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GNRO-2013/00068

September 12, 2013

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Entergy's Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Seismic Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident – 1.5 Year Response for CEUS Sites
Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. NPF-29

- REFERENCES:
1. NRC Letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident*, dated March 12, 2012 (ML12053A340, GNRI-2012/00059)
 2. NRC Letter, *Endorsement of EPRI Final Draft Report 1025287, "Seismic Evaluation Guidance,"* dated February 15, 2013 (ML12319A074)
 3. EPRI Report 1025287, *Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic* (ML12333A170)
 4. NEI Letter to NRC, *Proposed Path Forward for NTF Recommendation 2.1: Seismic Reevaluations*, dated April 9, 2013 (ML13101A345)
 5. NRC Letter, *EPRI Final Draft Report XXXXXX, "Seismic Evaluation Guidance: Augmented Approach for the Resolution of Near-Term Task Force Recommendation 2.1: Seismic,"* as an *Acceptable Alternative to the March 12, 2012, Information Request for Seismic Reevaluations*, dated May 7, 2013 (ML13106A331)
 6. Entergy letter to NRC, *Response to NRC Request For Information Pursuant to 10 CFR 50.54(f) Regarding the Seismic Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident*, dated April 26, 2013 (ML13119A104, GNRO-2013/00032)

Dear Sir or Madam:

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Reference 1 to all power reactor licensees and holders of construction permits in active or deferred status. Enclosure 1 of Reference 1 requested each addressee in the Central and Eastern United States (CEUS) to submit a written response consistent with the requested seismic hazard evaluation information (items 1 through 7) by September 12, 2013. On February 15, 2013, NRC issued Reference 2, endorsing the Reference 3 industry guidance for responding to Reference 1. Section 4 of Reference 3 identifies the detailed information to be included in the seismic hazard evaluation submittals.

On April 9, 2013, the Nuclear Energy Institute (NEI) submitted Reference 4 to NRC, requesting NRC agreement to delay submittal of some of the CEUS seismic hazard evaluation information so that an update to the Electric Power Research Institute (EPRI) (2004, 2006) ground motion attenuation model could be completed and used to develop that information. NEI proposed that descriptions of subsurface materials and properties and base case velocity profiles (items 3a and 3b in Section 4 of Reference 3) be submitted to NRC by September 12, 2013, with the remaining seismic hazard and screening information submitted to NRC by March 31, 2014. In Reference 5, NRC agreed with this recommendation. Reference 6 contained Entergy Operations, Inc.'s (Entergy's) commitment to follow the approach described in Reference 4.

The attachment to this letter contains the requested descriptions of subsurface materials and properties and base case velocity profiles for Grand Gulf Nuclear Station (GGNS). The information provided in the attachment to this letter is considered an interim product of seismic hazard development efforts being performed for the industry by EPRI. The complete and final seismic hazard report for GGNS will be provided to the NRC in our seismic hazard submittal by March 31, 2014 in accordance with Reference 5.

This letter contains no new regulatory commitments. Should you have any questions regarding this submittal, please contact Mr. Christopher R. Robinson, Licensing Manager, at (601) 437-7326.

I declare under penalty of perjury that the foregoing is true and correct; executed on September 12, 2013.

Sincerely,



KJM/slw

Attachment: Grand Gulf Nuclear Station's Descriptions of Subsurface Materials and Properties and Base Case Velocity Profiles

Cc: (See next page)

cc: U. S. Nuclear Regulatory Commission
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Attachment to GNRO-2013/00068

Grand Gulf Nuclear Station's Descriptions of

Subsurface Materials and Properties and Base Case Velocity Profiles

Grand Gulf Nuclear Station's Descriptions of Subsurface Materials and Properties and Base Case Velocity Profiles

Grand Gulf Site Description

The basic information used to create the site geologic profile at the Grand Gulf Nuclear Station is shown in Table 1. This profile was developed using information documented in Reference 1. As indicated in Table 1, the safe shutdown earthquake (SSE) Control Point is defined at elevation -87 feet, and the profile was modeled up to this elevation. For dynamic properties of sand, silt, and clay layers, modulus and damping curves were represented with two models. The first model used soil curves taken from Reference 2, the second model used soil curves taken from References 3 and 4. These dynamic property models were weighted equally.

The three base-case shear-wave velocity profiles used to model amplification at the site are shown in Figure 1. Profiles 1, 2, and 3 are weighted 0.4, 0.3, and 0.3, respectively. Thicknesses, depths, and shear-wave velocities (V_s) corresponding to each profile are shown in Table 2.

References

1. Entergy (2012). *Site Geologic Conditions for Grand Gulf Nuclear Station*, Informal report transmitted to Electric Power Research Institute (EPRI) in July 2012.
2. EPRI (1993). *Guidelines for Determining Design Basis Ground Motions*, Report TR-102293, Volumes 1-5, Palo Alto, CA.
3. Silva, W.J., N. A. Abrahamson, G.R. Toro, and C. Costantino (1996). *Description and Validation of the Stochastic Ground Motion Model*, Report submitted to Brookhaven National Laboratory, Assoc. Universities Inc., Upton NY 11973, Contract No. 770573.
4. Walling, M.A., W.J., Silva and N.A. Abrahamson (2008). "Nonlinear Site Amplification Factors for Constraining the NGA Models," *Earthquake Spectra*, 24 (1) 243-255.

