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

November 3, 2015

Vice President, Operations
Entergy Operations, Inc.
River Bend Station
5485 U.S. Highway 61N
St. Francisville, LA 70775

SUBJECT: RIVER BEND STATION, UNIT 1 - 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. MF3706)

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.

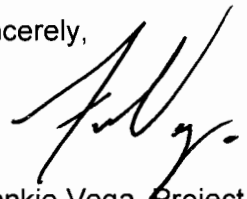
By letter dated March 26, 2014, Entergy Operations, Inc. (the licensee), responded to this request for River Bend Station, Unit 1 (River Bend).

The NRC staff has reviewed the information provided related to the reevaluated seismic hazard for River Bend and, as documented in the enclosed staff assessment, determined that you provided sufficient information in response to Requested Information Items (1) – (3), (5) - (9) and the comparison portion to Item (4), identified in Enclosure 1 of the 50.54(f) letter. Further, the NRC 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 the NRC's review and acceptance of the Entergy's high frequency confirmation (Item 4) for River Bend, 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 Vega, Project Manager
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Office of Nuclear Reactor Regulation

Docket No. 50-458

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

RIVER BEND STATION, UNIT 1

DOCKET NO. 50-458

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 was 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] The NRC Near-Term Task Force (NTTF) Recommendation 2.1, and subsequent Staff Requirements Memoranda (SRM) associated with Commission Papers SECY-11-0124 (NRC, 2011c) and SECY-11-0137 (NRC, 2011d), instructed the NRC staff to issue requests for information to licensees pursuant to 10 CFR 50.54(f).

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

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

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

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

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

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

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

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

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

(7) 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 NRC staff endorsed the SPID.

The required response section of Enclosure 1 to the 50.54(f) letter specifies that Central and Eastern United States (CEUS) licensees provide their Seismic Hazard and Screening Report (SHSR) by 1.5 years after issuance of the 50.54(f) letter. However, in order to complete its update of the EPRI seismic ground motion models (GMMs) for the CEUS (EPRI, 2013), industry proposed a six-month extension to March 31, 2014, for submitting the SHSR. Industry also proposed that licensees perform an expedited assessment, referred to as the Augmented Approach, for addressing the requested interim evaluation (Item 6 above), which would use a simplified assessment to demonstrate that certain key pieces of plant equipment for core cooling and containment functions, given a loss of all alternating current power, would be able to withstand a seismic hazard up to two times the design-basis. Attachment 2 to the April 9, 2013, letter (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 (Olson, 2013), Entergy Operations, Inc. (Entergy, the licensee) submitted at least partial site response information for River Bend Station, Unit 1 (RBS). By letter dated March 26, 2014 (Mashburn, 2014), 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) ground motion models. 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 March 26, 2014 (Mashburn, 2014), the licensee provided its SHSR for RBS. The licensee's SHSR indicated that the plant SSE bounds the GMRS between 1 to 10 Hertz (Hz). As such, the licensee stated that a seismic risk evaluation will not be performed. Also, a SFP evaluation will not be performed. Additionally, although the GMRS exceeds the SSE above 10 Hz, the licensee indicated that a HF confirmation will not be performed because the exceedance is minimal, the low GMRS spectral acceleration values at high frequencies and the robust design of high frequency sensitive equipment.

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 most of the licensee's screening results. The GMRS is bounded by the SSE in the frequency range of 1 to 10 Hz. Therefore, RBS screened out for conducting a plant seismic risk evaluation and a SFP evaluation is also not merited. However, the NRC staff determined that a HF confirmation for RBS is merited because the GMRS exceeds the SSE above 10 Hz.

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 RBS. The licensee stated that the RBS SSE was based on a Modified Mercalli Intensity VI event with an estimated maximum horizontal ground acceleration value of 0.07g. The licensee assumed a peak horizontal acceleration of 0.10g for the SSE along with a Regulatory Guide 1.60 (NRC, 1973) design response spectrum shape. The licensee specified that the control point for the SSE is located at the bottom of the foundations for the Auxiliary, Control, and Diesel Generator Building, which corresponds to elevation 65 ft (19.8 m).

The NRC staff reviewed the licensee's description of its RBS SSE in the SHSR, as well as the updated final safety analysis report (UFSAR, Entergy, 1987). Based on its review the NRC staff confirmed that the licensee's SSE is defined in terms of a PGA of 0.10g and a Regulatory Guide 1.60 design response spectrum shape, as described by the licensee. Finally, based on review of the SHSR and the UFSAR, the NRC staff confirmed that the licensee's control point elevation for the RBS site SSE is defined at an elevation of 65 ft (19.8 m) and is consistent with the guidance provided in the SPID.

