves at Selected Frequencies

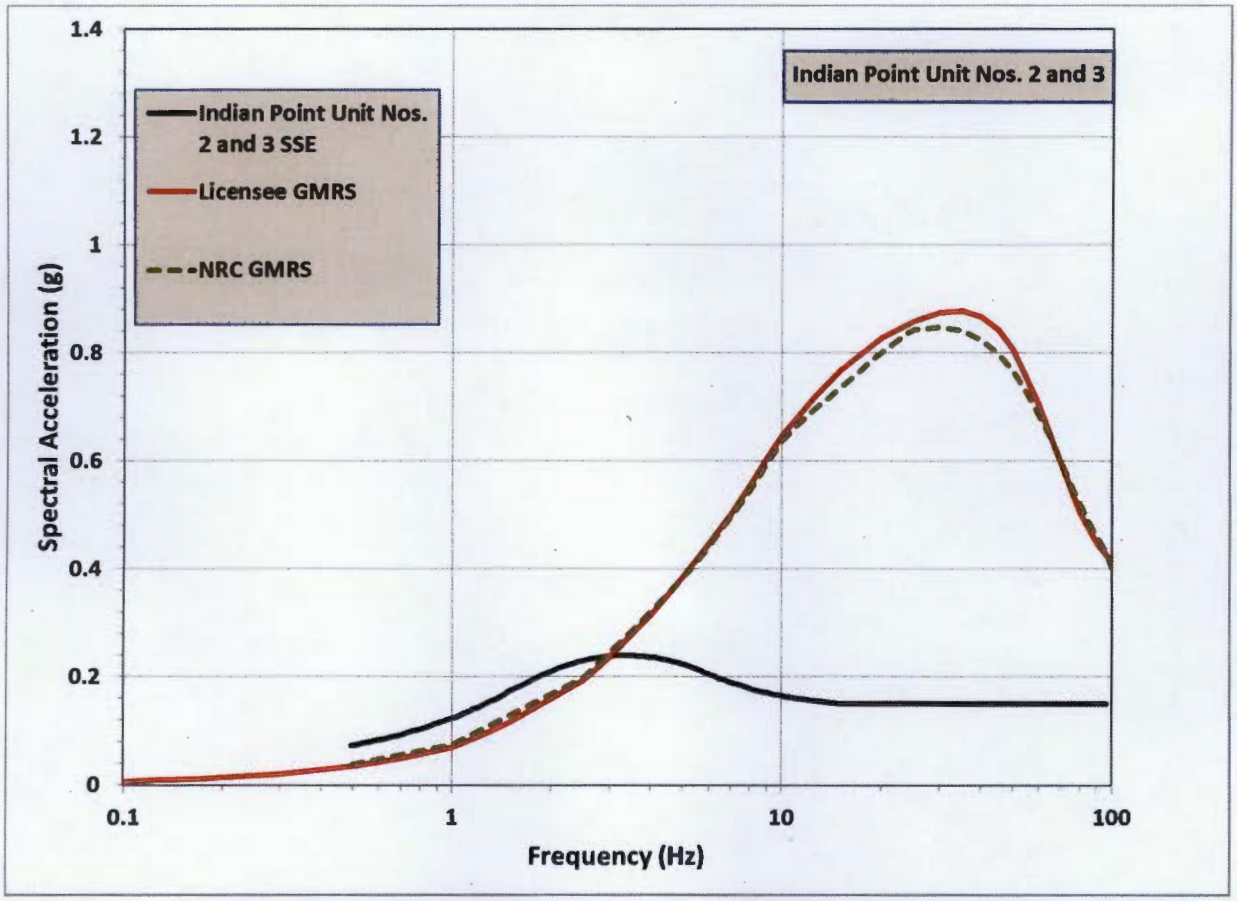

Figure 3.4-1 Comparison of the Staff's GMRS with Licensee's GMRS and the Indian Point Unit No. 2 SSE

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

Sincerely,

/RA by Nicholas DiFrancesco for/

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

Docket Nos. 50-247 and 50-286

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