Table 1 - Geotechnical profile for Grand Gulf site

Elev.	Depth Range (feet)	Soil Description	Compression Wave Velocity (fps)	Shear Wave Velocity (fps)	Density (pcf)	Poisson's Modulus (ksf)	Young's Modulus (ksf)	Shear Modulus (ksf)	Bulk Modulus (ksf)
197' to 127'	70	Loess – Silt	1400	670	105	0.35	3950	1460	4390
127' to 107'	20'	Terrace – Silty Clay	4600	1100	119	0.47	13,200	4470	73,000
107' to 87'	20'	Terrace – Sand	6000	1600	125	0.46	29,000	9940	121,000
87'	-	SSE Control Point at base mat of structures	-	-	-	-	-	-	-
87' to 67'	20'	Catahoula – Clay	6560	1600	120	0.47	28,000	9540	156,000
67' to 17'	50'	Catahoula – Clay and Silt with Silty Sand Layers	6560	1640	120	0.47	29,500	10,000	164,000
17' to -33'	50'	Catahoula – Clay and Silt with Silty Sand Layers	6400	1720	120	0.46	32,200	11,000	134,000
-33' to -103'	70'	Catahoula – Clay and Silt with Silty Sand Layers	6730	1715	120	0.47	32,200	11,000	179,000

