Safety Evaluation of the Early Site Permit Application in the Matter of Southern Nuclear Operating Company, for the Vogtle Early Site Permit Site

U.S. Nuclear Regulatory Commission
Office of New Reactors
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ABSTRACT

This safety evaluation report (SER) documents the U.S. Nuclear Regulatory Commission (NRC) staff's technical review of the site safety analysis report (SSAR) and emergency planning information included in the early site permit (ESP) application submitted by Southern Nuclear Operating Company (SNC or the applicant), for the Vogtle Electric Generating Plant (Vogtle or VEGP) site.

By letter dated August 14, 2006, SNC submitted an ESP application for the VEGP site in accordance with Subpart A, "Early Site Permits," of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants." The VEGP site is located in Burke County, Georgia, approximately 26 miles southeast of Augusta, Georgia. In its application, SNC seeks an ESP that could support a future application to construct and operate additional nuclear power reactors at the ESP site with a total nuclear generating capacity of up to 6800 megawatts thermal (MWt). The proposed ESP Units 3 and 4 would be built on the VEGP site adjacent to and west of two existing nuclear power reactors operated by SNC.

This SER presents the results of the staff's review of information submitted in conjunction with the ESP application. The staff has identified open items that the applicant needs to address before the staff can complete its review of the ESP application. Section 1.5 of this report summarizes these items. To resolve these items, the staff needs the additional information identified in this report. The staff will provide its conclusions on the review of the VEGP application in a final safety evaluation report (FSER).

The staff has identified in Appendix A to this SER, certain site-related items that will need to be addressed at the combined license (COL) or construction permit (CP) stage, should an applicant desire to construct one or more new nuclear reactors on the VEGP site. The staff determined that these items do not affect the staff's regulatory findings at the ESP stage and are, for reasons specified in Section 1.7 of the SER, more appropriately addressed at later stages in the licensing process. Appendix A to this SER also identifies the proposed permit conditions that the staff recommends the Commission impose, should an ESP be issued to the applicant.

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EXECUTIVE SUMMARY

The regulations at 10 CFR Part 52 contain requirements for licensing new nuclear power plants.[1] These regulations address ESPs, design certifications, and COLs. The ESP process (10 CFR Part 52, Subpart A) is intended to address and resolve site-related issues. The design certification process (10 CFR Part 52, Subpart B, "Standard Design Certifications") provides a means for a vendor to obtain NRC certification of a particular reactor design. Finally, the COL process (10 CFR Part 52, Subpart C, "Combined Licenses") allows an applicant to seek authorization to construct and operate a new nuclear power plant. A COL may reference an ESP, a certified design, both, or neither. A COL applicant must resolve any licensing issues that were not resolved as part of an ESP or design certification proceeding before the NRC issues a COL.

This SER describes the results of a review by the NRC staff of an ESP application submitted by SNC, for the VEGP site. The staff's review verified, with noted exceptions, the applicant's compliance with the requirements of Subpart A of 10 CFR Part 52. The SER serves to identify the status of completion of the NRC's safety review.

The NRC regulations also contain requirements for an applicant to submit an environmental report pursuant to 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." The NRC reviews the environmental report as part of the Agency's responsibilities under the National Environmental Policy Act of 1969, as amended. The NRC presents the results of that review in a draft environmental impact statement, which is a report separate from this SER.

By letter dated August 14, 2006, SNC, acting on behalf of itself and Georgia Power Company (GPC), Oglethorpe Power Corporation (an electric membership corporation), Municipal Electric Authority of Georgia, and the City of Dalton, Georgia, an incorporated municipality in the State of Georgia acting by and through its Board of Water, Light and Sinking Fund Commissioners, submitted an ESP application (ADAMS Accession No. ML062290246)[2] for the VEGP site. The VEGP site is located on a coastal plain bluff on the southwest side of the Savannah River in eastern Burke County, Georgia. The site is approximately 26 miles southeast of Augusta, Georgia and 100 miles northwest of Savannah, Georgia. Directly across from the site, on the eastern side of the Savannah River, is the U.S. Department of Energy's (DOE's) Savannah River Site in Barnwell County, South Carolina. The proposed ESP Units 3 and 4 would be built

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1. Applicants may also choose to seek a CP and operating license in accordance with 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," instead of using the 10 CFR Part 52 process.