3.2 Probabilistic Seismic Hazard Analysis

In Section 2.2 of its SHSR, the licensee stated that, in accordance with the 50.54(f) letter and the SPID, it performed a PSHA using the CEUS-SSC model and the updated EPRI GMM for the CEUS (EPRI, 2013). The licensee used a minimum magnitude 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 Charleston, Commerce, Eastern Rift Margin-North, Eastern Rift Margin-South, Marianna, Meers, New Madrid Fault System, and Wabash Valley Repeated Large Magnitude Earthquake (RLME) sources, which lie within 620 mi (1,000 km) of RBS. 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 weighted the GMM between the Gulf Coast and the midcontinent versions for all RLME sources depending on the relative portion of the path in each region. For the Charleston RLME source, the licensee used 70 percent midcontinent and 30 percent gulf. For the other RLMEs, the licensee used 60 percent midcontinent and 40 percent gulf. 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 its SHSR. The staff's review of the licensee's control point seismic hazard curves is provided in Section 3.3 of this staff assessment.

As part of its confirmatory analysis of the licensee's GMRS, the NRC staff performed PSHA calculations for base rock site conditions at the RBS 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 RBS site. In addition, the NRC staff included the Charleston, Commerce, Eastern Rift Margin-North, Eastern Rift Margin-South, Marianna, Meers, New Madrid Fault System, and Wabash Valley RLME sources, which lie within 620 km (1,000 mi) of the RBS site. For each of the CEUS-SSC sources used in the PSHA, the NRC staff used the Gulf version of the updated EPRI GMM, except for the Wabash Valley and Charleston RLME sources, for which the NRC staff used the midcontinent 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 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 ground motion models 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 RBS. According to the licensee, the RBS site sits atop approximately 27,000 ft (8,200 m) of Cenozoic and Mesozoic sediments over Paleozoic basement rocks. These sediments are topped by Pliocene-Pleistocene fluvial deposits and overlying loess. The licensee provided site profile descriptions in Sections 2.3.1 and 2.3.2 of its SHSR based on information in the RBS UFSAR (Entergy, 1987). The licensee used the in-situ shear wave velocities measurements made into the Pascagoula clay from the UFSAR in the development of the base case profile in the upper 165 ft (50 m). Beneath this depth, the licensee used the profile template in the SPID to extend the profile to a depth of 4,000 ft (1,219 m).

The licensee used the shear-wave velocity measurements from the UFSAR, along with guidance provided in the SPID, to develop the best-estimate profile (P1). The licensee used a scale factor of 1.25 over the upper 165 ft (50 m) to model lower (P2) and upper (P3) base case shear wave velocity profiles. At depths greater than 165 ft (50 m), the license used a scale factor of 1.57 to account for the greater uncertainty in the shear-wave velocity at depth.

The licensee stated that no site-specific dynamic material properties were available for the RBS site. Therefore, the licensee selected two alternative characterizations of dynamic material behavior following guidance provided in the SPID for the best-estimate profile and upper and lower base case models. The licensee assumed the materials in the upper 500 ft (150 m) could

be modeled with either EPRI cohesionless soil or Peninsular Range (PR) G/G_{max} and hysteretic damping curves.

The licensee also considered the impact of kappa, or small strain damping, on site response. Kappa is measured in units of seconds (sec), and is the damping contributed by both intrinsic hysteretic damping, as well as scattering, due to wave propagation in heterogeneous material. The licensee calculated kappa for each profile. For the RBS site, with greater than 3,000 ft (914 m) of underlying soil, the licensee assumed a maximum kappa value of 0.04 s for the base, lower and upper profiles. The licensee stated that it accounted for epistemic uncertainty in kappa at design loading levels by two sets of G/G_{max} and hysteretic damping curves.
To account for randomness in material properties across the plant site, the licensee stated in Section 2.3.2.1 of its SHSR that it randomized its base case profiles following Appendix B of the SPID. In addition, the licensee randomized the depth to hard rock of 4,000 ft (1,219 m) by ±1,200 ft (366 m).

3.3.2 Site Response Method and Results

In Section 2.3.4 of its SHSR, the licensee stated that it followed the guidance in Appendix B of the SPID to develop input ground motions for the site response analysis, and in Section 2.3.5, 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 two of the eleven input loading levels for the each base case profile.

