

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

3.0 PROPOSED ACTION

NRC

“The report must contain a description of the proposed action, including the applicant’s plans to modify the facility or its administrative control procedures....This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment...” 10 CFR 51.53(c)(2)

South Carolina Electric & Gas Company (SCE&G) proposes that the U.S. Nuclear Regulatory Commission (NRC) renew the operating license for V.C. Summer Nuclear Station Unit 1 (VCSNS) for an additional 20 years. Renewal would give SCE&G and the State of South Carolina the option of relying on VCSNS to meet future needs for electricity. Section 3.1 discusses the plant in general. Sections 3.2 through 3.4 address potential changes that license renewal could effect.

3.1 General Plant Information

General information about VCSNS is available in several documents. In 1973, the U.S. Atomic Energy Commission, the predecessor agency of NRC, prepared a Final Environmental Statement (FES) for construction and operation of VCSNS (USAEC 1973). In 1981, the NRC prepared an FES for operation of VCSNS (NRC 1981). The NRC *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996) describes important VCSNS features and, in accordance with NRC requirements, SCE&G maintains an updated Final Safety Analysis Report for the station. SCE&G has referred to each of these documents while preparing this environmental report for license renewal.

3.1.1 Reactor and Containment Systems

VCSNS is a single-unit plant with a domed concrete containment building. The station includes a pressurized light-water reactor nuclear steam supply system designed and furnished by Westinghouse Electric Company and a turbine generator manufactured, designed, and furnished by General Electric Corporation. It achieved initial criticality in October 1982 and began commercial operation in January 1983 (SCE&G 2002).

The reactor containment structure is a steel-lined, reinforced-concrete, 154-foot-diameter cylinder with a hemispheric dome and a flat reinforced concrete foundation mat (SCE&G 2002). The containment is designed to withstand an internal pressure of 57 pounds per square inch above atmospheric pressure (57 psig). Air pressure for routine operation inside the containment structure is maintained below atmospheric pressure. With its engineered safety features, the containment structure (Reactor Building) is designed to withstand severe weather (e.g., tornadoes and hurricanes) and provide radiation protection during normal operations and design-basis accidents. VCSNS fuel is slightly enriched uranium dioxide; the fuel enrichment is less than 4.95 percent by weight

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

uranium 235. SCE&G operates the reactor at a typical cycle burnup rate of 22,000 megawatt-days per metric ton uranium.

As originally designed and operated, VCSNS had a core thermal rating of 2,775 megawatts-thermal (MWt) and a maximum dependable electrical capacity of approximately 900 megawatts-electrical (MWe). The Station's three Westinghouse Model D-3 steam generators were replaced with new Westinghouse Delta-75 generators in the fall of 1994 during Refueling Outage 8 (SCE&G 1995). Following the steam generator replacement and subsequent changes in plant operating conditions, the Station's core power level was uprated (in May 1996) to a nominal value of 2,900 MWt (SCE&G 1997). At the same time, the Station's maximum dependable electrical capacity was increased to 945 MWe. The NRC prepared an Environmental Assessment in 1996 (61 Federal Register 16272-16273, April 12, 1996) that examined potential environmental impacts of the uprate and concluded with a Finding of No Significant Impact (FONSI).

In August 1997, VCSNS made instrumentation changes that improved the accuracy of the measurement of thermal power. This resulted in a 9-megawatt increase in indicated electrical power output, to 954 MWe. The most recent change, which occurred in the spring of 1999 during Refueling Outage 11, involved replacement of the High Pressure Turbine Rotor with a more efficient model. This increased the maximum dependable electrical capacity of the station (which equates to net electrical output) to 966 MWe (SCE&G 2000).

SCE&G projected that increasing the core power level from 2,775 MWt to 2,900 MWt would increase the heat rejected to the environment by approximately 3 percent, to a maximum of 6.4×10^9 Btu/hr (61 Federal Register 16272-16273, April 12, 1996). This value was below the heat rejection rate (6.67×10^9 Btu/hr) evaluated and found environmentally acceptable in the FES for operation of the Station (NRC 1981). However, to limit the heat load rejected to Monticello Reservoir, SCE&G installed the Turbine Building Closed-Cycle Cooling Water System in 1996 to provide cooling for certain station loads that were previously handled by the circulating water system.

The Turbine Building Closed-Cycle Cooling Water System supplies cooling water to equipment associated with the turbine, generator, and other non-nuclear systems in the Turbine Building. This system uses a forced-draft (closed-cycle) cooling tower with four fans and eight cooling coils to reject waste heat to the atmosphere. The cooling tower structure is 86.9 feet by 41.9 feet with a maximum elevation of 459.5 feet (grade elevation is 435.0 feet) (Byrne 1996). The cooling tower is located outside of the protected area fence, in a previously-unused area approximately 500 feet northwest of the Reactor Building.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Under normal operation, one of the two closed-cycle cooling water pumps circulates treated water through the cooling tower coils, transferring heat removed from the various components to the spray water and then to the atmosphere by evaporation of the spray water in the air stream produced by the cooling tower fans. The Turbine Building Closed-Cycle Cooling Water System is independent of plant emergency cooling facilities, and is not required for reactor protection or safe shutdown (SCE&G 2002).

3.1.2 Cooling and Auxiliary Water Systems

3.1.2.1 Surface Water

The circulating water system at VCSNS is designed to remove 6.67×10^9 BTU/hr of heat from the main and auxiliary condensers as well as the turbine auxiliaries (NRC 1981, pg. 3-2). Cooling water is withdrawn from Monticello Reservoir at a rate of approximately 513,000 gallons per minute (gpm), passed through the condensers, and ultimately returned to Monticello Reservoir. The FES (NRC 1981) and other environmental assessments and evaluations prepared in the 1970s and 1980s report the circulating water flow as 534,000 gpm; studies of system efficiency in 1990 showed the actual flow to be approximately 513,000 gpm (Skolds 1990). The intake structure, located along the south shoreline of the reservoir, has three pump bays, each with two entrances. Each entrance is 13 feet wide and 25.5 feet high, extending from the bottom of the pump house (elevation 390.0 feet) to the bottom of a skimmer wall (elevation 415.5 feet). The entrances are each equipped with vertical travelling screens (mesh size 0.4×0.35 inch) and two sets of trash racks of conventional design (NRC 1981, pg. 3-2).

Approach velocities vary, depending on reservoir level, but range from 0.44 to 0.51 feet per second under normal circumstances (reservoir elevation 420.5 to 425.0 feet above mean sea level) (Dames & Moore 1985). Velocities through the screens are somewhat higher, ranging from 1.0 foot per second (425 foot elevation/ 100 percent clean) to 2.27 feet per second (420.5 foot elevation/50 percent clean).

After leaving the condensers, circulating water moves via a 12-foot-diameter pipe from the plant to a semi-enclosed discharge basin. From the basin, the heated effluent moves through a 1,000-foot-long discharge canal to Monticello Reservoir. The discharge canal directs the discharge flow (heated effluent) to the northeast. A 2,600-foot-long jetty prevents recirculation of the heated water. [Figure 2-3](#) shows the intake structure, discharge basin, discharge canal, and associated features of the VCSNS circulating water system.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

The NRC defines “cooling pond” as a manmade impoundment that does not impede the flow of a navigable system and that is used primarily to remove waste heat from condenser water (NRC 1996, Section 4.4.1). Under this definition, Monticello Reservoir is categorized as a cooling pond. The NRC notes that nuclear power plants with cooling ponds represent a unique subset of closed-cycle systems in that they operate as once-through plants (with large condenser flow rates) but withdraw from relatively small bodies of water created for the plant (NRC 1996, Section 4.4.1). The "natural body of water" (the Broad River/Parr Reservoir) is not relied on for heat dissipation, but is used as a source of makeup water to replace that lost to evaporation from the cooling pond (Monticello Reservoir) and as a receiving stream for discharges from the cooling pond.

3.1.2.2 Groundwater

There are no groundwater wells for process or potable use on the VCSNS site; all of the water used by the Station is withdrawn from Monticello Reservoir. Makeup water for Monticello Reservoir is obtained from Parr Reservoir on the Broad River (SCE&G 2002).

There are two groundwater removal (dewatering) wells on the site, however, that are used to lower the water table in the area and alleviate problems with water seepage into below-grade portions of buildings. These wells, with pumps designated XPP5003 A and B, are in the Protected Area, one outside near the Control Building and the other inside the Auxiliary Service Building. Both wells discharge to the site stormwater system. Based on stormwater outfall flows (Outfalls 012 and 013 in the Station’s NPDES permit), it is estimated that these wells remove water at a rate of less than 26 gpm.

3.1.3 Transmission Facilities

SCE&G built eight transmission lines for the specific purpose of connecting Summer Station to the transmission system (NRC 1981, Section 3.2.7). Two additional transmission lines were built by the South Carolina Public Service Authority (known as Santee Cooper), one-third owner of the station, to connect the Station to the regional grid. A pre-existing Duke Power Company line crosses the VCSNS site, but does not connect to the VCSNS switchyard or the SCE&G transmission system.

Beginning at VCSNS, the SCE&G transmission lines generally run in a southerly direction, with five terminations very near Summer Station, one near Aiken, South Carolina, and two near Columbia, South Carolina (see [Figure 3-1](#)). The Santee Cooper lines run approximately east and west to substations near Blythewood and Newberry, South Carolina, respectively. The list that follows identifies the transmission lines by the

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

name of the substation (or other structure) at which each line connects to the overall electric grid. The accompanying paragraphs provide other features of the transmission lines, including voltage, right-of-way width and length, and presence of other lines in the right-of-way.

- Summer-Parr No. 1 and No. 2 – These two SCE&G lines, which occupy the same 240-foot right-of-way to the Parr Substation, operate at 230 kilovolts (kV). The lines' lengths are each 2.3 miles. For approximately 0.5 mile, these lines share the corridor with the Graniteville line and Santee Cooper's Newberry line (Figure 3-2).
- Summer-Fairfield No. 1 and No. 2 – These two 230-kV lines provide power to and from SCE&G's Fairfield Pumped Storage Facility. The lines are only 1 mile long and occupy a 170-foot, wholly-owned corridor.
- Summer-Denny Terrace No. 1 – This 2.5 mile, 230-kV tie line connects Summer Station to the Denny Terrace No. 1 line near Parr, South Carolina, well north of the Denny Terrace substation. The line was built by SCE&G and occupies a 100-foot right-of-way.
- Summer-Pineland No. 1 – This SCE&G line provides power at 230-kV to the Pineland Substation six miles northeast of Columbia. The right-of-way width is 240 feet for the approximately 18 miles that the line shares the corridor with the Denny Terrace No. 2 line and then 100 feet for the remaining 5.5 miles. Santee Cooper's Blythewood line parallels this line for approximately 17 miles. The VCSNS Final Environmental Statement (NRC 1981) describes a Summer-Pineland No. 2 line, but it was never built.
- Summer-Denny Terrace No. 2 – This 230-kV SCE&G line to the Denny Terrace substation two miles north of Columbia follows the Pineland corridor for approximately 18 miles and then continues for approximately 7 miles in a 100-foot right-of-way. Santee Cooper's Blythewood line parallels this line for 17 miles.
- Summer-Graniteville – This SCE&G line provides 230 kV of power to the Graniteville Substation. The line is 62.5 miles long. For the first 0.5 mile, it runs with the Newberry and Summer-Parr No. 1 and No. 2 line. Then for 2.5 miles it parallels the Newberry line. For the remaining 59.5 miles, it is the sole occupant of the corridor. The right-of-way width is 170 feet as far as the Broad River and then 100 feet to Graniteville.
- Summer-Blythewood – The Blythewood line is owned by Santee Cooper. It is a 230-kV line that runs for approximately 20 miles, sharing the corridor with the Summer-Pineland and the Denny Terrace No. 2 lines for the first 17 miles. For the remaining 3 miles, the right-of-way is 100 feet.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

- Summer-Newberry – This Santee Cooper line, which is approximately 18 miles long, operates at 230 kV and provides power to the Newberry Substation. For the first 0.5 mile, it shares the corridor with the Summer-Parr No. 1 and No. 2 and the Graniteville lines. For the next 2.5 miles it shares the corridor with the Summer-Graniteville line. For the remaining 15 miles, it occupies the 100-foot right-of-way alone.

In total, for the specific purpose of connecting VCSNS to the transmission system, SCE&G and Santee Cooper have constructed approximately 160 miles of transmission lines (120 miles of corridor) that occupy approximately 2,000 acres of corridor. The corridors pass through land that is primarily rolling hills covered in forests or farmland. The areas are mostly remote, with low population densities. The longer lines cross numerous state and U.S. highways, including I-26 and I-20. Corridors that pass through farmlands generally continue to be used in this fashion. SCE&G and Santee Cooper plan to maintain these transmission lines, which are integral to the larger transmission system, indefinitely. These transmission lines are expected to remain a permanent part of the regional transmission system after the Summer Station is decommissioned.

In mid-2002, SCE&G plans a modification to the transmission facilities that serve the Summer Station. The Summer-Denny Terrace No. 1 line will be disconnected near the Parr Substation and connected to an existing Parr-Edenwood line. This action will terminate the connection from Summer Station to Denny Terrace No. 1. The change will create a new Summer-Edenwood line. Simultaneously, the existing Parr-Edenwood line connection to the Parr Substation will be disconnected.

SCE&G and Santee Cooper designed and constructed all VCSNS transmission lines in accordance with the National Electrical Safety Code[®] and industry guidance that was current when the line was built. Ongoing right-of-way surveillance and maintenance of VCSNS transmission facilities ensure continued conformance to design standards. These maintenance practices are described in [Sections 2.4](#) and [4.13](#).