2. ADAMS (Agencywide Documents Access and Management System) is the NRC's information system that provides access to all image and text documents that the NRC has made public since November 1, 1999, as well as bibliographic records (some with abstracts and full text) that the NRC made public before November 1999. Documents available to the public may be accessed via the Internet at http://www.nrc.gov/reading-rm/adams/web-based.html. Documents may also be viewed by visiting the NRC's Public Document Room at One White Flint North, 11555 Rockville Pike, Rockville, Maryland. Telephone assistance for using web-based ADAMS is available at (800) 397-4209 between 8:30 a.m. and 4:15 p.m., eastern standard time, Monday through Friday, except Federal holidays. The staff is also making this SER available on the NRC's new reactor licensing public web site at http://www.nrc.gov/reactors/new-licensing/esp/vogtle.html.

on the VEGP site adjacent to two existing nuclear power reactors, Vogtle, Units 1 and 2, operated by SNC.

In accordance with 10 CFR Part 52, the VEGP application includes (1) a description of the site and nearby areas that could affect or be affected by a nuclear power plant(s) located at the site, (2) a safety assessment of the site on which the facility would be located, including an analysis and evaluation of the major structures, systems, and components (SSC) of the facility that bear significantly on the acceptability of the site, and (3) a complete and integrated emergency plan. The application describes how the site complies with the requirements of 10 CFR Part 52 and the siting criteria of 10 CFR Part 100, "Reactor Site Criteria."[3]

The SER presents the status of the staff's review of information the applicant submitted to the NRC through June 14, 2007. The staff has identified open items that the applicant must resolve before the NRC can complete its review of the ESP application. Section 1.5 of this SER summarizes these items. To close these items, the staff needs the additional information identified in this SER. The staff will provide the conclusions of its review of the VEGP application in the FSER.

The staff has identified, in Appendix A to this SER, the proposed permit conditions that it will recommend the Commission impose, if an ESP is issued to the applicant. Appendix A also includes a list of COL action items or certain site-related items that will need to be addressed at the COL or CP stage, if an applicant desires to construct one or more new nuclear reactors on the VEGP site. The staff determined that these items do not affect the staff's regulatory findings at the ESP stage and are, for reasons specified in Section 1.6, more appropriately addressed at these later stages in the licensing process. In addition, Appendix A lists the site characteristics and the bounding parameters identified by the staff for this site.

Inspections conducted by the NRC have verified, where appropriate, the conclusions in this SER. The inspections focused on selected information in the ESP application and its references. The SER identifies applicable inspection reports as reference documents.

The NRC's Advisory Committee on Reactor Safeguards (ACRS) will also review the bases for the conclusions in this report. The ACRS will independently review those aspects of the application that concern safety, as well as the SER, and will report the results of its review to the Commission. The NRC will include the ACRS comments and recommendations, and the staff's responses to them, in the FSER.

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3. The applicant has also submitted information intended to partially address some of the general design criteria (GDC) in Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50. Only GDC 2, "Design Bases for Protection Against Natural Phenomena," applies to an ESP application, and it does so only to the extent necessary to determine the safe-shutdown earthquake (SSE) and the seismically induced flood. The staff has explicitly addressed partial compliance with GDC 2, in accordance with 10 CFR 52.17(a)(1) and 10 CFR 50.34(a)(12), only in connection with the applicant's analysis of the SSE and the seismically induced flood. Otherwise, an ESP applicant need not demonstrate compliance with the GDC. The staff has included a statement to this effect in those sections of the SER that do not relate to the SSE or the seismically induced flood. Nonetheless, this SER describes the staff's evaluation of information submitted by the applicant to address GDC 2.

ABBREVIATIONS

ACRS	Advisory Committee on Reactor Safeguards
ADAMS	Agencywide Documents Access and Management System
ADL	administrative decision line
AF	amplification functions
AFCCC	Air Force Combat Climatology Center
ANSI	American National Standards Institute
ANSS	Advanced National Seismic System
ARC	American Red Cross
AREOP	Annual Radiological Environmental Operating Report
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
Bechtel	Bechtel Power Corporation
BLWM	Bureau of Land and Waste Management
BRH	Bureau of Radiological Health
CAR	Corrective Action Reports
CDE	committed dose equivalent
CEUS	Central and Eastern United States
CFR	Code of Federal Regulations
COL	combined operating license
CP	construction permit
CPT	(seismic) cone penetrometer test
CR	condition report
Cs	cesium
CVSZ	Central Virginia Seismic Zone

