

**V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR**

**SUBSECTION 2.5.0
GEOLOGY, SEISMOLOGY, AND GEOTECHNICAL ENGINEERING**

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2.5.0 GEOLOGY, SEISMOLOGY, AND GEOTECHNICAL ENGINEERING

This **Section** of the referenced DCD is incorporated by reference with the following departure(s) and/or supplement(s).

VCS DEP 2.0 -1

Section numbering for this Section is based on Regulatory Guide 1.206 down to the X.Y.Z level, rather than following the AP1000 DCD numbering. Left hand margin annotations indicate where DCD COL Items (VCS COL X.Y-#) have been responded to or supplementary information (VCS SUP X.Y-#) has been added.

{DEPARTURE JUSTIFICATION: Section 2.5 of the AP1000 DCD is not organized in a fashion that readily supports NRC review or applicant presentation of the required information. This administrative change is necessary to present the required information in a regulatory accepted fashion. Marginal annotations direct the reader to the proper location for the information required to be provided. This change is acceptable since it does not alter the nature of the information required to be provided.}

VCS SUP 2.5-1

This section presents information on the geological, seismological, and geotechnical characteristics of the VCSNS Units 2 and 3 site and the region surrounding the site. The data and analyses in this section documents SCE&G's evaluation of the suitability of the site. Section 2.5 provides sufficient information to support evaluations of the site-specific ground motion response spectra and provides information to permit adequate engineering solutions to geologic conditions and seismic effects at the site.

Section 2.5 is divided into five subsections that generally follow the organization of Regulatory Guide 1.206 and one subsection (**Subsection 2.5.6**) retained to follow the DCD organization:

- Subsection 2.5.1** Basic Geologic and Seismic Information
- Subsection 2.5.2** Vibratory Ground Motion
- Subsection 2.5.3** Surface Faulting
- Subsection 2.5.4** Stability of Subsurface Materials and Foundations
- Subsection 2.5.5** Stability of Slopes
- Subsection 2.5.6** Combined License Information for Embankments and Dams

The VCSNS site is located within the Central Piedmont Province, about 20 miles northwest of the Fall Line that separates the Piedmont and Coastal Plain

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physiographic provinces. The site topography consists of gently to moderately rolling hills and generally well-drained mature valleys. Most of the local terrain is mantled by residual soils and saprolite overlying the Winnsboro granitic plutonic complex that intruded the metamorphic country rock consisting of deformed gneiss and amphibolite.

The geological and seismological information presented in this section was developed from a review of previous reports prepared for Unit 1, published geologic literature, interviews with experts in the geology and seismotectonics of the site region, aerial photo analysis, and geologic field work performed for Units 2 and 3 (including new boreholes drilled at the site of Units 2 and 3, and geologic field reconnaissance). A review of published geologic literature supplements and updates the existing geological and seismological information. A list of the references used to compile the geological and seismological information presented in the following subsections is provided.

The review of regional and site geologic, seismic, and geophysical information and an evaluation of the updated earthquake catalog confirmed the use of appropriate EPRI seismic sources in the Probabilistic Seismic Hazard Analysis (PSHA) as well as the need to include updated Charleston and New Madrid seismic source zones to reflect current information on the source geometries, maximum earthquake magnitudes, and recurrence parameters. Borings at the site provided the geologic and geotechnical data to characterize the soil, underlying rock, and shear wave velocities. The field investigation program was supplemented by a laboratory testing program to characterize material properties of both the soil and rock. Boring and shear wave velocity survey data indicate that the seismic Category I structures in the nuclear island will be founded on hard rock.