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

3.2 Refurbishment Activities

NRC

“The report must contain a description of...the applicant’s plans to modify the facility or its administrative control procedures....This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment....” 10 CFR 51.53(c)(2)

“...The incremental aging management activities carried out to allow operation of a nuclear power plant beyond the original 40-year license term will be from one of two broad categories: (1) SMITTR actions, most of which are repeated at regular intervals, and (2) major refurbishment or replacement actions, which usually occur fairly infrequently and possibly only once in the life of the plant for any given item....” (NRC 1996, Section 2.6.3.1, pg. 2-41) (SMITTR defined in NRC 1996, Section 2.4, pg. 2-30, as surveillance, monitoring, inspections, testing, trending, and recordkeeping)

SCE&G has addressed refurbishment activities in this environmental report in accordance with NRC regulations and complementary information in the NRC GEIS for license renewal (NRC 1996, Section 2.6.2). NRC requirements for the renewal of operating licenses for nuclear power plants include the preparation of an integrated plant assessment (IPA) (10 CFR 54.21). The IPA must identify and list structures, systems and components (SSCs) subject to an aging management review. SSCs that are subject to aging and might require refurbishment include, for example, the reactor vessel, piping, supports, and pump casings (see 10 CFR 54.21 for details), as well as those that are not subject to periodic replacement.

In turn, the NRC regulations for implementing the National Environmental Policy Act require environmental reports to describe in detail and assess the environmental impacts of refurbishment activities such as planned modifications to SSCs or plant effluents [10 CFR 51.53(c)(2)]. Resource categories to be evaluated for impacts of refurbishment include terrestrial resources, threatened and endangered species, air quality, housing, public utilities and water supply, education, land use, transportation, and historic and archaeological resources.

The GEIS (NRC 1996) provides information about the scope of refurbishment activities to be evaluated in an environmental report. As explained below, the GEIS describes major refurbishment activities that utilities might perform for license renewal that would necessitate changing administrative control procedures and modifying the facility. The GEIS analysis assumes that an applicant would begin any major refurbishment work shortly after NRC grants a renewed license and would complete the activities during five outages, including one major outage at the end of the 40th year of operation. The GEIS refers to this as the refurbishment period.

GEIS Table B.2 lists license renewal refurbishment activities that NRC anticipated utilities might undertake. In identifying these activities, the GEIS intended to encompass actions that typically take place only once, if at all, in the life of a nuclear plant. The GEIS analysis assumed that a utility would undertake these activities solely for the purpose of extending plant operations beyond 40 years, and would undertake them during the refurbishment period. The GEIS indicates

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

that many plants will have undertaken various refurbishment activities to support the current license period, but that some plants might undertake such tasks only to support extended plant operations.

SCE&G has performed some major modifications at VCSNS in the past (e.g., replacement of steam generators in 1994). However, the VCSNS IPA that SCE&G conducted under 10 CFR 54, which SCE&G has included as part of its license renewal application, has not identified the need to undertake any major refurbishment or replacement actions to maintain the functionality of important SSCs during the license renewal period. Therefore, no refurbishment would be conducted that would directly affect the environment or plant effluents.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

3.3 Programs and Activities for Managing the Effects of Aging

NRC

“The report must contain a description of...the applicant’s plans to modify the facility or its administrative control procedures....This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment....” 10 CFR 51.53(c)(2)

“...The incremental aging management activities carried out to allow operation of a nuclear power plant beyond the original 40-year license term will be from one of two broad categories: (1) SMITTR actions, most of which are repeated at regular intervals, and (2) major refurbishment or replacement actions, which usually occur fairly infrequently and possibly only once in the life of the plant for any given item....” (NRC 1996, Section 2.6.3.1, pg. 2-41) (SMITTR is defined in NRC 1996, Section 2.4, pg. 2-30, as surveillance, monitoring, inspections, testing, trending, and recordkeeping)

SMITTR Activities

The VCSNS IPA, required by 10 CFR 54.21a, identifies the programs and inspections for managing aging effects at VCSNS. These programs are fully described in the *Application for Renewed Operating License, V.C. Summer Nuclear Station*, to which this Environmental Report is appended.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

3.4 Employment

Current Workforce

SCE&G employs a permanent workforce of approximately 600 employees at VCSNS and an additional 130 to 140 long-term contract employees who provide security, maintenance, engineering, and janitorial support; this is within the range of 600 to 800 personnel per reactor unit estimated in the GEIS (NRC 1996, Section 2.3.8.1). Approximately 90 percent of the employees live in Lexington, Richland, Fairfield, and Newberry Counties, with the balance of employees living in various other locations (see [Section 2.6](#)). [Figure 2-1](#) shows the locations of these counties.

VCSNS is on an 18-month refueling cycle. During refueling outages, which typically last for 30 to 40 days, the number of workers on site increases substantially. In three recent outages, VCSNS brought in 613 (RF-10), 591 (RF-11), and 791 (RF-12) contractors, an average of 665 additional workers per outage. This falls within the GEIS range of 200 to 900 additional workers per reactor outage.

License Renewal Increment

Performing the license renewal activities described in [Section 3.3](#) would necessitate increasing the VCSNS staff workload by some increment. The size of this increment would be a function of the schedule within which SCE&G must accomplish the work and the amount of work involved.

The GEIS (NRC 1996, Section 2.6.2.7) assumes that NRC would renew a nuclear power plant license for a 20-year period, plus the duration remaining on the current license, and that NRC would issue the renewal approximately 10 years prior to license expiration. In other words, the renewed license would be in effect for approximately 30 years. The GEIS further assumes that the utility would initiate SMITTR activities at the time of issuance of the new license and would conduct license renewal SMITTR activities throughout the remaining 30-year life of the plant, sometimes during full-power operation (NRC 1996, Section B.3.1.3), but mostly during normal refueling and the 5- and 10-year in-service refueling outages (NRC 1996, Table B.4).

It has been determined that the GEIS scheduling assumptions are reasonably representative of VCSNS incremental license renewal workload scheduling. Many VCSNS license renewal SMITTR activities would have to be performed during outages. Although some VCSNS license renewal SMITTR activities would be one-time efforts, others would be recurring periodic activities that would continue for the life of the plant.

The GEIS estimates that the most additional personnel needed to perform license renewal SMITTR activities would typically be 60 persons during the 3-month duration of a 10-year in-service refueling. Having established this upper value for what would be a single event in 20 years, the GEIS uses this number as the expected number of additional permanent workers

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

needed per unit attributable to license renewal. GEIS Section C.3.1.2 uses this approach in order to "...provide a realistic upper bound to potential population-driven impacts...".

It is anticipated that existing "surge" capabilities for routine activities, such as outages, will enable SCE&G to perform the increased SMITTR workload without adding VCSNS staff. Therefore, no more than 60 additional permanent workers would be required to perform all license renewal SMITTR activities.

Adding 60 full-time employees to the plant workforce for the license renewal operating term would have the indirect effect of creating additional jobs and related population growth in the community. An employment multiplier appropriate to the State of South Carolina (3.95) (Martin 2000) was used to calculate the total direct and indirect jobs in service industries that would be supported by the spending of the VCSNS workforce. The addition of 60 license renewal employees would generate approximately 177 indirect jobs distributed in the potentially impacted communities of Richland, Lexington, Fairfield, and Newberry Counties. This number was calculated as follows: $60 \text{ (additional employees)} \times 3.95 \text{ (regional multiplier)} = 237 \text{ (total jobs)}$. Of these, 60 would be direct jobs (VCSNS employees) and 177 would be indirect jobs (service industries).

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

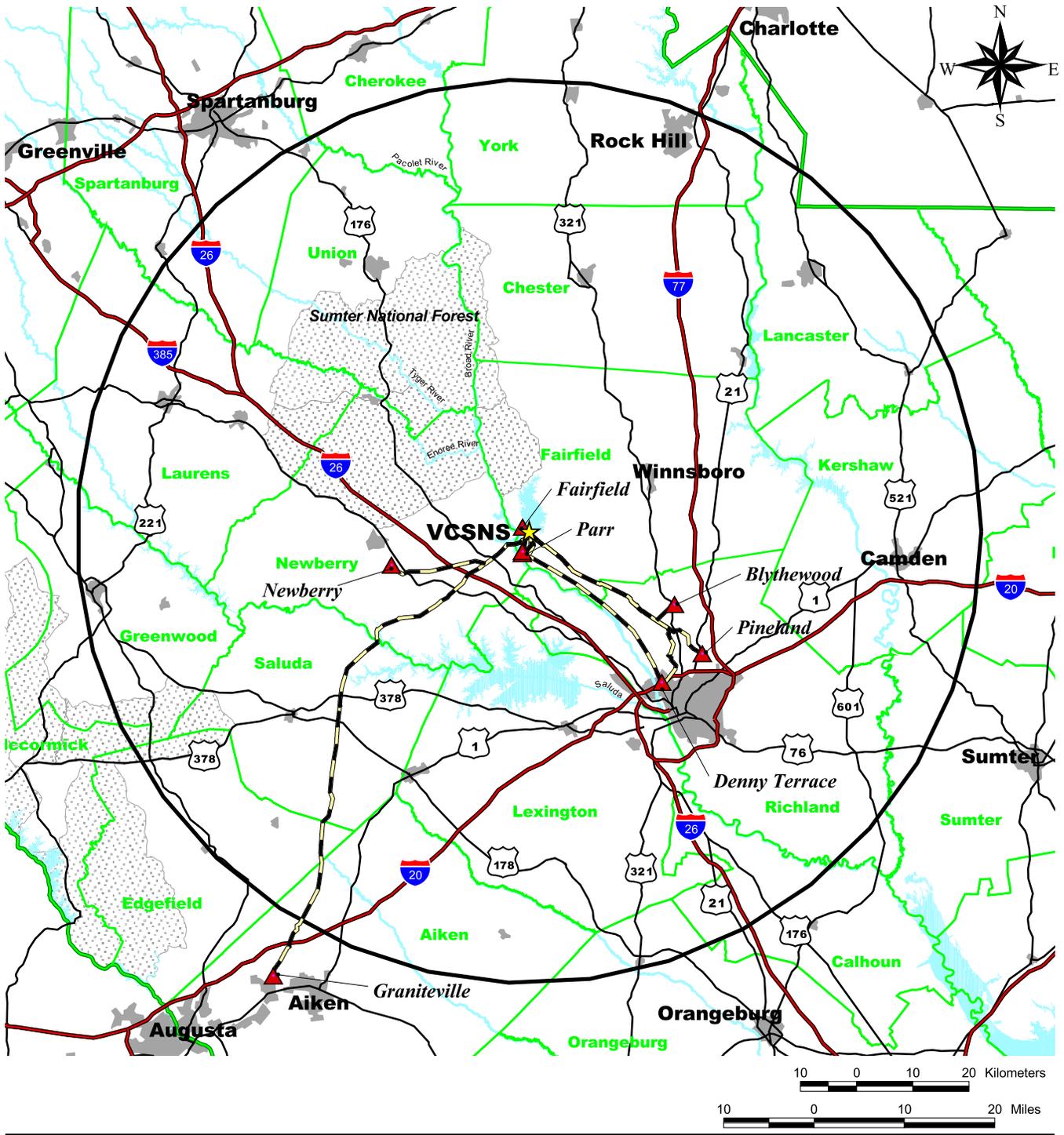
3.5 References

- Byrne, S.A. 1996. Letter to U.S. Nuclear Regulatory Commission concerning potential environmental impacts of closed-cycle cooling tower at V.C. Summer Nuclear Station. South Carolina Electric & Gas Company. March 26.
- Dames & Moore. 1985. Section 316(b) Demonstration for the Virgil C. Summer Nuclear Station for the South Carolina Department of Health and Environmental Control and the Nuclear Regulatory Commission. March.
- Martin, R. 2000. Direct-effect Employment Multipliers – Board of Economic Advisors – South Carolina State Budget and Control Board. Personal communication with E. N. Hill, TtNUS, July 31.
- NRC (U.S. Nuclear Regulatory Commission). 1981. Final Environmental Statement related to the operation of Virgil C. Summer Nuclear Station Unit 1, South Carolina Electric and Gas Company, Office of Nuclear Reactor Regulation, Washington, D.C.
- NRC (U.S. Nuclear Regulatory Commission). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*. Volumes 1 and 2, NUREG-1437. Washington, D.C. May.
- SCE&G (South Carolina Electric & Gas Company). 1995. Virgil C. Summer Nuclear Station – Annual Operating Report for 1994. Submitted to U.S. Nuclear Regulatory Commission on February 27, 1995.
- SCE&G (South Carolina Electric & Gas Company). 1997. Virgil C. Summer Nuclear Station – Annual Operating Report for 1996. Submitted to U.S. Nuclear Regulatory Commission on February 25, 1997.
- SCE&G (South Carolina Electric & Gas Company). 1998. Virgil C. Summer Nuclear Station – Annual Operating Report for 1997. Submitted to U.S. Nuclear Regulatory Commission on March 27, 1998.
- SCE&G (South Carolina Electric & Gas Company). 2000. Virgil C. Summer Nuclear Station – Annual Operating Report for 1999. Submitted to U.S. Nuclear Regulatory Commission on March 29, 2000.
- SCE&G (South Carolina Electric & Gas Company). 2002. Virgil C. Summer Nuclear Station Final Safety Analysis Report. Through Amendment 02-01.
- Skolds, J. L. 1990. Letter to Water Quality Assessments and Enforcement Division, South Carolina Department of Health and Environmental Control (SCDHEC) regarding change in flow for Outfall 001 under NPDES Permit No. SC0030856. South Carolina Electric & Gas Company. September 28.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

USAEC (United States Atomic Energy Commission). 1973. Final Environmental Statement Related to Operation of Virgil C. Summer Nuclear Station Unit 1, South Carolina Electric & Gas Company, Directorate of Licensing, Washington, D.C.

