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RC-13-0120

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

Dear Sir/Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNIT 1
DOCKET NO. 50-395
OPERATING LICENSE NO. NPF-12
SOUTH CAROLINA ELECTRIC & GAS (SCE&G) 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

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]
2. NRC Letter, Endorsement of EPRI Final Draft Report 1025287, "Seismic Evaluation Guidance," dated February 15, 2013
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, dated November 2012 [ML12333A170]
4. NEI Letter to NRC, Proposed Path Forward for NTTF Recommendation 2.1: Seismic Reevaluations, dated April 9, 2013
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]

On March 12, 2012, the 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.

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On April 9, 2013, 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 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.

The attachment to this letter contains the requested descriptions of subsurface materials and properties and base case velocity profiles for South Carolina Electric & Gas.

This letter contains no new regulatory commitments.

Should you have any questions concerning the content of this letter, please contact Bruce L. Thompson at (803) 931-5042.

I declare under penalty of perjury that the foregoing is true and correct.

9-11-2013
Executed on

Thomas D. Gatlin

BQ/TDG/ts
Attachment: I. V.C. Summer Unit 1 Site Data and Shear Wave Velocity Profiles

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VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNIT 1

ATTACHMENT I

V.C. Summer Unit 1 Site Data and Shear Wave Velocity Profiles

Purpose

V.C. Summer (VCSNS) Unit 1 is submitting the site response evaluation in accordance with the Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) (Reference 4) section 4 items 3a and 3b. This submittal was requested in the NRC letter of endorsement and schedule relief for the NEI proposed augmented approach activities, dated May 7, 2013 (Reference 6).

The requirements of this site response evaluation are to provide a description of subsurface materials and properties and develop the base case profiles and nonlinear material properties. The subsurface materials and properties description includes soil/rock types, layering, and properties. The development of base case profiles and nonlinear material properties will provide information on the base case shear wave velocity profiles and selected shear modulus and damping curves.

Description of Subsurface Materials and Properties

The VCSNS site is located in the Carolina Zone of the Central Piedmont province, about 20 miles (32 kilometers) northwest of the fall line that separates the Piedmont and Coastal Plain provinces. The VCSNS site lies within the Charlotte Terrane, the westernmost terrane of the Carolina Zone. The Charlotte Terrane is dominated by Neoproterozoic to Early Paleozoic plutonic rocks that intrude a suite of mainly metaigneous rocks.

The basic information used to create the site geologic profile at the VCSNS site is shown in Table 1. This profile was developed using information documented in Reference 1. For Structures, Systems, and Components (SSCs) using the "Rock SSE" at nominal depth 85 feet, no site amplification is used. For Unit 1, the majority of plant safety related structures are founded on rock. For SSCs using the "Soil SSE" at the surface, the profile was modeled as shown in Table 1.

Development of Base Case Profiles and Nonlinear Material Properties

EPRI has provided the following information as an interim product for seismic hazard development. The methods used for development of the base-case velocity profiles followed Appendix B of the SPID.

For dynamic properties, the modulus and damping curves for weathered rock layers were represented with 2 models. The first model used rock curves taken from Reference 3, the

second model assumed linear behavior. These dynamic property models were weighted equally.

The 3 base-case shear-wave velocity profiles used to model the "Soil SSE" 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 (Vs) corresponding to each profile are shown in Table 2.