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 Section 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

To confirm the licensee's site response analysis, the NRC staff performed site response calculations for the RBS site. The NRC staff independently developed a shear wave velocity profile, damping values and modeled nonlinear behavior of the subsurface materials using geological information and measurements provided in the RBS's UFSAR and Combined License (COL) application. For its site response calculations, the NRC staff employed the RVT approach and developed input ground motions in accordance with Appendix B of the SPID.

The RBS site is well characterized due to the geotechnical work implemented during subsurface investigations conducted as part of the COL application. Geotechnical investigations included the drilling of boreholes, P-S suspension logging, and resonant column and torsional shear (RCTS) analyses on soil samples. Due to the abundance of subsurface data and the consistency between the COL and RBS sites, the NRC staff relied on both the data obtained during original licensing as well as the more recent data from the COL. To develop the upper

200 ft (61 m) of its base case shear wave velocity profile, the NRC staff used the data provided in UFSAR Table 2.5-10. The NRC staff extended its base case velocity profile to a depth of about 1000 ft (305 m) using COL data and then used the generic gradient recommended in the SPID to extend the profile to a depth of 7000 ft (2,134 m). To develop the upper and lower base case velocity profiles, the NRC staff used a natural log standard deviation of 0.2. Figure 3.3-1 of this assessment shows a comparison of the three base case velocity profiles developed by the licensee with those developed by the NRC staff. The profiles developed by the licensee are similar in shape to those developed by the NRC staff. However, the staff's profiles extend to greater depth than the licensee's and are generally faster at depths greater than approximately 1,000 ft (305 m).

Consistent with guidance in the SPID, the NRC staff modeled the dynamic response of the soils using two models that incorporate different degrees of non-linear behavior. Similar to the licensee, the NRC staff used the EPRI (1993) curves to model the upper limit of non-linearity at the site and the Peninsular Range curves to model the lower limit.

In addition, the NRC staff also considered the impact of kappa on the site response analysis. The NRC staff followed guidance in the SPID for sites with greater than 3,000 ft (914 m) of soil overlying base rock to determine a base case kappa value of 0.028 sec. To model the uncertainty in kappa, the NRC staff used a natural log standard deviation of 0.40 to calculate lower and upper kappa values in each profile. This approach results in nine kappa values for the staff's site response analysis, which range from 0.017 to 0.047 sec.

Figure 3.3-2 of this assessment shows a comparison of the staff's and the licensee's median site amplification functions and uncertainties (±1 standard deviation) for two of the eleven input loading levels. The peak in amplification functions occurs between approximately 0.4 and 1.0 Hz in both the staff's and the licensee's curves. Differences in site amplification curves developed by the NRC staff and the licensee are due primarily to differences in site velocity profiles and are minor. As shown in Figure 3.3-3 of this assessment, these differences in site response have a modest impact on control point seismic hazard curves and the resulting GMRS, 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 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 RBS site.

3.4 Ground Motion Response Spectrum

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. As shown in Figure 3.4-1 below, the licensee's GMRS shape is very similar to that calculated by the NRC staff.

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 RBS 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 RBS 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) and (5) – (9) and the comparison portion to Item (4), identified in Enclosure 1 of the 50.54(f) letter. Further, the staff concludes that the licensee's reevaluated seismic hazard is suitable for other actions associated with NTTF Recommendation 2.1, "Seismic".

In reaching this determination, the NRC staff confirms the licensee's conclusion that the licensee's GMRS for the RBS site is bounded by the SSE in the 1 to 10 Hz range, but exceeds the SSE in a portion of the frequency range above 10 Hz. As such, a seismic risk evaluation and SFP evaluation (i.e., Requested Information Items (8) and (9)) are not merited, however a HF confirmation (i.e., Requested Information Item (4)) is merited. The NRC review and acceptance of Entergy's HF confirmation will complete the Seismic Hazard Evaluation identified in 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 RBS Site