DBA	design-basis accident
Dbar	mean distance
DCD	design control document
DF	design factor
DFCS	Department of Family and Children Services
DHEC	Department of Health and Environmental Control
DHS	Department of Homeland Security
DNR	Department of Natural Resources
DOE	Department of Energy
DOE-SR	Department of Energy, Savannah River Operations
DOT	Department of Transportation
DQ	Deposition factors
DS	Document Services
EAB	exclusion area boundary
EAL	emergency action level
EAS	emergency alert system
ECFS	East Coast Fault System
EF	Enhanced-Fujita
ECMA	East Coast Magnetic Anomaly
ECL	emergency classification levels
EIP	emergency implementing procedures
EMA	Emergency Management Agency
EMS	emergency medical services
ENC	Emergency News Center
ENN	Emergency Notification Network
ENS	emergency notification system
EOC	emergency operations center
EOF	emergency operations facility

EOP	emergency operating procedures
EPA	Environmental Protection Agency
EPC	emergency preparedness coordinator
EPD	Environmental Protection Division
EPIP	emergency plan implementing procedures
EPRI	Electric Power Research Institute
EPZ	Emergency Planning Zone
ERDS	emergency response data system
ERF	emergency response facilities
ERO	emergency response organization
ESBWR	Economic Simplified Boiling Water Reactor
ESF	Emergency Support Function
ESP	early site permit
ETE	evacuation time estimate
ETML	elevated temperature material liquids
ETSZ	Eastern Tennessee Seismic Zone
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FEOC	Forward Emergency Operations Center
FEMA	Federal Emergency Management Agency
FNARS	Federal National Alert Radio System
FNF	fixed nuclear facility
FRC	Federal Response Center
FRERP	Federal Radiological Emergency Response Plan
FRMAC	Federal Radiological Monitoring and Assessment Center
FSAR	final safety analysis report
FSER	final safety evaluation report
GA REP	Georgia Radiological Emergency Plan

GBU	Global Business Unit
GCSZ	Giles County Seismic Zone
GDC	general design criterion/criteria
Ge (Li)	lithium drifted germanium
GEMA	Georgia Emergency Management Agency
Georgia Tech	Georgia Institute of Technology
GEOP	Georgia Emergency Operations Plan
GET	general employee training
GIS	Geographic information system
GMRS	ground motion response spectrum
GPC	Georgia Power Company
h	hour
HEPA	high-efficient particulate air
HHS	Department of Health and Human Services
HP	health physics
HPN	Health Physics Network
I	Iodine
IC	initiating condition
ICC	Intrastate Coordinating Channel
IEM	Innovative Emergency Management, Inc.
INPO	Institute of Nuclear Power Operators
IPCC	Intergovernmental Panel on Climate Change
ITAAC	inspections, tests, analyses, and acceptance criteria
JFD	joint frequency distribution
JIC	joint information center
KI	potassium iodide
lbf/ft2	pounds-force per square foot
LGR	local government radio

LLEA	local law enforcement agencies
LLNL	Lawrence Livermore National Laboratory
LOCA	loss-of-coolant accident
LPZ	low-population zone
LWR	light-water reactor
m	meter
Mbar	mean magnitude
m/s	meters per second
M&TE	measuring and test equipment
MACTEC	MACTEC Engineering and Consulting, Inc.
MAST	Military Assistance to Safety and Traffic
MIDAS	Meteorological Information and Dispersion Assessment Code
MMI	modified mercalli intensity
MOA	Military Operation Area
MOU	memorandum of understanding
MOX	mixed oxide
MPA	methoxypropylamine
mya	million years ago
NaI	sodium iodide
NAWAS	National Warning System
NCDC	National Climatic Data Center
ND	Nuclear Development
NDQAM	Nuclear Development Quality Assurance Manual
NEI	Nuclear Energy Institute
NMSZ	New Madrid Seismic Zone
NOAA	National Oceanic and Atmospheric Administration
NOAA-CSC	National Oceanic and Atmospheric Administration-Coastal Services Center
NQAM	Nuclear Quality Assurance Manual

NRC	U.S. Nuclear Regulatory Commission
NREES	Nuclear Response and Emergency Environmental Surveillance Section
NRP	National Response Plan
NSSL	National Severe Storms Laboratory
NSSS	nuclear steam supply system
NUREG	NRC technical report (Nuclear Regulatory Commission)
NWR	National Weather Radio
NWS	National Weather Service
NYAL	New York-Alabama Lineament
OCA	owner-controlled area
OCGA	Official Code of Georgia Annotated
ODCM	offsite dose calculation manual
ORHMC	Oak Ridge Hospital of the Methodist Church
OSC	operational support center
PA	protected area
PAG	protective action guideline
PAR	protective action recommendation
PCS	Passive containment cooling system (NRC defines passive containment system)
PI	plasticity index
PIO	public information officer
PGA	peak ground acceleration
PMP	probable maximum precipitation
PMWP	probable maximum winter precipitation
PNS	prompt notification system
PO	purchase order
PQAM	Project Quality Assurance Manager
P-S	primary and secondary