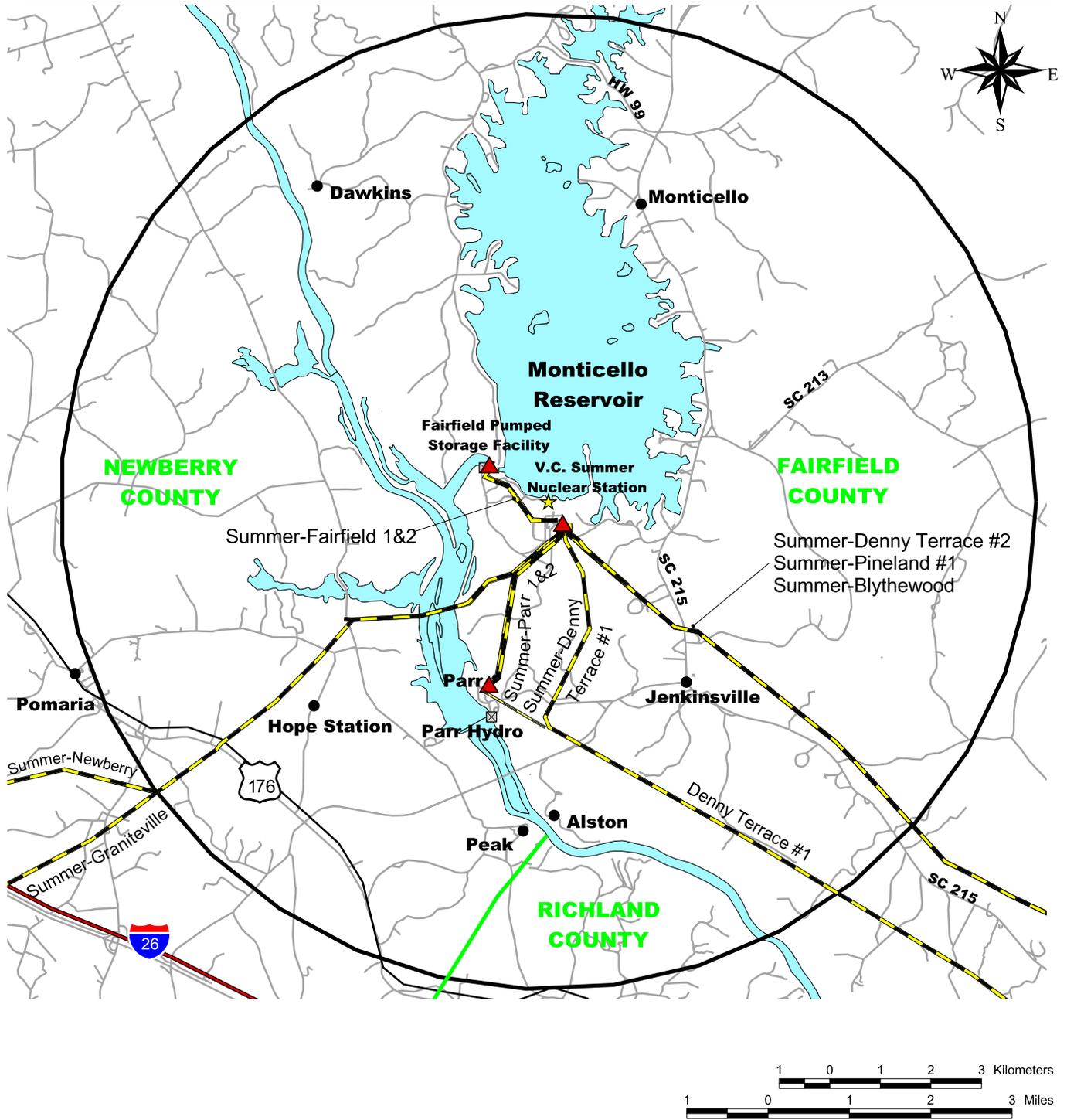
**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**



- LEGEND**
- ★ V.C. Summer Nuclear Station
 - ▲ Substations
 - ▬ Transmission Lines
 - 50 mile radius of V.C. Summer
 - ▬ Interstates
 - ▬ Major roads
 - ▬ County Boundaries
 - ▬ State Boundary
 - ▬ Lakes and Rivers
 - ▨ National Forests
 - ▬ Major Urban Areas

**FIGURE 3-1
V.C. Summer Nuclear Station,
50-Mile Transmission Line Map
LICENSE RENEWAL APPLICATION**

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**



LEGEND

- Substations
- Transmission Lines
- Six mile radius of V.C. Summer
- Interstates
- Major roads
- Minor roads
- County Boundaries
- Lakes and Rivers

**FIGURE 3-2
V.C. Summer Nuclear Station,
6-Mile Transmission Line Map
LICENSE RENEWAL APPLICATION**

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND
MITIGATING ACTIONS**

NRC

“The report must contain a consideration of alternatives for reducing adverse impacts...for all Category 2 license renewal issues....” 10 CFR 51.53(c)(3)(iii)

“The environmental report shall include an analysis that considers...the environmental effects of the proposed action...and alternatives available for reducing or avoiding adverse environmental effects....” 10 CFR 51.45(c) as adopted by 10 CFR 51.53(c)(2)

The environmental report shall discuss “the impact of the proposed action on the environment. Impacts shall be discussed in proportion to their significance;” 10 CFR 51.45(b)(1) as adopted by 10 CFR 51.53(c)(2)

“The information submitted...should not be confined to information supporting the proposed action but should also include adverse information.” 10 CFR 51.45(e) as adopted by 10 CFR 51.53(c)(2)

Chapter 4 presents an assessment of the environmental consequences and potential mitigating actions associated with the renewal of V.C. Summer Nuclear Station’s (VCSNS) operating license. The U.S. Nuclear Regulatory Commission (NRC) has identified and analyzed 92 environmental issues that it considers to be associated with nuclear power plant license renewal and has designated the issues as Category 1, Category 2, or NA (not applicable). NRC designated an issue as Category 1 if, based on the result of its analysis, the following criteria were met:

- the environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic;
- a single significance level (i.e., small, moderate, or large) has been assigned to the impacts that would occur at any plant, regardless of which plant is being evaluated (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent-fuel disposal); and
- mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely to be not sufficiently beneficial to warrant implementation.

If the NRC analysis concluded that one or more of the Category 1 criteria could not be met, then NRC designated the issue as Category 2. The NRC requires plant-specific analysis for Category 2 issues. The NRC designated two issues as NA, signifying that the categorization and impact definitions do not apply to these issues. NRC rules do not require analyses of Category 1 issues that NRC resolved using generic findings (10 CFR 51, Appendix B, Table B-1) as described in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996a). An applicant may reference the generic findings or GEIS analyses for Category 1

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

issues. [Appendix A](#) of this report lists the 92 issues and identifies the Environmental Report section that addresses each issue.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Category 1 License Renewal Issues

NRC

“The environmental report for the operating license renewal stage is not required to contain analyses of the environmental impacts of the license renewal issues identified as Category 1 issues in Appendix B to subpart A of this part.” 10 CFR 51.53(c)(3)(i)

**“...Absent new and significant information, the analysis for certain impacts codified by this rulemaking need only be incorporated by reference in an applicant’s environmental report for license renewal...”
(NRC 1996b, pg. 28483)**

Of the 69 Category 1 issues identified in Appendix B of 10 CFR 51, 17 do not apply to VCSNS. Ten of the issues do not apply because they refer to design or operational features not found at VCSNS. In addition, because no refurbishment activities are planned, the NRC findings for the 7 Category 1 issues that apply only to refurbishment clearly overestimate VCSNS refurbishment impacts and do not apply. [Table 4-1](#) lists these 17 issues and explains the basis for determining that these issues are not applicable to VCSNS.

[Table 4-2](#) lists the 52 Category 1 issues that are applicable to VCSNS and also lists the 2 issues for which NRC came to no generic conclusion (Issues 60 and 92). The table includes the findings that NRC codified and references to supporting GEIS analysis. SCE&G has reviewed the NRC findings and has identified no new and significant information or become aware of any such information that would make the NRC findings inapplicable to VCSNS (see Chapter 5.0). Therefore, SCE&G adopts by reference the NRC findings for these Category 1 issues.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Category 2 License Renewal Issues

NRC

“The environmental report must contain analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for those issues identified as Category 2 issues in Appendix B to subpart A of this part...” 10 CFR 51.53(c)(3)(ii)

“The report must contain a consideration of alternatives for reducing adverse impacts, as required by § 51.45(c), for all Category 2 license renewal issues....” 10 CFR 51.53(c)(3)(iii)

The NRC designated 21 issues as Category 2. Sections 4.1 through 4.20 address each of the Category 2 issues, beginning with a statement of the issue. As is the case with Category 1 issues, some Category 2 issues (3) apply to operational features that VCSNS does not have. In addition, some Category 2 issues (4) apply only to refurbishment activities. If the issue does not apply to VCSNS, then the section explains the basis for inapplicability.

For the 14 Category 2 issues that SCE&G has determined to be applicable to VCSNS, analyses are provided. These analyses include conclusions regarding the significance of the impacts relative to the renewal of the operating license for VCSNS and, when applicable, discuss potential mitigative alternatives to the extent required. SCE&G has identified the significance of the impacts associated with each issue as either Small, Moderate, or Large, consistent with the criteria that NRC established in 10 CFR 51, Appendix B, Table B-1, Footnote 3 as follows:

- SMALL** - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission’s regulations are considered small.
- MODERATE** - Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource.
- LARGE** - Environmental effects are clearly noticeable and are sufficient to destabilize any important attributes of the resource.

In accordance with National Environmental Policy Act (NEPA) practice, SCE&G considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts that are small receive less mitigative consideration than impacts that are large).

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

“NA” License Renewal Issues

The NRC determined that its categorization and impact-finding definitions did not apply to Issues 60 and 92; however, SCE&G included these issues in [Table 4-2](#). The NRC noted that applicants currently do not need to submit information on Issue 60, chronic effects from electromagnetic fields (10 CFR 51, Appendix B, Table B-1, Footnote 5). For Issue 92, environmental justice, NRC does not require information from applicants, but noted that it will be addressed in individual license renewal reviews (10 CFR 51, Appendix B, Table B-1, Footnote 6). Environmental justice demographic information is presented in [Section 2.11](#).

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.1 Water Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a Small River with Low Flow)

NRC

“If the applicant’s plant utilizes cooling towers or cooling ponds and withdraws make-up water from a river whose annual flow rate is less than 3.15×10^{12} ft³/year (9×10^{10} m³/year), an assessment of the impact of the proposed action on the flow of the river and related impacts on instream and riparian ecological communities must be provided....” 10 CFR 51.53(3)(ii)(A)

“...The issue has been a concern at nuclear power plants with cooling ponds and at plants with cooling towers. Impacts on instream and riparian communities near these plants could be of moderate significance in some situations....” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 13

The NRC made surface water use conflicts a Category 2 issue because consultations with regulatory agencies indicate that water use conflicts are already a concern at two closed-cycle plants (Limerick and Palo Verde) and may be a problem in the future at other plants. In the GEIS, NRC notes two factors that may cause water use and availability issues to become important for some nuclear power plants that use cooling towers. First, some plants equipped with cooling towers are located on small rivers that are susceptible to droughts or competing water uses. Second, consumptive water loss associated with closed-cycle cooling systems may represent a substantial proportion of the flows in small rivers (NRC 1996a, Section 4.3.2.1.).

As discussed in [Section 3.1.2](#), VCSNS operates as a once-through cooling plant that withdraws from and discharges to a cooling pond, Monticello Reservoir. This issue applies because Monticello Reservoir receives its makeup water from the Broad River, which has an annual mean flow of approximately 2.1×10^{11} cubic feet per year (6,535 cubic feet per second [cfs]) (Cooney et al. 2001, pg. 226). Monticello Reservoir was built to supply cooling water to VCSNS and to provide an upper reservoir for the Fairfield Pumped Storage Facility (FPSF), located on Parr Reservoir. Parr Reservoir was created (1913-1914) by impounding the Broad River approximately 26 miles upstream of the confluence of the Broad and Saluda Rivers.

The Federal Power Commission (FERC’s predecessor agency) licensed the Parr Hydroelectric Project in 1974, contingent upon a minimum instantaneous release at the Parr Powerhouse of 150 cfs during most months of the year and a minimum instantaneous release of 1,000 cfs during the March-April-May striped bass spawning period (NRC 1981, pg. 2-11). For the periods 1896 to 1907 and 1980 to 2000, the lowest daily mean flow of the Broad River at the Alston, South Carolina, gauging station was 235 cfs (Cooney et al. 2001, pg. 226). The lowest recorded daily mean flow of 149 cfs was measured at the Richtex Station, approximately 7 miles downstream of Parr Reservoir (NRC 1981, pg. 2-10).