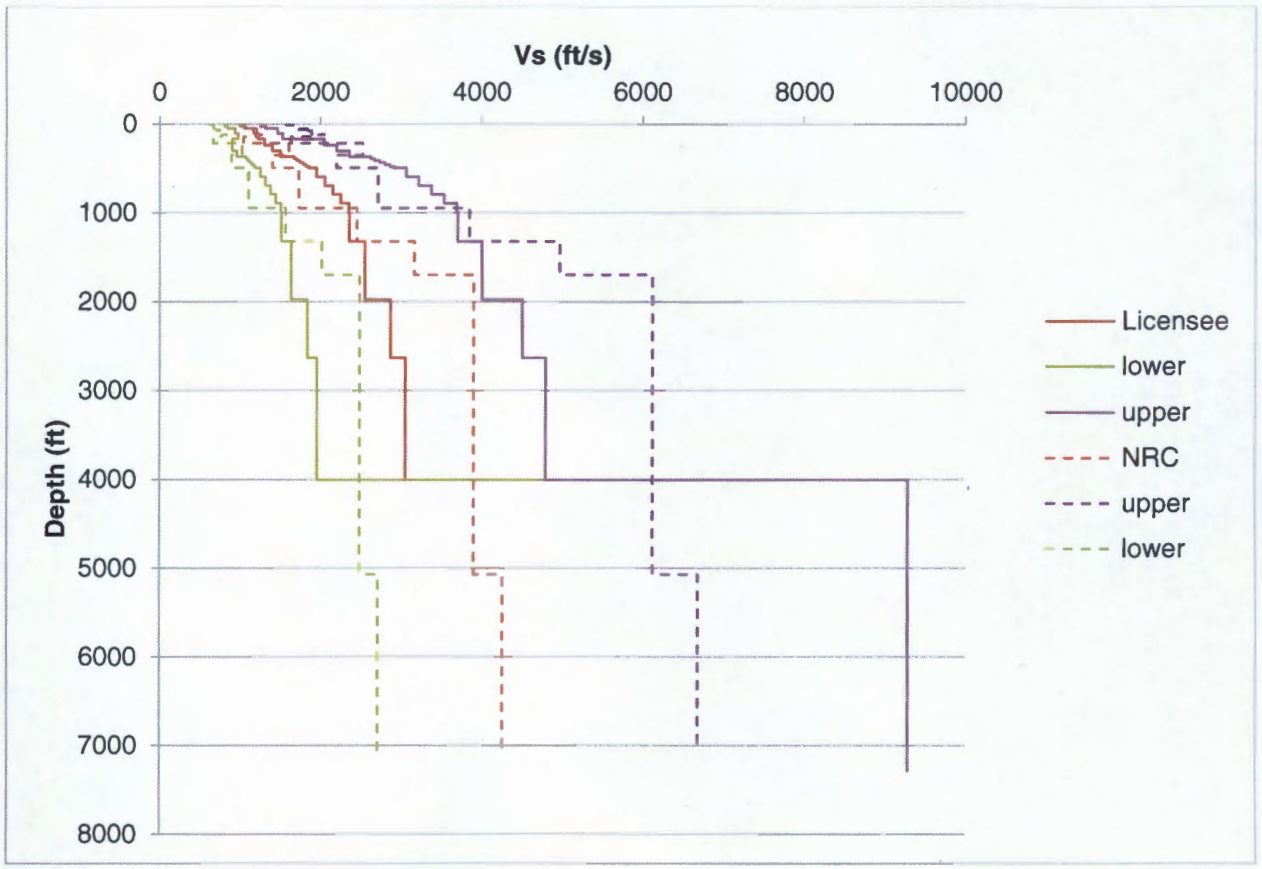


Figure 3.3- 2 Plot Comparing the Staff's and the Licensee's Median Amplification Functions and Uncertainties for the RBS site.