PSHA	probabilistic seismic hazard analysis
PWR	pressurized-water reactor
QA	quality assurance
QAPD	Quality Assurance Project Development
QAPP	Quality Assurance Program Plan
RAI	Request for additional information
RAP	Radiological Assistance Program
RASCAL	Radiological Assessment System for Consequence Analysis
RCL	Record Control Log
REI	Risk Engineering, Inc.
RER	radiological emergency response
RERP	radiological emergency response plan
RG	regulatory guide
RIS	Regulatory Issue Summary
RMC	Radiation Management Consultants
RS	review standard
SCDOT	South Carolina Department of Transportation
SCEMD	South Carolina Emergency Management Division
SCEOP	South Carolina Emergency Operations Plan
SCETV	South Carolina educational television network
SCORERP	South Carolina Operational Radiological Emergency Response Plan
SCR	stable continental region
SCS	Southern Company Services, Inc.
SCTRERP	South Carolina Technical Radiological Emergency Response Plan
SEI	Structural Engineering Institute
SEOC	State Emergency Operations Center
SER	safety evaluation report

SERCC	Southeast Regional Climate Center
SERT	State Emergency Response Team
SEUSS	South Eastern United States Seismic Network
SL	severity level
SLED	South Carolina Law Enforcement Division
SMRAP	Southern Agreement for Mutual State Radiation Assistance Activation Procedure
SNC	Southern Nuclear Operating Company
SOC	State Operations Center
SOP	Standard Operating Procedure
SQAP	Software Quality Assurance Plan
Sr	strontium
SRNL	Savannah River National Laboratory
SRP	Standard Review Plan
SRS	Savannah River Site
SSAR	site safety analysis report
SSC	systems, structures, and components
SSE	safe-shutdown earthquake
SSHAC	Senior Seismic Hazard Advisory Committee
TAG	Technical Advisory Group
TEDE	total effective dose equivalent
TFI	technical facilitator/integrator
TI	Technical Integrator
TIP	Trial Implementation Project
TLD	thermoluminescent dosimeter
TNT	trinitrotoluene
TSC	Technical Support Center
TtNUS	Tetra Tech, Inc.
TV	threshold value

UCSS	Updated Charleston Seismic Source
UHRS	uniform hazard response spectrum
UHS	ultimate heat sink
USCB	U. S. Census Bureau
USDA	U. S. Department of Agriculture
USGS	U. S. Geological Survey
UTM	Universal Transverse Mercator
VEGP	Vogtle Electric Generating Plant
V/H	vertical-to-horizontal
VHF	very high frequency
VOAD	Voluntary Organizations Active in Disaster
WES	Westinghouse Electric Company, LLC
WLA	William Lettis & Associates
WMA	Wildlife Management Area
WSRC	Washington Savannah River Company
WUS	Western United States
χ/Q	atmospheric dispersion factor
ZRA	zone of river anomalies

1.0 INTRODUCTION AND GENERAL DESCRIPTION

1.1 Introduction

SNC, acting on behalf of itself and the owners of the VEGP site, filed an application with the NRC, docketed on September 19, 2006, for an ESP for a site the applicant designated as the VEGP site. SNC requested an ESP with a permit duration of 20 years pursuant to Subpart A of 10 CFR Part 52. The proposed site is located in eastern Burke County, GA, approximately 26 miles (mi) southeast of Augusta, GA, and approximately 100 mi northwest of Savannah, GA.

To the extent possible at this time, the staff has completed its review of the information presented in the VEGP application concerning the site's meteorology, hydrology, geology, and seismology, as well as the potential hazards to a nuclear power plant that could result from manmade facilities and activities on or in the vicinity of the site. The staff also assessed the risks of potential accidents that could occur as a result of the operation of a nuclear plant(s) at the site and evaluated whether the site would support adequate physical security measures for a nuclear power plant(s). The staff evaluated whether the applicant's quality assurance measures were equivalent in substance to the measures discussed in Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50. The NRC found that the applicant's measures provide reasonable assurance that the information derived from ESP activities that could be used in the design and/or construction of SSCs important to safety would support satisfactory performance of such SSCs once they were in service. The staff also evaluated the adequacy of the applicant's program for compliance with 10 CFR Part 21, "Reporting of Defects and Noncompliance." Finally, the staff reviewed the complete and integrated emergency plan that SNC would implement if a new reactor(s) is eventually constructed at the ESP site.