The 1981 Final Environmental Statement (FES) indicated that approximately 13 cfs of the 1,180 cfs of water withdrawn from Monticello Reservoir for condenser cooling would be lost to evaporation. This water loss was to be made up by pumping back from Parr Reservoir, as

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

described in [Section 2.2](#). The projected evaporative loss of 13 cfs from condenser cooling represented approximately 9 percent of the minimum allowable instantaneous flow of 150 cfs, 5.5 percent of the lowest daily mean flow (235 cfs), and approximately 0.2 percent of the annual mean flow (6,535 cfs) of the Broad River at Alston, SC.

Based on a higher (theoretical maximum) cooling water withdrawal rate of 1,308 cfs, the VCSNS Quarterly Water Use Reports indicate that 22 cfs is lost to evaporation (SCE&G 1998a, 1999a). This loss represents 14.7 percent of the minimum allowable instantaneous flow of 150 cfs, 9.4 percent of the lowest daily mean flow (235 cfs), and approximately 0.3 percent of the annual mean flow (6,535 cfs) of the Broad River at Alston, South Carolina.

Under normal circumstances, evaporative losses from Monticello Reservoir represent a small (less than one percent) reduction in Broad River flows. Any impacts to riparian ecological communities in Parr Reservoir would be small, particularly when compared to impacts from fluctuating water levels caused by operation of FPSF. As discussed in [Section 2.2](#), Parr Reservoir levels can fluctuate as much as 10 feet daily with FPSF operations.

As noted earlier in this section, the relicensing of the Parr Hydroelectric Project was contingent upon minimum releases at the Parr Powerhouse. These FERC-mandated minimum instream flows would mitigate impacts (to the extent that they exist) to instream and riparian communities downstream of the Parr Shoals dam in the Broad River.

Changes in Broad River flows caused by VCSNS operations (i.e., evaporative losses) are small. Any impacts from VCSNS on instream and riparian communities in Parr Reservoir or the Broad River over the license renewal term would be small and would not warrant mitigation.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.2 Entrainment of Fish and Shellfish in Early Life Stages

NRC

“If the applicant’s plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(b) determinations...or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from...entrainment.” 10 CFR 51.53(c)(3)(ii)(B)

“...The impacts of entrainment are small at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems. Further, ongoing efforts in the vicinity of these plants to restore fish populations may increase the numbers of fish susceptible to intake effects during the license renewal period, such that entrainment studies conducted in support of the original license may no longer be valid....” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 25

The NRC made impacts on fish and shellfish resources resulting from entrainment a Category 2 issue, because it could not assign a single significance level (small, moderate, or large) to the issue. The impacts of entrainment are small at many plants, but they may be moderate or large at others. Also, ongoing restoration efforts may increase the number of fish susceptible to intake effects during the license renewal period (NRC 1996a, Section 4.2.2.1.2). Information needing to be ascertained includes: (1) type of cooling system (whether once-through or cooling pond), and (2) current Clean Water Act (CWA) Section 316(b) determination or equivalent state documentation.

As [Section 3.1.2](#) describes, VCSNS has a once-through heat dissipation system, but withdraws from and discharges to a cooling pond, Monticello Reservoir.

Section 316(b) of the CWA requires that any standard established pursuant to Sections 301 or 306 of the CWA shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts (33 USC 1326). Entrainment through the condenser cooling system of fish and shellfish in early life stages is a potential adverse environmental impact that can be minimized by the best available technology.

The current National Pollutant Discharge Elimination System (NPDES) permit for VCSNS (No. SC0030856, issued 9-29-97) contains the following language, in the “Rationale” section:

“On April 19, 1985, determination was made, in accordance with Section 316(b) of the Act, that the location, design, construction, and capacity of the VCSNS cooling water intake structure(s) reflects the best technology available for minimizing adverse environmental impact.” This determination was based on information submitted by SCE&G in a 316(b) Demonstration dated March 1985 (Dames & Moore 1985a).

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Thus, the current NPDES permit, which was issued on September 29, 1997 and expires September 30, 2002, constitutes the VCSNS CWA Section 316(b) determination. Portions of the permit are included as [Appendix B](#).

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.3 Impingement of Fish and Shellfish

NRC

“If the applicant’s plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(b) determinations...or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from...impingement...”10 CFR 51.53(c)(3)(ii)(B)

“...The impacts of impingement are small at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems...” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 26

The NRC made impacts on fish and shellfish resources resulting from impingement a Category 2 issue, because it could not assign a single significance level to the issue. Impingement impacts are small at many plants, but might be moderate or large at other plants (NRC 1996a, Section 4.2.2.1.3). Information that needs to be ascertained includes: (1) type of cooling system (whether once-through or cooling pond), and (2) current CWA 316(b) determination or equivalent state documentation.

As discussed in [Section 4.2](#), SCE&G submitted a comprehensive CWA Section 316(b) Demonstration in 1985 that evaluated impingement at VCSNS and concluded that the intake structure represented the best technology available to minimize impacts. The current NPDES permit (Appendix B) constitutes the VCSNS CWA Section 316(b) determination.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.4 Heat Shock

NRC

“If the applicant’s plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act...316(a) variance in accordance with 40 CFR 125, or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from heat shock...” 10 CFR 51.53(c)(3)(ii)(B)

“...Because of continuing concerns about heat shock and the possible need to modify thermal discharges in response to changing environmental conditions, the impacts may be of moderate or large significance at some plants...” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 27

The NRC made impacts on fish and shellfish resources resulting from heat shock a Category 2 issue, because of continuing concerns about thermal discharge effects and the possible need to modify thermal discharges in the future in response to changing environmental conditions (NRC 1996a, Section 4.2.2.1.4). Information to be ascertained includes: (1) type of cooling system (whether once-through or cooling pond), and (2) evidence of a CWA Section 316(a) variance or equivalent state documentation.

As [Section 3.1.2](#) describes, VCSNS has a once-through heat dissipation system, but withdraws from and discharges to a cooling pond, Monticello Reservoir. As discussed below, SCE&G also has a Section 316(a) variance for VCSNS discharges.

Section 316(a) of the CWA establishes a process whereby a thermal effluent discharger can demonstrate that thermal discharge limitations are more stringent than necessary and, using a variance, obtain alternative facility-specific thermal discharge limits (33 USC 1326).

NPDES permit No. SC0030856 for VCSNS contains a detailed 316(a) chronology, a portion of which follows:

“On April 30, 1976, a determination was made that the permittee had submitted adequate information to demonstrate that the alternative limitations for the thermal component of the discharge would assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the Monticello Reservoir. The alternate maximum discharge temperature for Outfall 001 is 45°C (113°F). A maximum thermal plume temperature of 32.2°C (90°F) and temperature rise of 1.66°C (3.0°F) is also imposed.

On July 1, 1984 a continuation of the 316(a) variance was allowed by the reissuance of the NPDES permit. On January 3, 1989, a request to continue the variance was included as part of the application for reissuance of the NPDES Permit. To support the request, the permittee has indicated there has been no change in facility operation and no change in the biological community. A tentative determination was made that continuation of the 316(a) variance was appropriate in the reissuance of this permit.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

On April 3, 1997, the permittee submitted an application for reissuance of the permit. A request to continue the 316(a) variance was included as part of the application. On June 19, 1997, the Department determined that continuance was appropriate.”

In August 2001, South Carolina Department of Health and Environmental Control (SCDHEC) approved a modification of NPDES Permit No. SC0030856 that eliminated the 1.66°C (3.0°F) limit on plume temperature rise and the requirement to continuously monitor the plume temperature rise. The permit modification noted there had been no violations of the 1.66°C (3.0°F) limit between 1993 and 2001 and “...no useful data (was) being generated by the continuous monitoring at Monticello Reservoir...”

The current NPDES permit, which was issued on September 29, 1997 and expires September 30, 2002, constitutes a CWA Section 316(a) variance in accordance with applicable state and federal regulations.

As discussed in [Section 2.2](#), there were a number of limited fish kills in the VCSNS discharge bay in the late 1980s and early 1990s that were associated with relatively high discharge temperatures in late summer and Monticello Reservoir drawdowns. SCE&G dredged the entire length of the discharge canal in 1993 to allow more cool water inflow at low reservoir levels. The dredging of the discharge canal altered circulation patterns and increased cool water inflow so that temperature at the bottom of the discharge bay in summer remained significantly (10 to 15 degrees) cooler than "end-of-pipe" discharge temperatures. No fish kills have been observed in the discharge bay or discharge canal since the canal was dredged.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.5 Groundwater Use Conflicts (Plants Using > 100 gpm of Groundwater)

NRC

“If the applicant’s plant...pumps more than 100 gallons (total onsite) of ground water per minute, an assessment of the impact of the proposed action on groundwater use must be provided.” 10 CFR 51.53(c)(3)(ii)(C)

**“Plants that use more than 100 gpm may cause ground water use conflicts with nearby ground water users.”
10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 33**

Based on information presented in Section 3.1.2.2, V.C. Summer Nuclear Station’s groundwater use is substantially less than 100 gallons per minute (gpm). Therefore, the issue of groundwater use conflicts (plants using more than 100 gpm groundwater) does not apply.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.6 Groundwater Use Conflicts (Plants Using Cooling Towers or Cooling Ponds That Withdraw Makeup Water From a Small River)

NRC

“If the applicant’s plant utilizes cooling towers or cooling ponds and withdraws make-up water from a river whose annual flow rate is less than 3.15×10^{12} ft³ / year[,],...[t]he applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow.” 10 CFR 51.53(3)(ii)(A)

“...Water use conflicts may result from surface water withdrawals from small water bodies during low flow conditions which may affect aquifer recharge, especially if other groundwater or upstream surface water users come on line before the time of license renewal...” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 34

The issue of groundwater use conflicts applies to VCSNS because it withdraws from and discharges to a cooling pond, Monticello Reservoir, which receives its make-up water from Parr Reservoir on the Broad River. The Broad River is considered a small river, based on an average flow of 2.1×10^{11} cubic feet per year.

As discussed in Section 2.2, daily mean flow in the Broad River in the vicinity of VCSNS (at Alston, SC, 1.2 miles downstream of the Parr Shoals dam) ranged from 235 to 130,000 cfs over the period of record, with an annual average of 6,535 cfs. According to the Final Environmental Statements for construction (USAEC 1973) and operation (NRC 1981) of Summer Station, the lowest recorded daily mean flow at a gauging station in the vicinity of VCSNS was 149 cfs at Richtex, SC, 7 miles downstream of the Parr Shoals dam. This U.S. Geological Survey (USGS) station was taken out of service in 1983.

Monticello Reservoir water lost to evaporation is replaced with water from Parr Reservoir as part of the normal operation of the FPSF. Water is cycled between the reservoirs daily. The VCSNS water use reports for 1998 and 1999 indicate that evaporative losses as high as 22 cfs are associated with VCSNS operations (SCE&G 1998a, 1999a). This loss represents approximately 1.7 percent of the cooling water removed from the reservoir (1,308 cfs) and approximately 0.3 percent of the average annual natural stream flow of 6,535 cfs. The potential evaporative loss represents 14.8 percent of the lowest recorded daily mean stream flow of 149 cfs reported in the FES (NRC 1981).

Water potentially used for cooling at the facility is not removed from a stream with natural flow, but from Parr Reservoir, an impounded section of the Broad River. The impoundment’s level is regulated to maintain a minimum downstream release of 150 cfs (NRC 1981). The site is located within the Piedmont Physiographic Province of South Carolina. Rivers in the South Carolina Piedmont typically are high-energy, shallow, rocky-bottomed streams that tend not to develop extensive alluvial flood plains. The Broad River is typical of the area. With the construction of Parr Reservoir, the upstream river floodplain was inundated. The surrounding area is characterized by a surficial water table aquifer in saprolitic soils and shallow fractures in rocks

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

(SCE&G 2002). With the construction of Parr Reservoir, the water in the surficial aquifer adjacent to the reservoir rose. Water flow within saprolitic soil is typically very slow due to the relatively impermeable natural soils, and the flow direction follows the surface topography within drainage basins toward discharge points along the stream valleys. These soils release water slowly back to reservoir during extreme low-level periods.

The fact that Broad River water is pumped (via FPSF) to Monticello Reservoir for condenser cooling has had no significant impact on the alluvial aquifer in the vicinity of the site during periods of low natural stream flow. The water in Parr Reservoir itself and the surrounding surficial aquifer distributes any loss in reservoir water level in such a way as to be considered insignificant to the alluvial aquifer. Impacts of VCSNS operation on the alluvial aquifer over the license renewal term would likewise be small, and would not warrant mitigation.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.7 Groundwater Use Conflicts (Plants Using Ranney Wells)

NRC

“If the applicant’s plant uses Ranney wells...an assessment of the impact of the proposed action on groundwater use must be provided.” 10 CFR 51.53(c)(3)(ii)(C)

“...Ranney wells can result in potential groundwater depression beyond the site boundary. Impacts of large groundwater withdrawal for cooling tower makeup at nuclear power plants using Ranney wells must be evaluated at the time of application for license renewal...” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 35

The issue of groundwater use conflicts does not apply to VCSNS because the plant does not use Ranney wells. As [Section 3.1.2](#) describes, VCSNS uses a once-through cooling system, but withdraws from and discharges to a cooling pond, Monticello Reservoir.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.8 Degradation of Groundwater Quality

NRC

“If the applicant’s plant is located at an inland site and utilizes cooling ponds, an assessment of the impact of the proposed action on groundwater quality must be provided.” 10 CFR 51.53(c)(3)(ii)(D)

“...Sites with closed-cycle cooling ponds may degrade ground-water quality. For plants located inland, the quality of the ground water in the vicinity of the ponds must be shown to be adequate to allow continuation of current uses....” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 39

The issue of groundwater degradation applies to VCSNS because the station uses a cooling pond. As [Section 3.1.2](#) describes, VCSNS employs a once-through cooling system, but withdraws from and discharges to a cooling pond, Monticello Reservoir.