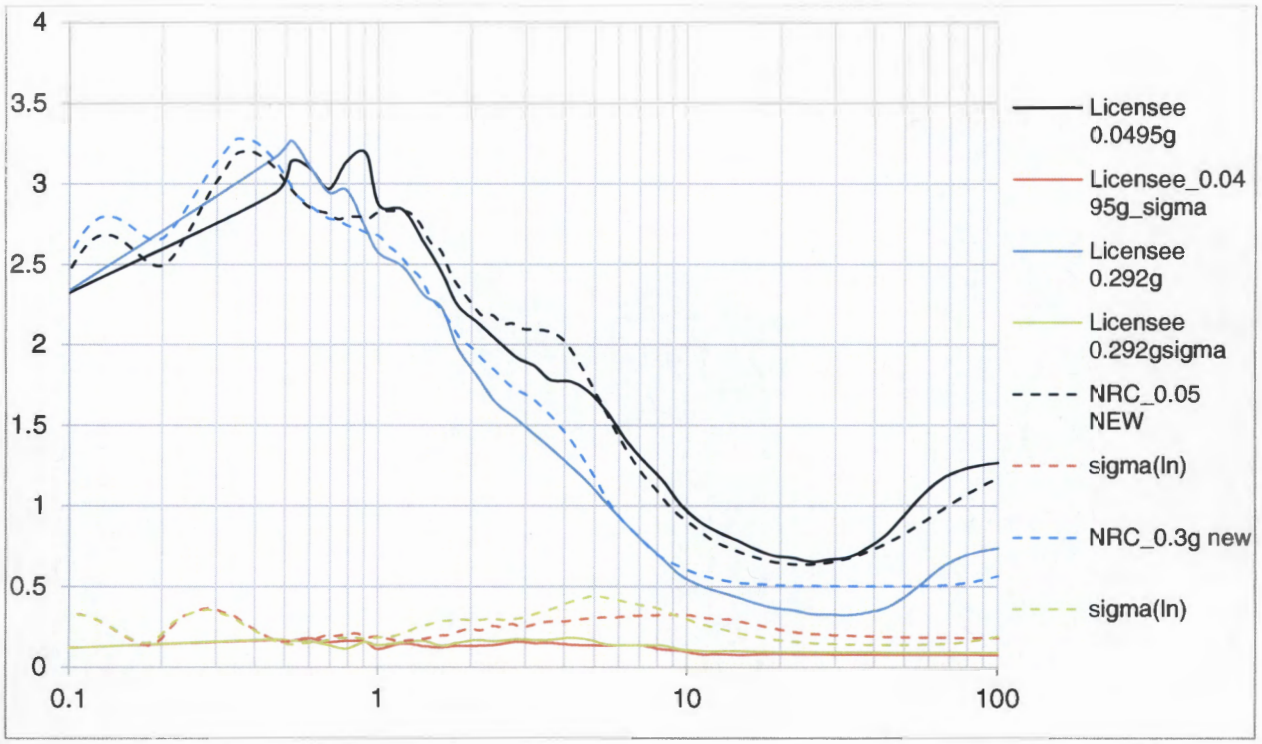


Figure 3.3-3 Plot Comparing the Staff's and the Licensee's Mean Control Point Hazard Curves at a Variety of Frequencies for the RBS site