The VEGP application includes the SSAR, which describes a safety assessment of the site, as required by 10 CFR 52.17, "Contents of Applications." The public may inspect copies of the ESP application in ADAMS under Accession No. ML071710055. The application is also available for public inspection at the NRC's Public Document Room at One White Flint North, 11555 Rockville Pike, Rockville, MD 20852, and at the Burke County Public Library, 130 Highway 24 South, Waynesboro, GA 30830. As updated versions of the ESP application are received, they will also be available at these same locations.

This SER summarizes the results of the staff's technical evaluation of the suitability of the proposed VEGP site for construction and operation of a nuclear power plant(s) falling within the design parameters that SNC specified in its application. The SER delineates the scope of the technical matters that the staff considered in evaluating the suitability of the site. NRC Review Standard (RS)-002, "Processing Applications for Early Site Permits," Attachment 2, provides additional details on the scope and bases of the staff's review of the radiological safety and emergency planning aspects of a proposed nuclear power plant site. RS-002, Attachment 2, contains regulatory guidance based on NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (hereafter referred to as the SRP). The SRP reflects the staff's many years of experience in establishing and promulgating guidance to enhance the safety of nuclear facilities, as well as in evaluating safety assessments.

The applicant also filed an environmental report for the VEGP site in which it evaluated those matters relating to the environmental impact assessment that can be reasonably reviewed at this time. The staff will discuss the results of its evaluation of the environmental report for the VEGP site in a draft environmental impact statement (DEIS). The applicant has also provided a site redress plan, in accordance with 10 CFR 52.17(c), in order to perform the site preparation and preliminary construction activities allowed by 10 CFR 52.25(a) (i.e., in the activities listed in 10 CFR 50.10(e)(1)). The DEIS will summarize the results of the staff's evaluation of the SNC site redress plan.

Appendix A to this SER contains the list of site characteristics, permit conditions, COL action items, and the bounding parameters that the staff recommends the Commission include in any ESP that might be issued for the proposed site. Appendix B to the SER is a chronology of the principal actions and correspondence related to the staff's review of the ESP application for the VEGP site. Appendix C lists the references for this SER, and Appendix D lists the principal contributors to this report.

1.2 General Site Description

Proposed ESP Units 3 and 4 are planned to be built on the VEGP site. The VEGP site, which spans 3,169 acres, is located on a coastal plain bluff on the southwest side of the Savannah River in eastern Burke County. The site is approximately 15 miles east-northeast of Waynesboro, GA, 26 miles southeast of Augusta, GA, and it is also approximately 100 miles from Savannah, GA. Directly east of the site, across the Savannah river, is the DOE's Savannah River Site.

Numerous small towns exist within 50 miles of the site. U.S. Interstate Highway No. I-20 (I-20), a major interstate highway, crosses the northern portion of the 50-mile radius. The site can be accessed through U.S. Route 25; Georgia State Routes 23, 24, 56, and 80; and New River Road. A navigation channel is authorized on the Savannah River from the Port of Savannah to Augusta, GA and a railroad spur connects the site to the Norfolk Southern Savannah-to-Augusta track. The applicant's SSAR Figures 1-1 and 1-2 show the site location and a 6-mile and 50-mile radius. Section 2.1 of this SER discusses the site location in more detail.

With regard to the existing development of the site, the VEGP site currently has two Westinghouse pressurized water reactors (PWRs), rated at 3,565 Mwt. Also on the site are their supporting structures, which include two natural-draft cooling towers (one per unit), associated pumping and discharge structures, water treatment building, switchyard, and training center. Plant Wilson, a six-unit, oil-fueled combustion turbine facility, is also located on the VEGP site, east of Units 1 and 2. The applicant's SSAR Figure 1-3 shows the current VEGP site plan.

With regard to the proposed development of the site, the new plant footprint selected for proposed Units 3 and 4 is adjacent to the west side of the VEGP Units 1 and 2. The footprint is shown on the applicant's SSAR Figure 1-4.

The applicant has selected the Westinghouse AP1000 certified reactor design for the ESP application. The applicant's SSAR Section 1.3 identifies the design parameters, site characteristics, and site interface values used in the development of the ESP application. The

design parameters are based on the addition of two Westinghouse AP1000 units, to be designated Vogtle Units 3 and 4. The AP1000 has a thermal power rating of 3,400 MWt and a net electrical output of 1,117 megawatts electric.