Monticello Reservoir provides once-through cooling water to VCSNS and acts as the upper reservoir for the FPSF. Parr Reservoir, created by the damming of the Broad River, serves as the lower reservoir for the FPSF. Makeup water for Monticello Reservoir is supplied from Parr Reservoir. As part of FPSF operations, water is released from Monticello Reservoir through FPSF and discharged to Parr Reservoir during the day. Water is then pumped at night from Parr Reservoir to Monticello Reservoir to maintain the level of the upper reservoir. Over time, the water quality of Monticello Reservoir due to the constant cycling and mixing of water is basically that of the Broad River (NRC 1981, pg. 4-3).

Water quality monitoring data indicate that Monticello Reservoir waters are relatively low in concentrations of common ions, low in hardness, and low in dissolved solids/conductivity (Dames & Moore 1985b). Groundwater in the vicinity of the site is highly mineralized, due to prolonged contact with, and solution of, rock minerals, and as a result is generally higher than local surface waters in hardness, dissolved solids, and conductivity (Dames & Moore 1985b, Table 2.2.2; SCE&G 2002). There is no indication that evaporative losses associated with operation of VCSNS have increased concentrations of common ions, minerals, or solids in Monticello Reservoir water, and no indication that groundwater quality in the area has been affected by this cooling pond.

Therefore, there appears to have been little or no negative impact on groundwater quality as a result of the operation of VCSNS. Impacts of continued operation would be small and would not warrant mitigation.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.9 Impacts of Refurbishment on Terrestrial Resources

NRC

The environmental report must contain an assessment of "...the impact of refurbishment and other license-renewal-related construction activities on important plant and animal habitats...." 10 CFR 51.53(c)(3)(ii)(E)

"...Refurbishment impacts are insignificant if no loss of important plant and animal habitat occurs. However, it cannot be known whether important plant and animal communities may be affected until the specific proposal is presented with the license renewal application...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 40

"...If no important resource would be affected, the impacts would be considered minor and of small significance. If important resources could be affected by refurbishment activities, the impacts would be potentially significant...." (NRC 1996a, Section 3.6, pg. 3-6)

The NRC made impacts to terrestrial resources from refurbishment a Category 2 issue, because the significance of ecological impacts cannot be determined without considering site- and project-specific details (NRC 1996a, Section 3.6).

The issue of impacts of refurbishment on terrestrial resources is not applicable to VCSNS because, as discussed in [Section 3.2](#), SCE&G has no plans for major refurbishment or replacement actions at VCSNS.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.10 Threatened or Endangered Species

NRC

“Additionally, the applicant shall assess the impact of the proposed action on threatened and endangered species in accordance with the Endangered Species Act.” 10 CFR 51.53(c)(3)(ii)(E)

“...Generally, plant refurbishment and continued operation are not expected to adversely affect threatened or endangered species. However, consultation with appropriate agencies would be needed at the time of license renewal to determine whether threatened or endangered species are present and whether they would be adversely affected....” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 49

The NRC made impacts to threatened and endangered species a Category 2 issue because the status of many species is being reviewed, and site-specific assessment is required to determine whether any identified species could be affected by refurbishment activities or continued plant operations through the renewal period. In addition, compliance with the Endangered Species Act requires consultation with the appropriate federal agency (NRC 1996a, Sections 3.9 and 4.1).

[Section 2.5](#) discusses threatened and endangered species that may occur at VCSNS or along associated transmission line corridors. As discussed in [Section 3.2](#), SCE&G has not identified any major refurbishment or replacement actions that would be required for license renewal at VCSNS. Therefore, there would be no refurbishment-related impacts to threatened and endangered species, and no further analysis of refurbishment-related impacts is applicable.

Operation of VCSNS has not adversely affected any listed species and may have benefited at least one, the bald eagle, which forages on Monticello Reservoir and its subimpoundment and nests on neighboring Parr Reservoir. Evidence suggests that the number of eagles using the Parr Reservoir-Monticello Reservoir system is increasing. The FES for construction of VCSNS indicated that Fairfield County lay in the “ancestral range” of two endangered species, the Southern bald eagle and the peregrine falcon, but that neither had been recently observed in the region (USAEC 1973, pg. II-26). The Operating License Environmental Report contains an account of the first confirmed sighting of a bald eagle in the area, a mature bird that was seen in early August 1973 (SCE&G 1974, pg. 5.6-30). This eagle was believed to be migrating through the area, presumably towards nesting areas in coastal South Carolina. Bald eagles were first documented nesting in the Parr-Monticello system in the early 1980s (Dames & Moore 1985b, pg. Viii).

By the 1990s, bald eagles were routinely observed foraging around Monticello Reservoir, the FPSF tailrace canal, Parr Reservoir, and on the Broad River downstream of the Parr Shoals dam. South Carolina Department of Natural Resources (SCDNR) records indicate that there may be as many as four active bald eagle nests within five miles of VCSNS (Holling 2001; SCDNR 2001). Based on the fact that bald eagles were rarely observed prior to construction and operation of VCSNS and are now common in the area, it appears that construction and operation of VCSNS have had no adverse effect on this species and may have had a beneficial effect, by expanding

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

foraging and nesting areas for the birds. Impacts over the license renewal term would be essentially the same, as Monticello Reservoir would continue to provide foraging habitat and potential nesting habitat for bald eagles.

Based on the VCSNS location and habitat types, other threatened or endangered species identified in [Section 2.5](#) could be located on the VCSNS site or along associated transmission line corridors. SCE&G is not aware of any such occurrences but cannot rule them out. SCE&G is currently conducting surveys of the Summer Station site and transmission corridors to determine if listed plants or animals are present. Survey results will be available in late August 2002, after submittal of the License Renewal Application.

SCE&G has no plans for major refurbishment or replacement actions, and license renewal will not result in operational changes that would alter current natural resource management practices. The station and its transmission lines have been in existence for approximately 20 years, long enough for operational impacts to have stabilized. Current vegetation management practices in transmission corridors could actually be working to benefit threatened and endangered species that depend on open, prairie-like conditions. Species that could benefit from regular mowing and removal of shrubby vegetation in transmission corridors include the gopher tortoise, smooth coneflower, and Georgia aster (see [Section 2.5](#)).

SCE&G wrote the SCDNR and the U.S. Fish and Wildlife Service requesting information on any listed species or critical habitats that might occur on the VCSNS site or along associated transmission line rights-of-way, with particular emphasis on species that might be adversely affected by continued operations over the license renewal term. Agency response are provided in [Appendix C](#).

Due to the fact that operation of VCSNS to date has not adversely affected any listed species and SCE&G has no plans to alter current natural resource management practices, it seems likely that impacts to threatened or endangered species from license renewal would be small and could be beneficial to at least one species, the bald eagle. No mitigation measures appear to be warranted.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.11 Air Quality During Refurbishment

NRC

“If the applicant’s plant is located in or near a nonattainment or maintenance area, an assessment of vehicle exhaust emissions anticipated at the time of peak refurbishment workforce must be provided in accordance with the Clean Air Act as amended.” 10 CFR 51.53(c)(3)(ii)(F)

**“...Air quality impacts from plant refurbishment associated with license renewal are expected to be small. However, vehicle exhaust emissions could be cause for concern at locations in or near nonattainment or maintenance areas. The significance of the potential impact cannot be determined without considering the compliance status of each site and the numbers of workers expected to be employed during the outage...”
10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 50**

The NRC made impacts to air quality during refurbishment a Category 2 issue because vehicle exhaust emissions could be cause for some concern, and a general conclusion about the significance of the potential impact could not be drawn without considering the compliance status of each site and the number of workers expected to be employed during an outage (NRC 1996a, Section 3.3).

Air quality during refurbishment is not applicable to VCSNS because, as discussed in [Section 3.2](#), SCE&G has no plans for major refurbishment or replacement actions at VCSNS.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.12 Microbiological Organisms

NRC

“If the applicant’s plant uses a cooling pond, lake, or canal or discharges into a river having an annual average flow of less than 3.15×10^{12} ft³/year (9×10^{10} m³/year), an assessment of the proposed action on public health from thermophilic organisms in the affected water must be provided.” 10 CFR 51.53(c)(3)(ii)(G)

“...These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals that discharge to small rivers. Without site-specific data, it is not possible to predict the effects generically....” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 57

The NRC designated impacts on public health from thermophilic organisms a Category 2 issue because NRC did not have sufficient data available for facilities using cooling ponds, lakes, or canals that discharge to small rivers. Information to be determined is: (1) whether the plant discharges to a small river, and (2) whether discharge characteristics (particularly temperature) are conducive to thermophilic organism survival in public waters.

This issue is applicable to VCSNS because the station uses a cooling pond (Monticello Reservoir) that discharges to the Broad River, which has an average annual flow of 2.1×10^{11} cubic feet per year and is categorized as a small river in the GEIS (NRC 1996a, Section 5.3.3.4.2, Table 18). Also, there is public access to Monticello Reservoir, including recreational fishing, boating, and waterfowl hunting. Some subsistence fishing may also occur along the eastern shore, where all the lakeshore residences are located.

Organisms of concern include the enteric pathogens *Salmonella* and *Shigella*, the *Pseudomonas aeruginosa* bacterium, thermophilic Actinomycetes (“fungi”), the many species of *Legionella* bacteria, and pathogenic strains of the free-living *Naegleria amoeba*.

Pathogenic bacteria have evolved to survive in the digestive tracts of mammals and, accordingly, have optimum temperatures of around 99°F (Joklik and Smith 1972, pg. 65). Many of these pathogenic microorganisms (e.g., *Pseudomonas*, *Salmonella*, and *Shigella*) are ubiquitous in nature, occurring in the digestive tracts of wild mammals and birds (and thus in natural waters), but are usually only a problem when the host is immunologically compromised. Thermophilic bacteria generally occur at temperatures of 77°F to 176°F, with maximum growth at 122°F to 140°F (Joklik and Smith 1972, pg. 65).

From a public health standpoint, the assessment of thermophilic organisms is more relevant to Monticello Reservoir in the vicinity of the discharge canal than to the discharge canal proper. This is because there is no public access to the discharge canal. The discharge basin and canal are within the nuclear exclusion zone, land access to which is controlled (see [Section 2.1](#)). The discharge canal area is patrolled by VCSNS security as well as SCDNR conservation officers.

SCE&G monitors water temperature and other parameters at an “uplake” location (near the northern end of the reservoir), a location near the Station water intake, and a location just outside

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

of the northern end of the discharge canal as part of the Station's water quality monitoring program. Measurements are taken at these three locations monthly. The maximum temperature observed in monitoring years 1995 through 2000 was 103.7°F, which occurred in late July 1999 (SCE&G 2000a). Maximum temperatures for other monitoring years were 98.8°F (August 1995), 95.2°F (July 1996), 97.2°F (August 1997), 98.6°F (July 1998), and 101.2°F (July 2000), respectively (SCE&G 1996a, 1997a, 1998b, 1999b, 2001a). All of these maximum temperatures were observed in July and August at the surface (approximately 1-foot depth). Temperatures at 1 meter or deeper in the vicinity of the discharge canal were generally 3.0 to 9.0°F lower during the summer months and never exceeded 100°F.

Maximum temperatures in Monticello Reservoir outside of the discharge canal are below the optimal temperature range for growth and reproduction of thermophilic microorganisms. They could support limited survival of these organisms in summer months, although temperatures are generally below the range most conducive to the growth of thermophilic microorganisms.

Another factor controlling the survival and growth of thermophilic organisms in Monticello Reservoir is the disinfection of VCSNS sewage treatment plant effluent. This reduces the likelihood that a seed source or inoculant will be introduced into the Station's discharge canal or Monticello Reservoir. Following primary treatment in an aeration lagoon and secondary treatment through sand filters, wastewater is moved to a contact chamber for chlorination. It is then dechlorinated prior to mixing with other plant waste streams and eventual discharge to the discharge canal.

Fecal coliform bacteria are regarded as indicators of other pathogenic microorganisms, and are the organisms normally monitored by state health agencies. The NPDES permit for the Station requires monitoring of fecal coliforms in sewage treatment plant effluent (after discharge from the chlorine contact chamber and prior to mixing with other waste streams). Samples are collected for fecal coliform analysis and other parameters twice per month. The NPDES permit specifies a maximum 30-day average of 200 organisms per 100 milliliter sample (200/100 ml), and a daily maximum of 400/100 ml. From 1995 through 2000, neither of these limits was exceeded during any sampling event (SCE&G 1996b, 1997b, 1998c, 1999c, 2000b, 2001b).

It should also be noted that waterborne-disease outbreaks are generally rare and depend upon specific exposure conditions. The Centers for Disease Control and Prevention (CDC) reports on waterborne-disease outbreaks throughout the United States. From 1977 to 1998, a total of 18 states reported 32 outbreaks associated with recreational water, which includes both thermophilic and non-thermophilic microorganisms as confirmed etiological agents (CDC 2000). Most of the outbreaks associated with thermophilic microorganisms involved swimming and wading pools, hot tubs, and springs. Fecal contamination was frequently a contributing factor. In 1998, only four cases of disease attributable to *Naegleria* were confirmed in the entire United States (CDC 2000). *Naegleria* infection usually only occurs in warm weather environments, when water near the bottom of a lake is forced up the nasal passage of a swimmer, and when pollution appears to

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

be a factor (EPA 1979). However, studies have shown the absence of *Naegleria* infection and related diseases among swimmers in lakes with relatively high numbers of the pathogenic organisms present (EPA 1979).