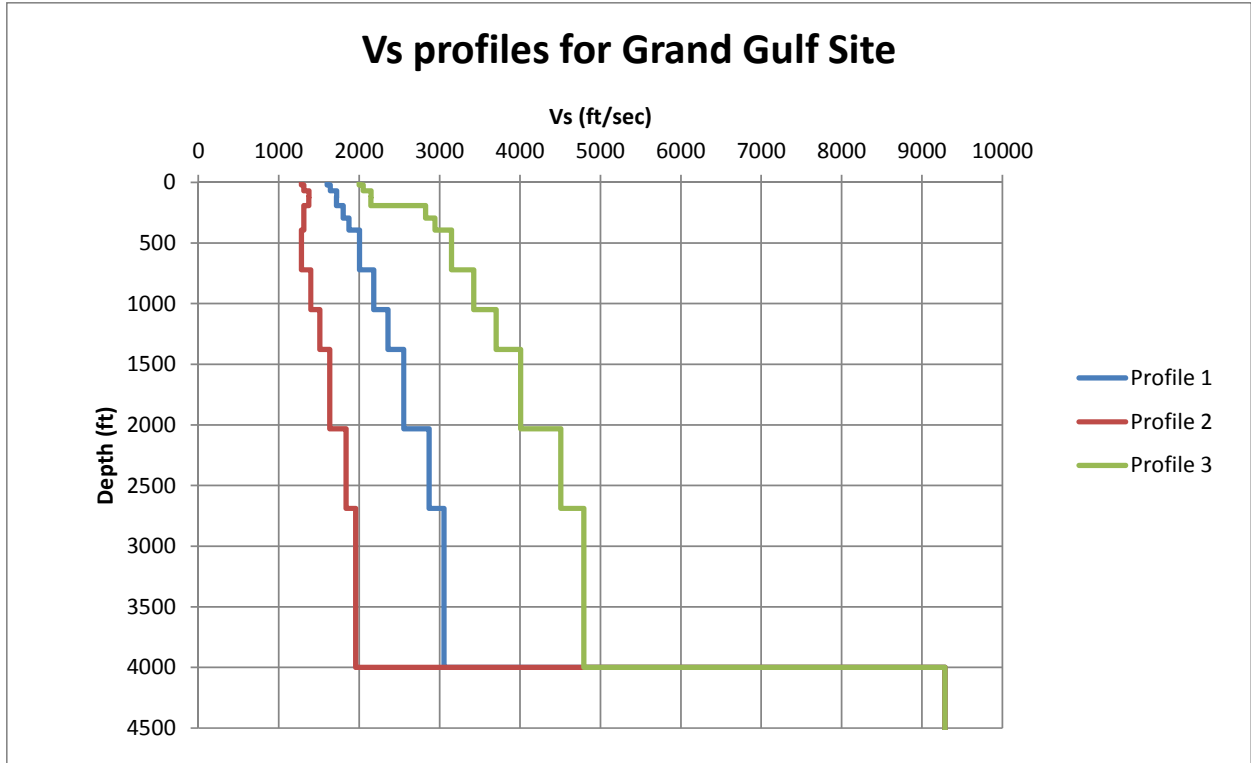


Figure 1 - Vs profiles for Grand Gulf site

Table 2 - Layer thicknesses, depths, and Vs for 3 profiles, Grand Gulf site

Profile 1			Profile 2			Profile 3		
thickness(ft)	depth (ft)	Vs(ft/s)	thickness(ft)	depth (ft)	Vs(ft/s)	thickness(ft)	depth (ft)	Vs(ft/s)
	0	1600		0	1280		0	2000
10.2	10.2	1600	10.2	10.2	1280	10.2	10.2	2000
10.2	20.3	1600	10.2	20.3	1280	10.2	20.3	2000
12.5	32.8	1640	12.5	32.8	1312	12.5	32.8	2050
12.5	45.3	1640	12.5	45.3	1312	12.5	45.3	2050
4.6	49.9	1640	4.6	49.9	1312	4.6	49.9	2050
7.9	57.7	1640	7.9	57.7	1312	7.9	57.7	2050
12.5	70.2	1640	12.5	70.2	1312	12.5	70.2	2050
12.5	82.7	1720	12.5	82.7	1376	12.5	82.7	2150
12.5	95.1	1720	12.5	95.1	1376	12.5	95.1	2150
12.5	107.6	1720	12.5	107.6	1376	12.5	107.6	2150
12.5	120.1	1720	12.5	120.1	1376	12.5	120.1	2150
14.1	134.2	1715	14.1	134.2	1372	14.1	134.2	2144
14.1	148.3	1715	14.1	148.3	1372	14.1	148.3	2144
14.1	162.4	1715	14.1	162.4	1372	14.1	162.4	2144
14.1	176.5	1715	14.1	176.5	1372	14.1	176.5	2144
14.1	190.6	1715	14.1	190.6	1372	14.1	190.6	2144
17.7	208.3	1800	17.7	208.3	1312	17.7	208.3	2826
17.7	226.0	1800	17.7	226.0	1312	17.7	226.0	2826
17.7	243.8	1800	17.7	243.8	1312	17.7	243.8	2826
6.2	250.0	1800	6.2	250.0	1312	6.2	250.0	2826
44.0	294.0	1800	44.0	294.0	1312	44.0	294.0	2826
32.8	326.8	1873	32.8	326.8	1312	32.8	326.8	2941
32.8	359.6	1873	32.8	359.6	1312	32.8	359.6	2941
32.8	392.4	1873	32.8	392.4	1312	32.8	392.4	2941
40.0	432.4	2005	40.0	432.4	1283	40.0	432.4	3147
40.0	472.4	2005	40.0	472.4	1283	40.0	472.4	3147
27.6	500.0	2005	27.6	500.0	1283	27.6	500.0	3147
52.5	552.5	2005	52.5	552.5	1283	52.5	552.5	3147
40.0	592.5	2005	40.0	592.5	1283	40.0	592.5	3147
42.7	635.2	2005	42.7	635.2	1283	42.7	635.2	3147
42.7	677.8	2005	42.7	677.8	1283	42.7	677.8	3147
42.7	720.5	2005	42.7	720.5	1283	42.7	720.5	3147
65.6	786.1	2182	65.6	786.1	1396	65.6	786.1	3425
65.6	851.7	2182	65.6	851.7	1396	65.6	851.7	3425
65.6	917.3	2182	65.6	917.3	1396	65.6	917.3	3425
65.6	982.9	2182	65.6	982.9	1396	65.6	982.9	3425
65.6	1048.6	2182	65.6	1048.6	1396	65.6	1048.6	3425
65.6	1114.2	2359	65.6	1114.2	1510	65.6	1114.2	3704
65.6	1179.8	2359	65.6	1179.8	1510	65.6	1179.8	3704

65.6	1245.4	2359	65.6	1245.4	1510	65.6	1245.4	3704
65.6	1311.0	2359	65.6	1311.0	1510	65.6	1311.0	3704
65.6	1376.6	2359	65.6	1376.6	1510	65.6	1376.6	3704
131.2	1507.9	2552	131.2	1507.9	1634	131.2	1507.9	4007
131.2	1639.1	2552	131.2	1639.1	1634	131.2	1639.1	4007
131.2	1770.3	2552	131.2	1770.3	1634	131.2	1770.3	4007
131.2	1901.6	2552	131.2	1901.6	1634	131.2	1901.6	4007
131.2	2032.8	2552	131.2	2032.8	1634	131.2	2032.8	4007
131.2	2164.0	2871	131.2	2164.0	1837	131.2	2164.0	4507
131.2	2295.3	2871	131.2	2295.3	1837	131.2	2295.3	4507
131.2	2426.5	2871	131.2	2426.5	1837	131.2	2426.5	4507
131.2	2557.7	2871	131.2	2557.7	1837	131.2	2557.7	4507
131.2	2689.0	2871	131.2	2689.0	1837	131.2	2689.0	4507
164.0	2853.0	3054	164.0	2853.0	1955	164.0	2853.0	4795
164.0	3017.1	3054	164.0	3017.1	1955	164.0	3017.1	4795
164.0	3181.1	3054	164.0	3181.1	1955	164.0	3181.1	4795
164.0	3345.1	3054	164.0	3345.1	1955	164.0	3345.1	4795
164.0	3509.2	3054	164.0	3509.2	1955	164.0	3509.2	4795
490.5	3999.7	3054	490.5	3999.7	1955	490.5	3999.7	4795
3280.8	7280.5	9285	3280.8	7280.5	9285	3280.8	7280.5	9285