1.3 Identification of Agents and Contractors

SNC is the applicant for the ESP and has been the only participant in the review of the suitability of the VEGP site for a nuclear power plant. Bechtel Power Corporation (Bechtel) served as the principal contractor for the development of the SSAR portion of the ESP application and Tetra Tech NUS, Inc. (TtNUS), to assist with preparing the environmental report portion. Both Bechtel and TtNUS supplied personnel, systems, project management, and resources to work on an integrated team with SNC.

Several subcontractors also assisted in the development of SNC's ESP application. MACTEC Engineering and Consulting, Inc., performed geotechnical field investigations and laboratory testing in support of SSAR Section 2.5, "Geology, Seismology, and Geotechnical Engineering." William Lettis & Associates, Inc., performed geologic mapping and characterized seismic sources in support of SSAR Section 2.5. Risk Engineering, Inc., performed probabilistic seismic hazard assessments (PSHA) and related sensitivity analyses in support of SSAR Section 2.5.

1.4 Summary of Principal Review Matters

This SER summarizes the results of the NRC staff's technical evaluation of the VEGP site. The staff's evaluation included a technical review of the information and data the applicant submitted, with emphasis on the following principal matters:

- population density and land use characteristics of the site environs and the physical characteristics of the site, including meteorology, hydrology, geology, and seismology, to evaluate whether these characteristics were adequately described and appropriately considered in determining whether the site characteristics are in accordance with the Commission's siting criteria (10 CFR Part 100, Subpart B, "Evaluation Factors for Stationary Power Reactor Site Applications on or After January 10, 1997")

- potential hazards of man-made facilities and activities to a nuclear power plant(s) that might be constructed on the ESP site (e.g., mishaps involving storage of hazardous materials (toxic chemicals, explosives), transportation accidents (aircraft, marine traffic, railways, pipelines), and the existing nuclear power plant at the nearby VEGP units)

- potential capability of the site to support the construction and operation of a nuclear power plant(s) with design parameters falling within those specified in the application under the requirements of 10 CFR Parts 52 and 100

- suitability of the site for development of adequate physical security plans and measures for a nuclear power plant(s)

- proposed complete and integrated emergency plan, should an applicant decide to seek a license to construct and operate a nuclear power plant(s) on the ESP site, any

significant impediments to the development of emergency plans for the VEGP site, and a description of contacts and arrangements made with Federal, State, and local government agencies with emergency planning responsibilities

- quality assurance measures SNC applied to the information submitted in support of the ESP application and safety assessment

- the acceptability of the applicant's proposed exclusion area and low-population zone (LPZ) under the dose consequence evaluation factors of 10 CFR 50.34(a)(1)

During its review, the staff held several meetings with representatives of SNC and its contractors and consultants to discuss various technical matters related to the staff's review of the VEGP site (refer to Appendix B to this SER). The staff also visited the site to evaluate safety matters.

1.5 Summary of Open and Confirmatory Items

As of the completion of this SER, the staff requires additional information from the applicant regarding certain matters. The individual sections of the SER refer to these issues as open items. The staff assigns each of these issues an identifying number for tracking purposes. Table 1.6-1 lists each open item, the SER section in which it appears, and the subject matter to which it is related. Completion of the staff's FSER on the current schedule depends on the applicant's timely submission of sufficient information to allow the staff to review and resolve each open item.

Table 1.5-1 - Open Items

Open Item No.	SER Section	Subject
2.3-1	2.3.1	Calculate the following AP1000 specific temperature site characteristics based on a 100-year return period. ● Maximum safety dry-bulb temperature with a coincident wet-bulb temperature ● Maximum safety noncoincident wet-bulb temperature
2.4-1	2.4.8	The NRC staff reviewed the information provided by the applicant in the SSAR. The NRC staff concluded that as proposed in the application, the new VEGP Units 3 and 4 will not rely on any external water source for safety-related cooling water. The applicant did not propose any safety-related canals or reservoirs as a source for cooling water. However, there will be the need for safety-related water for initial filling and occasional makeup purposes. Therefore, the applicant should provide design parameters for these values.