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 [ML13101A379].
2. SCE&G (2012). CGSV-12-0010, *Request for Information Response – EPRI Seismic Attenuation and GMRS Project,* Letter from J. Graham to J. Hamel dated July 2, 2012.
3. EPRI (1993). *Guidelines for Determining Design Basis Ground Motions*, EPRI, Palo Alto, CA, Rept. TR-102293, Vol. 1—5.
4. EPRI 1025287, "Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic," EPRI, Palo Alto, CA: November 2012 [ML12333A170]
5. NRC Letter, Endorsement of EPRI Final Draft Report 1025287, "Seismic Evaluation Guidance," dated February 15, 2013 [ML12319A074].
6. 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]

Source of Site Information

V.C. Summer Unit 1 FSAR Docket No. 50-395

- Section 2.5: Geology
  - Tables: 2.5-5, 2.5-9, 2.5-11
  - Figures: 2.5-40, 2.5-41, 2.5-44 thru -48, 2.5-77 thru -81, 2.5-25, 2.5-91, 2.5-102
  - Appendices: Figure 2E, Figure 2F
- Section 3.7 Seismic Design
  - Tables: 3.7-5, 3.7-6, 3.7-7
- Section 3.8 Design of Category I Structures
  - Figures: 3.8-54 thru -65, 3.8-67 thru 71

V.C. Summer Units 2/3, COL Application , Part 2, FSAR Docket No. 52-027/028

- Section 2.5.4 "Stability of Subsurface Materials and Foundation"

Table 1
Summary of Geotechnical Profile Data for V.C. Summer Unit 1

Depth Range (feet)	Soil/Rock Description		Density (pcf)	Shear Wave Velocity (fps)	Compressional Wave Velocity (fps)	Poisson's Ratio
0	SOIL SSE Control Point (at surface)					
0-25	Zone III Structural Fill [b]		140 [b]	--- [b]	--- [b]	.33 [b]
25-65	Saprolite		110-135	900 [a]	1000-3000	.35
65-75	All highly weathered rock; and moderately weathered highly jointed rock.	Type 3	140-160	3000 [a]	12000-13000	.3
75-85	Moderately weathered rock, slight jointing; and slightly weathered rock, moderately to very jointed.	Type 2	140-160	6000 [a]	12000-13000	.3
85	ROCK SSE Control Point					
85+	Massive Fresh Rock - Late Precambrian to Early Paleozoic Igneous and Metamorphic Rock	Type 1	165	10000 [a]	15000	.2

NOTES:

[a] Shear wave velocity measurement taken from VCS Unit 2/3 COL Application FSAR. The measurements were taken in near vicinity of VCS Unit 1 and rock is considered to be equivalent. Review of boring logs for each site validates this assumption. Shear wave velocity measurements were taken using current methods (geophysical down-hole tests using suspension P-S Velocity logging), and are considered to contain greater accuracy than dated methods used during Unit 1 construction.

[b] Compressional/Shear wave velocity measurements for the Zone III fill not available. Reference 2 provides design information for the Zone III fill. Young's Modulus, E = 54,000 psi for Zone III fill.