Given the thermal characteristics of Monticello Reservoir in the vicinity of the discharge outfall and disinfection of sewage treatment plant effluent, SCE&G does not expect plant operations to stimulate growth or reproduction of thermophilic microorganisms. Under certain circumstances, these organisms might be present in limited numbers in the discharge bay and canal, where water temperatures can be as high as 107°F (SCE&G 1996a), but would not be expected in sufficient concentrations to pose a threat to recreational users of Monticello Reservoir or downstream water users in Parr Reservoir or the Broad River.

SCE&G wrote SCDHEC requesting information on any studies the agency might have conducted of thermophilic microorganisms in Monticello Reservoir and any concerns the agency might have relative to these organisms. SCDHEC's response indicated that public health hazards from thermophilic microorganisms are largely theoretical and do not represent a significant health threat to offsite users of Monticello Reservoir's waters. Based on this evaluation it appears that the impact of microbiological organisms on public health over the license renewal period would be small and would not warrant mitigation. Copies of the SCE&G letter and agency response are included in [Appendix D](#) of this Environmental Report.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.13 Electric Shock From Transmission-Line-Induced Currents

NRC

The environmental report must contain an assessment of the impact of the proposed action on the potential shock hazard from transmission lines “[i]f the applicant's transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the National Electric Safety Code® for preventing electric shock from induced currents....” 10 CFR 51.53(c)(3)(ii)(H)

“...Electrical shock resulting from direct access to energized conductors or from induced charges in metallic structures have not been found to be a problem at most operating plants and generally are not expected to be a problem during the license renewal term. However, site-specific review is required to determine the significance of the electric shock potential at the site....” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 59

The NRC made impacts of electric shock from transmission lines a Category 2 issue because, without a review of each plant's transmission line conformance with the National Electrical Safety Code® (NESC®) (Institute of Electrical and Electronics Engineers 1997) criteria, NRC could not determine the significance of the electrical shock potential.

In the case of VCSNS, there have been no previous NRC or NEPA analyses of transmission-line-induced-current hazards. Therefore, this section provides an analysis of the Station's transmission lines' conformance with the NESC® standard. The analysis is based on computer modeling of induced current under the lines.

Objects located near transmission lines can become electrically charged due to the effect of what is commonly called “static electricity,” but is more precisely termed “an electrostatic field.” This charge results in a current that flows through the object to the ground. The current is called “induced” because there is no direct connection between the line and the object. The induced current can also flow to the ground through the body of a person who touches the object. An object that is particularly well insulated from the ground, such as a car on rubber tires, can actually store an electrical charge, becoming what is called “capacitively charged.” A person standing on the ground and touching the car receives an electrical shock due to the sudden discharge of the capacitive charge through the person's body to the ground. The intensity of the shock depends on several factors, including the following:

- the strength of the electrostatic field which, in turn, depends on the voltage of the transmission line
- the height of the line above the ground
- the size of the object on the ground
- the extent to which the object is grounded.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

In 1977, the NESC[®] adopted a provision that describes how to establish minimum vertical clearances to the ground for electric lines having voltages exceeding 98 kilovolt (kV) alternating current to ground.¹ The clearance must limit the induced current² due to electrostatic effects to 5 milliamperes if the largest anticipated truck, vehicle, or equipment were short-circuited to ground. The NESC[®] chose this limit as being protective of the health of a person who wears a heart pacemaker. By way of comparison, the setting of ground fault circuit interrupters used in residential wiring (special breakers for outside circuits or those with outlets around water pipes) is 6 milliamperes; the shock that one feels on a dry day after walking on a carpet or sliding across a car seat and touching an object is the result of approximately 3 milliamperes of current.

As described in [Section 3.1.3](#), there are 10 230-kV lines that were specifically constructed to distribute power from VCSNS to the electric grid. The analysis of the Santee Cooper transmission lines began by identifying the limiting case for each line. The limiting case is the configuration along each line where the potential for current-induced shock would be greatest. Once the limiting case was identified, the electric field strength and induced current for each transmission line were calculated. For SCE&G-owned lines, the analysis was based on the design template used for the lines. If the template design satisfies the NESC criteria, then all the lines built in accordance with the template would satisfy the criteria.

SCE&G calculated electric field strength and induced current for both Santee Cooper-owned and SCE&G-owned lines using a computer code called AC/DCLINE, produced by the Electric Power Research Institute (EPRI 1991). The results of this computer program have been field-verified through actual electric field measurements by several utilities. The input parameters included the design features of the template or limiting-case scenario, the NESC[®] requirement that line sag be determined at 120°F conductor temperature, and the maximum vehicle size under the lines as a tractor-trailer 55 feet long, 8.2 feet wide, and an average of 11.8 feet high.

The analysis determined that none of the transmission lines has the capacity to induce as much as 5 milliamperes in a vehicle parked beneath the lines. Therefore, the VCSNS transmission line designs conform to the NESC[®] provisions for preventing electric shock from induced current. The results for each transmission line are provided in [Table 4-3](#).

SCE&G surveillance and maintenance procedures provide assurance that design ground clearances will not change. These procedures include routine helicopter inspection two times a year and ground inspection once every eight years. These routine aerial patrols of all corridors include checks for encroachments, broken conductors, broken or leaning structures, and signs of trees burning, any of which would be evidence of clearance problems. The ground inspections include examination for clearance at questionable locations and surveillance for dead or diseased

¹ Part 2, Rules 232C1c and 232D3c.

² The NESC[®] and the GEIS use the phrase “steady-state current,” whereas 10 CFR 51.53(c)(3)(ii)(H) uses the phrase “induced current.” The phrases mean the same here.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

trees which might fall on the transmission line. Problems noted during any inspection are brought to the attention of the appropriate organizations for corrective action.

SCE&G's assessment under 10 CFR 51 concludes that electric shock is of small significance for the VCSNS transmission lines. Due to the small significance of the issue, mitigation measures such as installing warning signs at road crossings or increasing clearances are not warranted. This conclusion would remain valid into the future, provided there are no changes in voltage, current, and maintenance practices and no changes in land use under the lines, conditions over which SCE&G has control.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.14 Housing Impacts

NRC

The environmental report must contain “[a]n assessment of the impact of the proposed action on housing availability....” 10 CFR 51.53(c)(3)(ii)(I)

“...Housing impacts are expected to be of small significance at plants located in a medium or high population area and not in an area where growth control measures that limit housing development are in effect. Moderate or large housing impacts of the workforce associated with refurbishment may be associated with plants located in sparsely populated areas or areas with growth control measures that limit housing development....” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 63

“...[S]mall impacts result when no discernible change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and no housing construction or conversion occurs....” (NRC 1996a, Section 4.7.1.1, pp. 4-101 to 4-102)

The NRC made housing impacts a Category 2 issue, because impact magnitude depends on local conditions that the NRC could not predict for all plants at the time of GEIS publication (NRC 1996a, Section 3.7.2). Local conditions that need to be ascertained are: (1) population categorization as small, medium, or high, and (2) applicability of growth control measures.

Refurbishment activities and continued operations could result in housing impacts due to increased staffing. As described in [Section 3.2](#), SCE&G does not plan to perform refurbishment. SCE&G concludes that there would be no refurbishment-related impacts to area housing and no analysis is therefore required. Accordingly, the following discussion focuses on impacts of continued operations on local housing availability.

As described in [Section 2.6](#), VCSNS is located in a medium population area. As noted in [Section 2.9](#), the area of interest is not subject to growth control measures that limit housing development. In 10 CFR 51, Subpart A, Appendix B, Table B-1, NRC concluded that impacts to housing are expected to be of small significance at plants located in “medium” population areas where growth control measures are not in effect. Therefore, SCE&G expects housing impacts to be small.

This conclusion is supported by the following site-specific housing analysis. The maximum impact to area housing is calculated using the following assumptions: (1) all direct and indirect jobs would be filled by in-migrating residents; (2) the residential distribution of new residents would be similar to current worker distribution; and (3) each new job created (direct and indirect) represents one housing unit. As described in [Section 3.4](#), approximately 90 percent of the VCSNS employees reside in Richland, Lexington, Fairfield, and Newberry Counties. Therefore, the focus of the housing impact analysis is on these areas. As also discussed in [Section 3.4](#), SCE&G’s conservative estimate of 60 license renewal employees could generate the demand for 237 housing units (60 direct and 177 indirect jobs). If it is assumed that 90 percent of the 237 new workers would locate in these four counties, consistent with current employee trends, approximately 213 housing units would be required in Richland, Lexington, Fairfield, and

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Newberry Counties. In an area with a population of nearly 600,000, it is reasonable to conclude that this demand would not create a discernible change in housing availability, rental rates or housing values, or spur housing construction or conversion. Therefore, impacts to housing availability resulting from plant-related population growth would be small and would not warrant mitigation.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.15 Public Utilities: Public Water Supply Availability

NRC

The environmental report must contain “...an assessment of the impact of population increases attributable to the proposed project on the public water supply.” 10 CFR 51.53(c)(3)(ii)(I)

“...An increased problem with water shortages at some sites may lead to impacts of moderate significance on public water supply availability....” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 65

“Impacts on public utility services are considered small if little or no change occurs in the ability to respond to the level of demand and thus there is no need to add capital facilities. Impacts are considered moderate if overtaxing of facilities during peak demand periods occurs. Impacts are considered large if existing service levels (such as the quality of water and sewage treatment) are substantially degraded and additional capacity is needed to meet ongoing demands for services....” (NRC 1996a, Section 3.7.4.5, pg. 3-19)

The NRC made public utility impacts a Category 2 issue because an increased problem with water availability, resulting from pre-existing water shortages, could occur in conjunction with plant demand and plant-related population growth (NRC 1996a, Section 4.7.3.5). Local information needed would be: (1) a description of water shortages experienced in the area, and (2) an assessment of the public water supply system’s available capacity.

The NRC’s analysis of impacts to the public water supply system considered both plant demand and plant-related population growth demands on local water resources. [Section 3.4](#) describes potential population increases, and [Section 2.6](#) describes the distribution of that population in the area associated with license renewal activities at VCSNS. [Section 2.10.1](#) describes the public water supply systems potentially affected by license renewal activities. VCSNS does not use water from a municipal system; therefore, SCE&G does not expect VCSNS to have an effect on local water supplies. As discussed in [Section 3.2](#), no refurbishment is planned for VCSNS and, therefore, no refurbishment impacts are expected.

The impact to the local water supply systems from plant-related population growth can be determined by calculating the amount of water that would be required by these individuals. The average American uses between 50 and 80 gallons per day for personal use (Fetter 1980, pg. 2). As described in [Section 3.4](#), SCE&G’s conservative estimate of 60 license renewal employees could generate a total of 237 new jobs, which could result in a population increase of 640 in the area [237 jobs multiplied by 2.7, which is the average number of persons per household in the area (Central Midlands Council of Governments 1999)]. Using this consumption rate, the plant-related population increase could require an additional 51,200 gallons per day (640 people multiplied by 80 gallons per day) in an area where the public water supply capacity is more than 150 million gallons per day. If it is assumed that this increase is distributed across the four potentially affected counties, consistent with current employee trends, the increase in water demand would not create shortages in capacity of the water supply systems in these communities, based on recently completed assessments. (See [Section 2.10.1](#) for a discussion of these systems.)

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Therefore, impacts from plant-related population growth on public water supplies would be small, requiring no additional capacity and not warranting mitigation.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.16 Education Impacts from Refurbishment

NRC

The environmental report must contain “an assessment of the impact of the proposed action on...public schools (impacts from refurbishment activities only) within the vicinity of the plant...” 10 CFR 51.53(c)(3)(ii)(I)

“...Most sites would experience impacts of small significance but larger impacts are possible depending on site- and project-specific factors...” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 66

“...[S]mall impacts are associated with project-related enrollment increases of 3 percent or less. Impacts are considered small if there is no change in the school systems’ abilities to provide educational services and if no additional teaching staff or classroom space is needed. Moderate impacts generally are associated with 4 to 8 percent increases in enrollment. Impacts are considered moderate if a school system must increase its teaching staff or classroom space even slightly to preserve its pre-project level of service....Large impacts are associated with project-related enrollment increases greater than 8 percent....” (NRC 1996a, Section 3.7.4.1, pg. 3-15)

The NRC made impacts to education a Category 2 issue because site- and project-specific factors determine the significance of impacts (NRC 1996a, Section 3.7.4.2).

This issue is not applicable to VCSNS because, as [Section 3.2](#) discusses, SCE&G has no plans for major refurbishment or replacement actions at VCSNS.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.17 Offsite Land Use

4.17.1 Offsite Land Use - Refurbishment

NRC

The environmental report must contain “an assessment of the impact of the proposed action on...land-use...(impacts from refurbishment activities only) within the vicinity of the plant...” 10 CFR 51.53(c)(3)(ii)(I)

“...Impacts may be of moderate significance at plants in low population areas....” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 68

“...[I]f plant-related population growth is less than 5 percent of the study area’s total population, off-site land-use changes would be small, especially if the study area has established patterns of residential and commercial development, a population density of at least 60 persons per square mile (2.6 km²), and at least one urban area with a population of 100,000 or more within 80 km (50 miles)....” (NRC 1996a, Section 3.7.5, pg. 3-21)

The NRC made impacts to offsite land use as a result of refurbishment activities a Category 2 issue because land-use changes could be considered beneficial by some community members and adverse by others.