Open Item No.	SER Section	Subject
2.4-2	2.4.12	The applicant should provide an improved and complete description of the current and future local hydrological conditions, including alternate conceptual models, to demonstrate that the design bases related to groundwater-induced loadings on subsurface portions of safety-related SSCs would not be exceeded. Alternatively, the applicant can provide design parameters for buoyancy evaluation of the plant structures.
2.4-3	2.4.13	The NRC staff found the applicant's analysis in the SSAR to be incomplete; because it did not include consideration for the inevitable change in hydrology, and, hence, the potential change in flow direction within the Water Table aquifer for some release locations within the protected area (PA). The applicant's analysis provided no assurance that an adequate number of combinations of release locations and feasible pathways had been considered.
2.4-4	2.4.13	The NRC staff's review of the release location, migration, attenuation, and dilution of the radioactive liquid effluent inventory was incomplete because, as stated in Open Item 2.4-3, the applicant has not considered a sufficient number of alternate conceptual models to identify potential release points and pathways. Therefore, the applicant needs to specify the nearest point along each potential pathway that may be accessible to the public.
2.5-1	2.5.2	Provide additional justification to support the low weights for the larger M_{max} values for the Electric Power Research Institute (EPRI) seismic source zones that include the ESP site.
2.5-2	2.5.2	Provide an evaluation of any information contained in the Trial Implementation Project (TIP) study that is relevant to the seismic source characterization of the ESP site.
2.5-3	2.5.2	Provide additional justification to support the low weights for the larger M_{max} for the Eastern Tennessee seismic zone. In addition, provide additional information to show that the Eastern Tennessee seismic zone does not significantly contribute to the hazard at the ESP site if larger M_{max} values are considered.
2.5-4	2.5.2	Because the staff received the requested information from the applicant on June 18, 2007, it requires additional time to complete its review of the applicant's response to Request for Additional Information (RAI) 2.5.2-4. In addition, the staff requests that the applicant explain why only two of the four members of the Technical Advisory Group (TAG) panel reviewed and approved written copies of the engineering report describing the Updated Charleston Seismic Source (UCSS), as stated in it response to RAI 2.5.2-4.

Open Item No.	SER Section	Subject
2.5-5	2.5.2	Provide supporting evidence to rule out the occurrence of large inland earthquakes.
2.5-6	2.5.2	Because the staff received the requested information from the applicant on June 18, 2007, it requires additional time to complete its review of the applicant's supplemental response to RAI 2.5.2-19. In addition, address the differences between the Step 6 of the site response methodology description provided in response to RAI 2.5.2-19 with the information provided in the SSAR.
2.5-7	2.5.2	Provide further justification to support the claim that the equivalent-linear approach is suitable for higher strain levels.
2.5-8	2.5.2	Because the staff received the requested information from the applicant on June 18, 2007, it requires additional time to complete its review of the applicant's response to RAI 2.5.2-3. No additional information is requested from the applicant for this open item.
2.5-9	2.5.2	Provide further justification regarding the applicability of the Lee (2001) and the NUREG/CR-6728 V/H ratios to the ESP site. In addition, provide justification for the use of an approximate envelope of the Lee (2001) and the NUREG/CR-6728 V/H ratios.
2.5-10	2.5.3	Provide a more detailed description of the geometry and appearance of the injection sand dikes and their spatial association with dissolution depressions (including photographs of this feature, if available).
2.5-11	2.5.4	Conduct sufficient field and laboratory tests to reliably determine static and dynamic property values, (instead of using the values from previous investigation) for the soils beneath the Blue Bluff Mart at the ESP site.
2.5-12	2.5.4	Provide sufficient data to derive reliably the undrained shear strength value for the Blue Bluff Marl, instead of using the values from previous investigation.
2.5-13	2.5.4	Calculate preconsolidation pressure and OCRs for the Blue Bluff Marl using the reliable undrained shear strength based on sufficient test data (instead of using the data from previous investigation) from the ESP investigation.
2.5-14	2.5.4	Provide reliable effective angles of internal friction for the subsurface soils, instead of using the values from previous investigation.
2.5-15	2.5.4	Provide information to demonstrate that the marl will behave as a hard clay or soft rock material and thus not need to be addressed with relative density.

Open Item No.	SER Section	Subject
2.5-16	2.5.4	Determine elastic modulus E using sufficient site-specific (ESP investigation) SPT N values for the Upper and Lower Sand Strata.
2.5-17	2.5.4	Calculate Unit Weight values for the ESP subsurface soils using sufficient ESP investigation data, instead of using the values from previous investigations.
2.5-18	2.5.4	Define site-specific shear wave velocity profile using sufficient shear wave velocity measurements from the ESP investigation.
2.5-19	2.5.4	Provide site-specific soil degradation and damping ratio curves for ESP soil amplification calculation.
2.5-20	2.5.4	Revise SSAR Sections 2.5.2.5.1.5, 2.5.4.7.2.1, and 2.5.4.7.2.2, along with associated tables and figures, to show the degradation curves only at a 1 percent or less cyclic shear strain.
2.5-21	2.5.4	Confirm that the Blue Bluff Marl is not liquefiable with sufficient ESP soil property data.
2.5-22	2.5.4	Provide appropriate bearing capacity with consideration of factors, 1) settlements; 2) allowable pressures used in design of the wall/basemat intersection; and 3) toe pressures developed during potential overturning and sliding of the facility.
13.3-1	13.3	Provide the bases for why Unit 3 inspections, tests, analyses and acceptance criteria (ITAAC) 9.1 will demonstrate sufficiency of the ITAAC in relation to Unit 4, or supplement Table V2A4-1 with comparable Unit 4 ITAAC.
13.3-2	13.3	Provide an adequate basis for the 75-minute staff augmentation time in ESP Plan Table B-1 for Units 3 and 4.
13.3-3	13.3	Provide a letter of agreement from Radiation Management Consultants (RMC), current at the time of the application and has not expired.
13.3-4	13.3	The review and acceptance of the application's Emergency Action Levels (EALs) for Units 3 and 4.
13.3-5	13.3	Revise Unit 3 ITAAC 6.5 to accurately reflect the corresponding allowable generic ITAAC (consistent with RG 1.206).