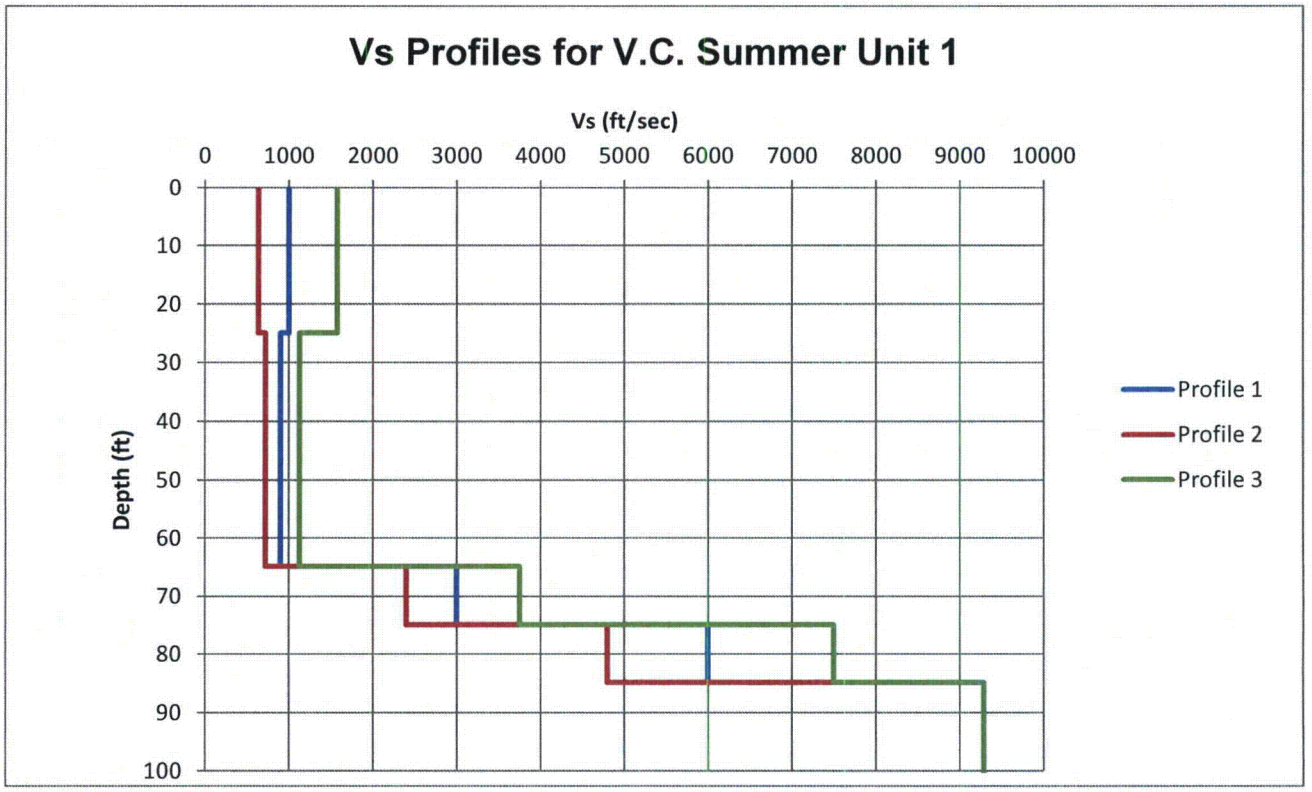

Figure 1. The "Soil SSE" at VCSNS was modeled using 3 base-case shear-wave velocity profiles. Profiles 1, 2, and 3 are weighted 0.4, 0.3, and 0.3, respectively. Thicknesses, depths, and shear-wave velocities (Vs) correspond to each profile shown in Table 2.

Table 2
Layer Thicknesses, Depths, and Vs for 3 Profiles, V.C. Summer Unit 1

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	1000		0	637		0	1570
5.0	5.0	1000	5.0	5.0	637	5.0	5.0	1570
5.0	10.0	1000	5.0	10.0	637	5.0	10.0	1570
5.0	15.0	1000	5.0	15.0	637	5.0	15.0	1570
5.0	19.9	1000	5.0	19.9	637	5.0	19.9	1570
5.0	24.9	1000	5.0	24.9	637	5.0	24.9	1570
6.7	31.6	900	6.7	31.6	720	6.7	31.6	1125
6.7	38.3	900	6.7	38.3	720	6.7	38.3	1125
6.7	44.9	900	6.7	44.9	720	6.7	44.9	1125
6.7	51.6	900	6.7	51.6	720	6.7	51.6	1125
6.7	58.2	900	6.7	58.2	720	6.7	58.2	1125
6.7	64.9	900	6.7	64.9	720	6.7	64.9	1125
5.0	69.9	3000	5.0	69.9	2400	5.0	69.9	3750
5.0	74.9	3000	5.0	74.9	2400	5.0	74.9	3750
5.0	79.9	6000	5.0	79.9	4800	5.0	79.9	7500
5.0	84.8	6000	5.0	84.8	4800	5.0	84.8	7500
3280.8	>84.8	9285	3280.8	>84.8	9285	3280.8	>84.8	9285