This issue is not applicable to VCSNS because, as [Section 3.2](#) discusses, SCE&G has no plans for major refurbishment or replacement actions at VCSNS.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.17.2 Offsite Land Use - License Renewal Term

NRC

The environmental report must contain “[a]n assessment of the impact of the proposed action on...land-use...within the vicinity of the plant...” 10 CFR 51.53(c)(3)(ii)(I)

“...Significant changes in land use may be associated with population and tax revenue changes resulting from license renewal...” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 69

“...[I]f plant-related population growth is less than 5 percent of the study area’s total population, off-site land-use changes would be small...” (NRC 1996a, Section 3.7.5, pg. 3-21)

“...[I]f the plant’s tax payments are projected to be small relative to the community’s total revenue, new tax-driven land-use changes during the plant’s license renewal term would be small, especially where the community has preestablished patterns of development and has provided adequate public services to support and guide development...” (NRC 1996a, Section 4.7.4.1, pg. 4-108)

The NRC made impacts to offsite land use during the license renewal term a Category 2 issue, because land-use changes may be perceived as beneficial by some community members and adverse by others. Therefore, NRC could not assess the potential significance of site-specific offsite land-use impacts (NRC 1996a, Section 4.7.4.1). Site-specific factors to consider in an assessment of new tax-driven land-use impacts include: (1) the size of plant-related population growth compared to the area’s total population, (2) the size of the plant’s tax payments relative to the community’s total revenue, (3) the nature of the community’s existing land-use pattern, and (4) the extent to which the community already has public services in place to support and guide development.

The GEIS presents an analysis of offsite land use for the renewal term that is characterized by two components: population-driven and tax-driven impacts (NRC 1996a, Section 4.7.4.1). Based on the GEIS case-study analysis, NRC concludes that all new population-driven land-use changes during the license renewal term at all nuclear plants would be small. This follows logically from the fact that population growth caused by license renewal would represent a much smaller percentage of the local area’s total population than has operations-related growth (NRC 1996a, Section 4.7.4.2).

Tax-Revenue-Related Impacts

The NRC has determined that the significance of tax payments as a source of local government revenue would be large, if the payments are greater than 20 percent of revenue (NRC 1996a, Section 4.7.2.1).

The NRC defined the magnitude of land-use changes as follows (NRC 1996a, Section 4.7.4):

- Small - very little new development and minimal changes to an area’s land-use pattern

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

- Moderate - considerable new development and some changes to land-use pattern
- Large - large-scale new development and major changes in land-use pattern.

NRC further determined that, if a plant's tax payments are projected to be a dominant source of a community's total revenue (i.e., greater than 20 percent of revenue), then new tax-driven land-use changes would be large.

Table 2-3 provides a comparison of total tax payments made by SCE&G to Fairfield County and the County's operating budget. For the 6-year period from 1995 through 2000, VCSNS's tax payments to Fairfield County represented approximately 47 percent of the County's total annual property tax revenue and 47 percent of Fairfield County's annual operating budget. Using NRC's criteria, VCSNS's tax payments are of large significance to Fairfield County.

As described in Section 3.2, SCE&G does not anticipate major refurbishment or construction during the license renewal period. Therefore, SCE&G does not anticipate any increase in the assessed value of VCSNS due to refurbishment-related improvements nor any related tax-increase-driven changes to offsite land use and development patterns.

VCSNS has been, and would probably continue to be, the dominant source of tax revenue for Fairfield County. However, despite having this income source since the early 1980s, Fairfield County has not experienced large land-use changes. The VCSNS environs have remained largely rural, county population growth rates after VCSNS construction have been minimal, and county planners are not projecting large changes (Stowers 2000). Continued operation of VCSNS over the license renewal term would be important to maintaining the current level of development and public services, but should not bring plant-induced changes to local land-use and development patterns.

Conclusion

SCE&G views the continued operation of VCSNS as a significant benefit to Fairfield County through direct and indirect salaries and tax contributions to the County's economy. Because population growth related to the license renewal of VCSNS is expected to be relatively small and there would be no new tax impacts to Fairfield County land use, the renewal of VCSNS's license would have a continued beneficial impact on Fairfield County.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.18 Transportation

NRC

The environmental report must contain an assessment of “...the impact of the proposed project on local transportation during periods of license renewal refurbishment activities and during the term of the renewed license.” 10 CFR 51.53(c)(3)(ii)(J)

“...Transportation impacts...are generally expected to be of small significance. However, the increase in traffic associated with additional workers and the local road and traffic control conditions may lead to impacts of moderate or large significance at some sites....” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 70

“...LOS [Level of Service] A and B are associated with small impacts because the operation of individual users is not substantially affected by the presence of other users....LOS C and D are associated with moderate impacts because the operation of individual users begins to be severely restricted by other users....” (NRC 1996a, Section 3.7.4.2, pg. 3-17)

The NRC made impacts to transportation a Category 2 issue, because impact significance is determined primarily by road conditions existing at the time of license renewal, which NRC could not forecast for all facilities (NRC 1996a, Section 3.7.4.2). Local road conditions to be ascertained are: (1) level of service conditions, and (2) incremental increases in traffic associated with refurbishment activities and license renewal staff.

As described in [Section 3.2](#), no major refurbishment is planned and no refurbishment impacts to local transportation are therefore anticipated.

As described in [Section 3.4](#) (Employment), SCE&G’s VCSNS workforce includes approximately 600 permanent and 130 to 140 contract employees. On an 18-month cycle, 600 to 800 additional workers join the permanent workforce during refueling outages. SCE&G’s conservative projection of 60 additional employees associated with license renewal for VCSNS represents a 10 percent increase in the current number of permanent employees and an even smaller percentage of employees present onsite during a typical refueling outage. Given these employment projections and the average number of vehicles per day currently using the surrounding roads to VCSNS ([Table 2-6](#)), it appears that impacts to transportation would be small and mitigative measures would be unwarranted.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.19 Historic and Archeological Resources

NRC

The environmental report must contain an assessment of “...whether any historic or archeological properties will be affected by the proposed project.” 10 CFR 51.53(c)(3)(ii)(K)

“...Generally, plant refurbishment and continued operation are expected to have no more than small adverse impacts on historic and archeological resources. However, the National Historic Preservation Act requires the Federal agency to consult with the State Historic Preservation Officer to determine whether there are properties present that require protection....” 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 71

“...Sites are considered to have small impacts to historic and archeological resources if (1) the State Historic Preservation Officer (SHPO) identifies no significant resources on or near the site; or (2) the SHPO identifies (or has previously identified) significant historic resources but determines they would not be affected by plant refurbishment, transmission lines, and license-renewal-term operations and there are no complaints from the affected public about altered historic character; and (3) if the conditions associated with moderate impacts do not occur....” (NRC 1996a, Section 3.7.7, pg. 3-23)

The NRC made impacts to historic and archeological resources a Category 2 issue because determinations of impacts to historic and archeological resources are site-specific in nature, and the National Historic Preservation Act mandates that impacts must be determined through consultation with the State Historic Preservation Officer (SHPO) (NRC 1996a, Section 4.7.7.3). Correspondence between SCE&G and the State Historic Preservation Office is provided as Appendix E.

SCE&G has no plans for major refurbishment or replacement actions that would require land disturbance, and no refurbishment-related impacts are therefore anticipated. As described in [Section 2.13](#), two archeological sites were excavated prior to construction and approximately four to five sites were flooded when Monticello Reservoir was filled. However, these were appropriately surveyed and reconciled in an approved manner by the University of South Carolina Institute of Archeology and Anthropology (Stephenson 1978). Archeological and historic sites of significance have been identified within a 6-mile radius of the site, and none appears to lie within (or near) a transmission corridor. Therefore, continued use of transmission lines and rights-of-way over the license renewal term is unlikely to affect these resources. Any impacts from continued operation of VCSNS on historic or archeological resources would be small and would not warrant mitigation.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.20 Severe Accident Mitigation Alternatives

NRC

The environmental report must contain a consideration of alternatives to mitigate severe accidents “...If the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environmental assessment...” 10 CFR 51.53(c)(3)(ii)(L)

The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to ground water, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives. 10 CFR Part 51, Subpart A, Appendix B, Table B-1 (Issue 76)

Section 4.20 describes how SCE&G analyzed a large number of alternatives to mitigate severe accidents and briefly summarizes the results of the analysis. Appendix F provides a more detailed description of the analysis and the results.

The term “accident” refers to any unintentional event (i.e., outside the normal or expected plant operational envelope) that results in the release or a potential for release of radioactive material to the environment. Generally, NRC categorizes accidents as “design-basis” or “severe.” Design basis accidents are those for which the risk is great enough that an applicant is required to design and construct a plant to prevent unacceptable accident consequences. Severe accidents are those considered too unlikely to warrant design controls.

Historically, the NRC has not included in its Environmental Impact Statements (EISs) or environmental assessments any analysis of alternative ways to mitigate the environmental impact of severe accidents. A 1989 court decision ruled that, in the absence of an NRC finding that severe accidents are remote and speculative, severe accident mitigation alternatives (SAMAs) should be considered in the NEPA analysis [*Limerick Ecology Action v. NRC*, 869 F.2d 719 (3rd Cir. 1989)]. For most plants, including VCSNS, license renewal is the first licensing action that would necessitate consideration of SAMAs.

The NRC concluded in its generic license renewal rulemaking that the unmitigated environmental impacts from severe accidents met its Category 1 criteria. However, NRC made consideration of mitigation alternatives a Category 2 issue because ongoing regulatory programs related to mitigation (i.e., Individual Plant Examination [IPE] and Accident Management) have not been completed for all plants. Since these programs have identified plant programmatic and procedural improvements (and in a few cases, minor modifications) as cost-effective in reducing severe accident and risk consequences, NRC thought it premature to draw a generic conclusion as to whether severe accident mitigation would be required for license renewal. Site-specific information to be presented in the environmental report includes: (1) potential SAMAs; (2) benefits, costs, and net value of implementing potential SAMAs; and (3) sensitivity of analysis to changes to key underlying assumptions.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Analysis

SCE&G maintains a probabilistic risk assessment (PRA) model to use in evaluating the most significant risks of radiological release from VCSNS fuel into the reactor and from the reactor into the containment structure. For the SAMA analysis, SCE&G used PRA model output as input to an NRC-approved model that calculated economic costs and dose to the public from hypothesized releases from the containment structure into the environment. The results of the VCSNS-specific analyses for severe accidents ([Appendix F](#)) show that the total core damage frequency is estimated at 5.59×10^{-5} per year (internal events) and the dose risk is estimated at 0.954 person-rem per year.

Then, using NRC regulatory analysis techniques, SCE&G calculated the monetary value of the VCSNS severe accident risk based on the current plant operating characteristics. The result represents the monetary value of the base risk of dose to the public and workers, offsite and onsite economic costs, and replacement power. This value was used as a cost-benefit screening tool for potential SAMAs. This bounding analysis demonstrates that plant enhancements (severe accident mitigation and containment performance improvements) in excess of \$1,203,000 are not cost justified based on averted public health risk.

SCE&G used industry, NRC, and VCSNS-specific information to create a list of 268 SAMAs for consideration. SCE&G analyzed this list and screened out SAMAs that would not apply to the VCSNS design, that SCE&G had already implemented at VCSNS, or that would achieve results that SCE&G had already achieved at VCSNS by other means. SCE&G prepared preliminary cost estimates for the remaining SAMAs and used the maximum averted cost-risk value to screen out SAMAs that would not be cost beneficial. Thirty two candidate SAMAs remained for further consideration, twelve of which required full model quantification for disposition.

SCE&G evaluated the remaining SAMAs using PSA model insights or full model quantifications, which simulated SAMA implementation. The model runs simulating SAMA implementation yielded reduced cost-risk levels due to the impact of the modifications. The difference between the base case cost-risk value and the SAMA-reduced cost-risk value is defined as the averted risk, or a measure of the value of implementing the SAMA. SCE&G prepared more detailed estimates of the cost of implementing each SAMA and repeated the cost/benefit comparison. The results of this analysis are presented in [Table 4-4](#). None of the candidate SAMAs emerged from the analysis for further consideration

The benefits of revising the operational strategies in place at VCSNS and/or implementing hardware modifications can be evaluated without the insight from a risk-based analysis. The SAMA analysis has, however, provided an enhanced understanding of the effects of the proposed changes relative to the cost of implementation and projected impact on a much larger future population. The results of the SAMA analysis indicate that none of the potential plant

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

improvements identified are cost beneficial based on the methodology defined in this document. No SAMAs are suggested for implementation on a cost-benefit basis.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

4.21 References

- CDC (Centers for Disease Control and Prevention). 2000. Surveillance for Waterborne-Disease Outbreaks – United States, 1977 – 1998. Volume 49, No. SS-4, Atlanta, GA.
- Central Midlands Council of Governments. 1999. Households and Families, 1980 – 1990. Available online at <http://www.cmcog.state.sc.us/chouse.html>. Accessed August 11, 2000.
- Cooney, T. W., P.A. Drewes, S.W. Ellisor, and F. Melendez. 2001. Water Resources Data South Carolina: Water Year 2000. Water-Data Report 00-1. U.S. Dept. of the Interior, U.S. Geological Survey, Columbia, SC.
- Dames & Moore. 1985a. Section 316(b) Demonstration for the Virgil C. Summer Nuclear Station for the South Carolina Department of Health and Environmental Control and the Nuclear Regulatory Commission.
- Dames & Moore. 1985b. Environmental Monitoring Report, January 1983 – December 1984, for Virgil C. Summer Nuclear Station.
- EPA (Environmental Protection Agency). 1979. Pathogenic *Naegleria* – Distribution in Nature. Health Effects Research Laboratory, Cincinnati, OH, EPA-622/1-79-018.
- EPRI (Electric Power Research Institute). 1991. TL Workstation Code, Volume 7: AC/DCLINE User's Manual, Version 1.0, EPRI, Palo Alto, California.
- Fetter, C. W., Jr. 1980. *Applied Hydrogeology*. Charles E. Merrill Publishing Co. Columbus, OH.
- Holling, J. 2001. Letter to S.A. Byrne, SCE&G, responding to request for information on listed species and important habitats. SC Department of Natural Resources Heritage Trust Program. February 15.
- Institute of Electrical and Electronics Engineers, Inc. (IEEE). *National Electrical Safety Code, 1997 Edition*. New York, New York.
- Joklik, W. K. and D. T. Smith, (eds.). 1972. *Microbiology, 15th edition*. Appleton-Century-Crofts. New York, NY.
- NRC (U.S. Nuclear Regulatory Commission). 1981. *Final Environmental Statement Related to the Operation of Virgil C. Summer Nuclear Station Unit 1*, South Carolina Electric and Gas Company, Office of Nuclear Reactor Regulation, Washington, DC.
- NRC (U.S. Nuclear Regulatory Commission). 1996a. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*. Volumes 1 and 2. NUREG-1437. Washington, DC. May.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

NRC (U.S. Nuclear Regulatory Commission). 1996b. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses," Federal Register 61, No. 109. June 5.