Open Item No.	SER Section	Subject
13.3-6	13.3	The applicant must either provide the bases for why Unit 3 ITAAC criteria 6.1 - 6.3 and 6.5 - 6.7 will demonstrate the sufficiency of the ITAAC in relation to Unit 4 (i.e., describe why these are not site-specific and reflect both Unit 3 and Unit 4), or supplement Table V2A4-1 with comparable Unit 4 ITAAC; as was done for ITAAC 6.4. (The completion of the Unit 3 ITAAC, which demonstrates that the acceptance criteria have been met – to the extent that they apply to equipment and systems common to Unit 4 – would not have to be repeated as part of the Unit 4 ITAAC; only those capabilities specific to Unit 4.)
13.3-7	13.3	Update the Burke County Emergency Plan, including review and approval by the Burke County Emergency Management Agency (EMA) Director.
13.3-8	13.3	Resolve the apparent inconsistency of the use of buses to evacuate non-auto-owning residents, and evaluate the time to mobilize the buses, travel through the emergency planning zone (EPZ) to pick up residents, and then exit the EPZ.
13.3-9	13.3	Explain how the sportsmen population numbers for zones G-10 and H-10 (200 each) were derived, and clarify the sportsmen population associated with the Yuchi Wildlife Management Area.
13.3-10	13.3	Discuss whether State & local agencies have reviewed the (new) ETE and provided comments, and discuss the resolution of those comments (including impact on existing offsite plans, in relation to the ESP application).
13.3-11	13.3	Verify the population numbers used in the MIDAS software, and update the software to reflect the new population numbers.
13.3-12	13.3	Revise the non-specific (*should be*) terminology in ITAAC 8.1 to include objective acceptance criteria (the completion of which is easily discernible).
13.3-13	13.3	Provide the bases for why Unit 3 ITAAC 8.1 will demonstrate the sufficiency of the ITAAC in relation to Unit 4, or supplement Table V2A4-1 with comparable Unit 4 ITAAC.

1.6 Summary of Combined License Action Items

The staff has also identified certain site-related items that will need to be addressed at the COL or CP stage if a COL or CP applicant desires to construct one or more new nuclear reactors on the VEGP site. This report refers to these items as COL action items. The COL action items relate to issues that are outside the scope of this SER. The COL action items do not establish requirements; rather, they identify an acceptable set of information to be included in the site-specific portion of the safety analysis report submitted by a COL or CP applicant referencing the VEGP. An applicant for a COL or CP will need to address each of these items in its application. The applicant may deviate from or omit these items, provided that the COL or CP application identifies and justifies the deviation or omission. The staff determined that the COL action items do not affect its regulatory findings at the ESP stage and are, for reasons specified in this report for each item, more appropriately addressed at later stages in the licensing process.

Appendix A to this SER includes a list of the COL action items to be addressed by a future COL or CP applicant. The staff identified COL action items in order to ensure that particular significant issues are tracked and considered during the COL or CP stage. The COL action items focus on matters that may be significant in any COL or CP application referencing the ESP for the Vogtle site, if one is issued. Usually, COL action items are not necessary for issues covered by permit conditions or explicitly covered by the bounding parameters. The list of COL action items is not exhaustive.

1.7 Summary of Permit Conditions

The staff has identified certain permit conditions that it will recommend the Commission impose if an ESP is issued to the applicant. Appendix A to this SER summarizes these conditions. Each permit condition has been assigned a number identifying the order which it appears in this SER. The staff has provided an explanation of each permit condition in the applicable section of this report. These permit conditions, or limitations on the ESP, are based on the provisions of 10 CFR 52.24, “Issuance of Early Site Permit.”