Bechtel Power Corporation, supported by William Lettis & Associates, Inc. and Risk Engineering, Inc., conducted an assessment of ground motion at the Units 2 and 3 site using the guidance provided in Regulatory Guide 1.208. The starting point for this site assessment is the Electric Power Research Institute - Seismicity Owners Group PSHA evaluation (EPRI NP-6395-D 1989). Regulatory Guide 1.208 incorporates developments in ground motion estimation models; updated models for earthquake sources; methods for determining site response; and new methods for defining a site-specific, performance-based earthquake ground motion that satisfy the requirements of 10 CFR 100.23 and led to the establishment of the safe shutdown earthquake ground motion. The purpose of **Subsection 2.5.2** is to develop the site-specific ground motion response spectrum characterized by horizontal and vertical response spectra determined as free-field motions on hard rock using performance-based procedures. The ground motion response spectrum represents the first step in development of a safe shutdown earthquake for a site as a characterization of the regional and local seismic hazard under Regulatory Position 5.4 of Regulatory Guide 1.208. In the case of the Units 2 and 3 site, the ground motion response spectrum will be used to supplement the certified seismic design response spectra for the Westinghouse AP1000 DCD. The certified seismic design response spectra will be the safe shutdown earthquake for the site for lower frequency ground motions and the site-

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specific ground motion response spectrum will be the safe shutdown earthquake for higher frequency ground motions. The safe shutdown earthquake defined in this way will comprise the vibratory ground motion for which certain structures, systems, and components are qualified.

Subsection 2.5.1.1 describes the geologic and tectonic setting of the site region (200 miles), and **Subsection 2.5.1.2** describes the geology and structural geology of the site vicinity (25 miles), site area (5 miles), and site (0.6 mile). The geological and seismological information was developed in accordance with the guidance presented in NRC Regulatory Guide 1.206, Section 2.5.1, *Basic Geologic and Seismic Information*, and Regulatory Guide 1.208, and is intended to satisfy the requirements of 10 CFR 100.23(c). The geological and seismological information presented in this subsection is used as a basis for evaluating the detailed geologic, seismic, and man-made hazards at the site.

Subsection 2.5.2 describes the methodology used to develop the ground motion response spectrum for the VCSNS site. Regulatory Guide 1.208 further requires that the geological, seismological, and geophysical database is updated and any new data is evaluated to determine whether revisions to the 1986 EPRI seismic source model are required (presented in **Subsection 2.5.2**). This subsection, therefore, provides an update of the geological, seismological, and geophysical database for the Units 2 and 3 site, focusing on whether any data published since 1986 indicates a significant change to the 1986 EPRI seismic source model.

Subsection 2.5.3 documents an evaluation of the potential for tectonic and non-tectonic surface deformation at the Units 2 and 3 site. The data, developed as a result of literature and data reviews, interpretations of aerial and satellite imagery, field and aerial reconnaissance, and discussions with current researchers and an analysis of seismicity with respect to geologic structures, indicates that there are no Quaternary faults or capable tectonic sources within 25 miles of the site.

Subsection 2.5.4 describes the site subsurface investigation consisted of 111 soil and rock borings, 36 cone penetrometer tests, 4 test pits, and geophysical logging including P-S suspension logging. Laboratory testing of soil and rock samples provided data on geotechnical/geoengineering parameters. The seismic Category I nuclear island will be founded on rock or on concrete placed on rock. The seismic Category II annex building will be founded on structural fill placed on rock. Any liquefaction of the saprolitic sand, were it to occur, will not impact the stability of any Units 2 and 3 seismic Category I and II structures since the zone of loading influence of these structures does not reach the saprolitic sands.

As discussed in **Subsection 2.5.5**, the permanent perimeter slopes are at least 600 feet away from the nearest point on the nuclear islands, and at least 500 feet away from the nearest point on the annex buildings. Thus, failure of these slopes, under any of the conditions to which they could be exposed during the life of the plant, will not adversely affect the safety of the nuclear power plant facilities. There will be no significant impact of seepage through the slopes or erosion of the slopes. The temporary slopes that will be installed for plant construction will not adversely affect the safety of the nuclear power plant facilities.

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Subsection 2.5.6 is retained from the DCD for completeness. This subsection explains that there are no dams or embankments required to protect the site.