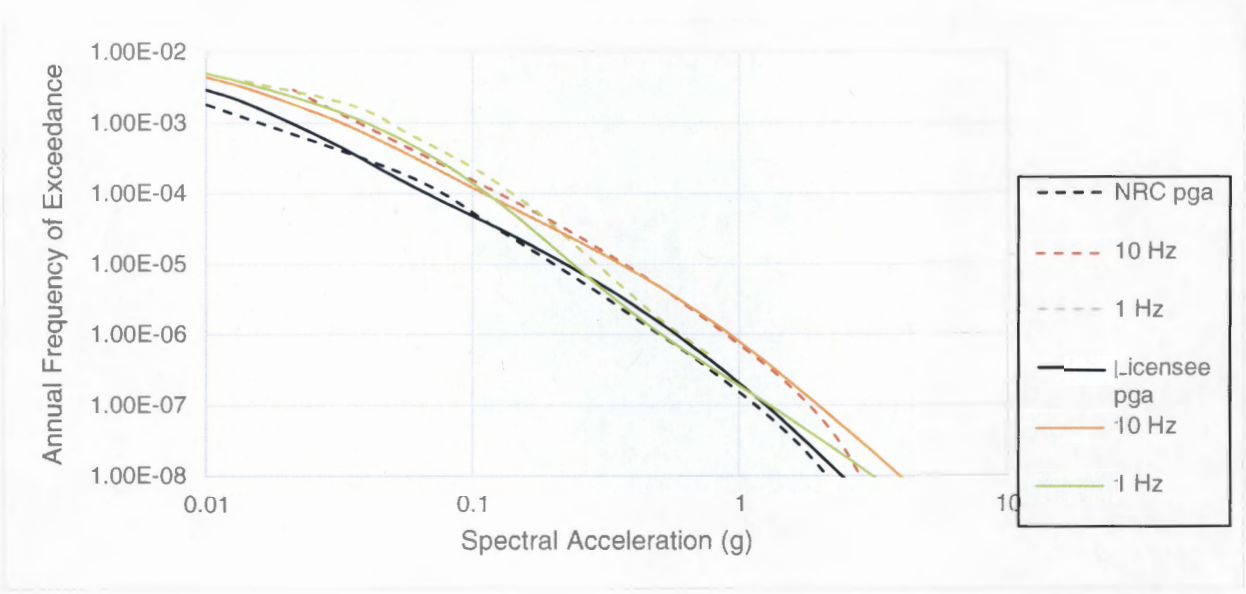
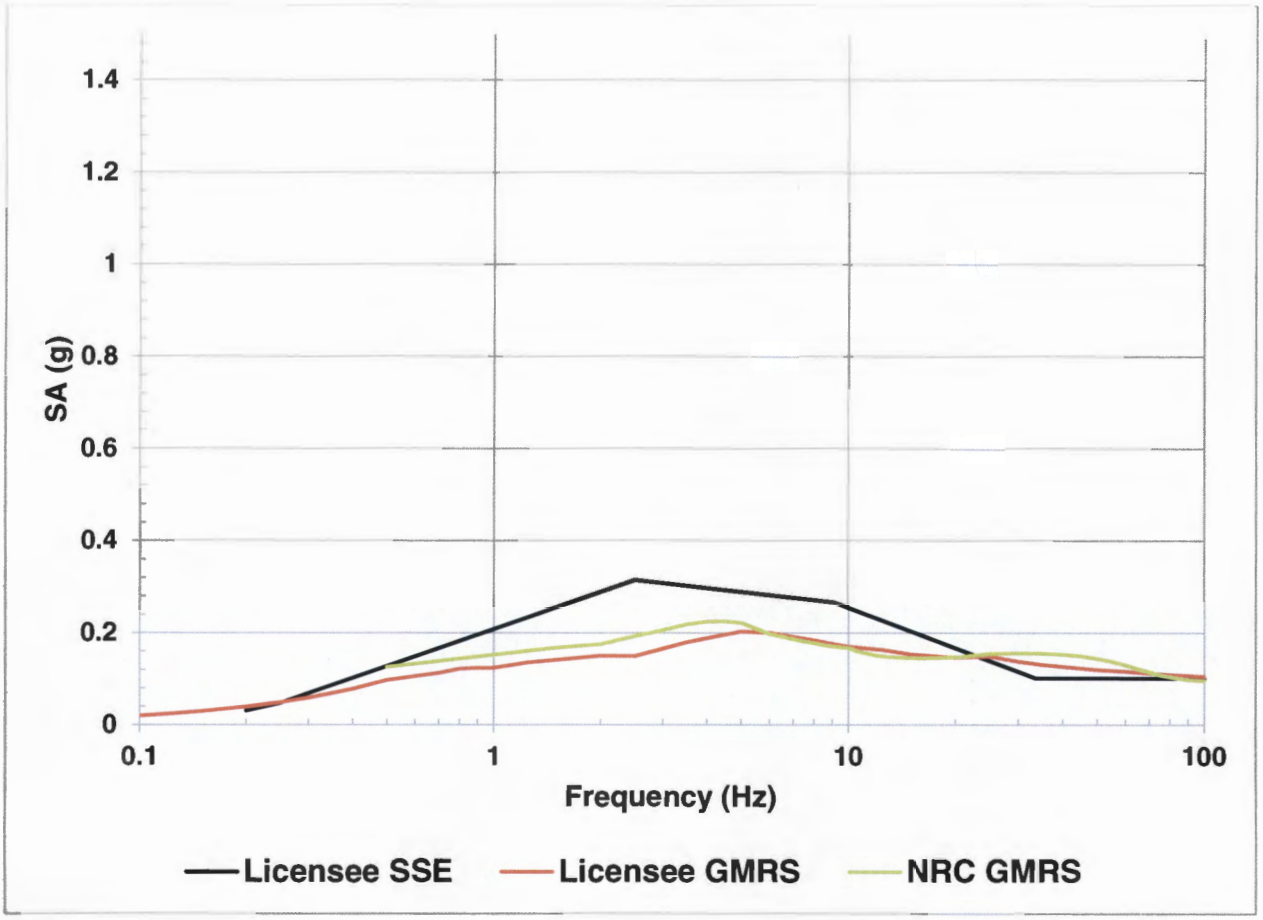


Figure 3.4-1 Comparison of the Staff's GMRS with Licensee's GMRS and the SSE for the River Bend Station site



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 No. 50-458

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Hazard Evaluation and Screening Report

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