SCDNR (South Carolina Department of Natural Resources). 2001. South Carolina Rare, Threatened & Endangered Species Inventory. <http://www.dnr.state.sc.us/heritage/owa/species.login>. Note: This is a protected website that is accessible only through SCDNR authorization.

SCE&G (South Carolina Electric & Gas Company). 1974. *Virgil C. Summer Nuclear Station Operating License Environmental Report* (Volume II), South Carolina Electric & Gas Company, Columbia, SC.

SCE&G (South Carolina Electric & Gas Company). 1996a. 1995 Water Quality Monitoring Report for Monticello Reservoir. Environmental Services, South Carolina Electric and Gas. March 1.

SCE&G (South Carolina Electric & Gas Company). 1996b. V.C. Summer Station National Pollutant Discharge Elimination System (NPDES) Discharge Monitoring Reports for 1995.

SCE&G (South Carolina Electric & Gas Company). 1997a. 1996 Water Quality Monitoring Report for Monticello Reservoir. Environmental Services, South Carolina Electric and Gas. March 5.

SCE&G (South Carolina Electric & Gas Company). 1997b. V.C. Summer Station National Pollutant Discharge Elimination System (NPDES) Discharge Monitoring Reports for 1996.

SCE&G (South Carolina Electric & Gas Company). 1998a. Virgil C. Summer Nuclear Station Quarterly Water Use Report for 1998. Submitted to SCDHEC by SCE&G.

SCE&G (South Carolina Electric & Gas Company). 1998b. 1997 Water Quality Monitoring Report for Monticello Reservoir. Environmental Services, South Carolina Electric and Gas. February 10.

SCE&G (South Carolina Electric & Gas Company). 1998c. V.C. Summer Station National Pollutant Discharge Elimination System (NPDES) Discharge Monitoring Reports for 1997.

SCE&G (South Carolina Electric & Gas Company). 1999a. Virgil Summer Nuclear Station Quarterly Water Use Report for 1999. Submitted to SCDHEC by SCE&G.

SCE&G (South Carolina Electric & Gas Company). 1999b. 1998 Water Quality Monitoring Report for Monticello Reservoir. Environmental Services, South Carolina Electric and Gas. January 13.

SCE&G (South Carolina Electric & Gas Company). 1999c. V.C. Summer Station National Pollutant Discharge Elimination System (NPDES) Discharge Monitoring Reports for 1998.

SCE&G (South Carolina Electric & Gas Company). 2000a. 1999 Water Quality Monitoring Report for Monticello Reservoir. Environmental Services, South Carolina Electric and Gas. January 13.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

SCE&G (South Carolina Electric & Gas Company). 2000b. V.C. Summer Station National Pollutant Discharge Elimination System (NPDES) Discharge Monitoring Reports for 1999.

SCE&G (South Carolina Electric & Gas Company). 2001a. 2000 Water Quality Monitoring Report for Monticello Reservoir, Environmental Services, South Carolina Electric and Gas. February 14.

SCE&G (South Carolina Electric & Gas Company). 2001b. V.C. Summer Station National Pollutant Discharge Elimination System (NPDES) Discharge Monitoring Reports for 2000.

SCE&G (South Carolina Electric & Gas Company). 2002. Virgil C. Summer Nuclear Station Final Safety Analysis Report, through Amendment 02-01.

Stephenson, R. L. 1978. Letter to E.H. Crews, South Carolina Electric and Gas Company, concerning archeological resources related to the V.C. Summer Nuclear Station construction. U.S.C. Institute of Archeology and Anthropology. August 11.

Stowers, R. 2000. Fairfield County Planning, Building, and Zoning. General Land Use Trends – Past and Present. Personal Communication with E. N. Hill, TtNUS, Aiken, SC. August 9.

USAEC (United States Atomic Energy Commission). 1973. *Final Environmental Statement Related to Operation of Virgil C. Summer Nuclear Station Unit 1*, South Carolina Electric & Gas Company, Directorate of Licensing, Washington, DC.

TABLE 4-1
CATEGORY 1 ISSUES THAT ARE NOT APPLICABLE TO V.C. SUMMER NUCLEAR STATION (VCSNS)^a

Issues	Basis for Inapplicability to VCSNS
Surface Water Quality, Hydrology, and Use (for all plants)	
1. Impacts of refurbishment on surface water quality	Issue applies to activity, refurbishment, that VCSNS will not undertake.
2. Impacts of refurbishment on surface water use	Issue applies to activity, refurbishment, that VCSNS will not undertake.
4. Altered salinity gradients	Issue applies to discharge to a natural water body that has a salinity gradient to alter, not inland freshwaters.
Aquatic Ecology (for all plants)	
14. Refurbishment	Issue applies to activity, refurbishment, that VCSNS will not undertake.
Aquatic Ecology (for plants with cooling-tower-based heat dissipation systems)	
28. Entrainment of fish and shellfish in early life stages	Issue applies to plants with cooling tower-based heat dissipation systems; VCSNS uses a cooling pond to dissipate waste heat from condensers.
29. Impingement of fish and shellfish	Issue applies to plants with cooling tower-based heat dissipation systems; VCSNS uses a cooling pond to dissipate waste heat from condensers.
30. Heat shock	Issue applies to plants with cooling tower-based heat dissipation systems; VCSNS uses a cooling pond to dissipate waste heat from condensers.
Groundwater Use and Quality	
31. Impacts of refurbishment on groundwater use and quality	Issue applies to activity, refurbishment, that VCSNS will not undertake.
36. Groundwater quality degradation (Ranney wells)	Issue applies to a plant feature, Ranney wells, that VCSNS does not have.
37. Groundwater quality degradation (saltwater intrusion)	Issue applies to plants in coastal areas, not inland sites such as VCSNS.
38. Groundwater quality degradation (cooling ponds in salt marshes)	Issue applies to cooling ponds in salt marshes, not inland sites such as VCSNS.
Terrestrial Resources	
41. Cooling tower impacts on crops and ornamental vegetation	Issue applies to plants with cooling-tower-based heat dissipation systems; VCSNS uses a cooling pond to dissipate waste heat from condensers.
42. Cooling tower impacts on native plants	Issue applies to plants with cooling-tower-based heat dissipation systems; VCSNS uses a cooling pond to dissipate waste heat from condensers.
43. Bird collisions with cooling towers	Issue applies to plants with cooling-tower-based heat dissipation systems; VCSNS uses a cooling pond to dissipate waste heat from condensers.

TABLE 4-1 (Continued)
CATEGORY 1 ISSUES THAT ARE NOT APPLICABLE TO V.C. SUMMER NUCLEAR STATION (VCSNS)^a

Issues		Basis for Inapplicability to VCSNS
Human Health		
54.	Radiation exposures to the public during refurbishment	Issue applies to activity, refurbishment, that VCSNS will not undertake.
55.	Occupational radiation exposures during refurbishment	Issue applies to activity, refurbishment, that VCSNS will not undertake.
Socioeconomics		
72.	Aesthetic impacts (refurbishment)	Issue applies to activity, refurbishment, VCSNS will not undertake.

< = less than

gpm = gallons per minute

NRC = U. S. Nuclear Regulatory Commission

a. NRC listed the issues in Table B-1 of 10 CFR 51 Appendix B. SCE&G added issue numbers for expediency.

TABLE 4-2
CATEGORY 1 AND “NA” ISSUES THAT ARE APPLICABLE TO V.C. SUMMER NUCLEAR STATION (VCSNS)^a

Issue	NRC Findings ^b	GEIS, Ref. 4.0-2 (Section/Page)
Surface Water Quality, Hydrology, and Use (for all plants)		
3.	Altered current patterns at intake and discharge structures	SMALL. Altered current patterns have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
		4.2.1.1/4-4 (once-through) 4.3.2.2/4-31 (cooling tower)
5.	Altered thermal stratification of lakes	SMALL. Generally, lake stratification has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
		4.2.1.2.2./4-4 (once-through)
6.	Temperature effects on sediment transport capacity	SMALL. These effects have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
		4.3.4.2.3/4-6 (once-through)
7.	Scouring caused by discharged cooling water	SMALL. Scouring has not been found to be a problem at most operating nuclear power plants and has caused only localized effects at a few plants. It is not expected to be a problem during the license renewal term.
		4.4.2.2/4-53
8.	Eutrophication	SMALL. Eutrophication has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
		4.4.2.2/4-53
9.	Discharge of chlorine or other biocides	SMALL. Effects are not a concern among regulatory and resource agencies, and are not expected to be a problem during the license renewal term.
		4.4.2.2/4-53
10.	Discharge of sanitary wastes and minor chemical spills	SMALL. Effects are readily controlled through NPDES permit and periodic modifications, if needed, and are not expected to be a problem during the license renewal term.
		4.4.2.2/4-53
11.	Discharge of other metals in waste water	SMALL. These discharges have not been found to be a problem at operating nuclear power plants with cooling-tower-based heat dissipation systems and have been satisfactorily mitigated at other plants. They are not expected to be a problem during the license renewal term.
		4.4.2.2/4-53
12.	Water use conflicts (plants with once-through cooling systems)	SMALL. These conflicts have not been found to be a problem at operating nuclear power plants with once-through heat dissipation systems.
		4.2.1.3/4-13 (once-through)
Aquatic Ecology (for all plants)		
15.	Accumulation of contaminants in sediments or biota	SMALL. Accumulation of contaminants has been a concern at a few nuclear power plants, but has been satisfactorily mitigated by replacing copper alloy condenser tubes with those of another metal. It is not expected to be a problem during the license renewal term.
		4.4.3/4-56 4.4.2.2/4-53
16.	Entrainment of phytoplankton and zooplankton	SMALL. Entrainment of phytoplankton and zooplankton has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
		4.4.3/4-56

TABLE 4-2 (Continued)
CATEGORY 1 AND “NA” ISSUES THAT ARE APPLICABLE TO V.C. SUMMER NUCLEAR STATION (VCSNS)^a

Issue	NRC Findings ^b	GEIS, Ref. 4.0-2 (Section/Page)
17. Cold shock	SMALL. Cold shock has been satisfactorily mitigated at operating nuclear plants with once-through cooling systems, has not endangered fish populations or been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds, and is not expected to be a problem during the license renewal term.	4.4.3/4-56
18. Thermal plume barrier to migrating fish	SMALL. Thermal plumes have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.	4.2.2.1.6/4-19 (once-through)
19. Distribution of aquatic organisms	SMALL. Thermal discharge may have localized effects, but is not expected to affect the larger geographical distribution of aquatic organisms.	4.2.2.1.6/4-19 (once-through)
20. Premature emergence of aquatic insects	SMALL. Premature emergence has been found to be a localized effect at some operating nuclear power plants, but has not been a problem and is not expected to be a problem during the license renewal term.	4.4.3/4-56
21. Gas supersaturation (gas bubble disease)	SMALL. Gas supersaturation was a concern at a small number of operating nuclear power plants with once-through cooling systems, but has been satisfactorily mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.	4.4.3/4-56
22. Low dissolved oxygen in the discharge	SMALL. Low dissolved oxygen has been a concern at one nuclear power plant with a once-through cooling system, but has been effectively mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.	4.4.3/4-56
23. Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	SMALL. These types of losses have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.	4.4.3/4-56
24. Stimulation of nuisance organisms (e.g., shipworms)	SMALL. Stimulation of nuisance organisms has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where previously it was a problem. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.	4.4.3/4-56

TABLE 4-2 (Continued)
CATEGORY 1 AND “NA” ISSUES THAT ARE APPLICABLE TO V.C. SUMMER NUCLEAR STATION (VCSNS)^a

	Issue	NRC Findings^b	GEIS, Ref. 4.0-2 (Section/Page)
Groundwater Use and Quality			
32.	Groundwater use conflicts (potable and service water; plants that use < 100 gpm)	SMALL. Plants using less than 100 gpm are not expected to cause any groundwater use conflicts.	4.4.3/4-56
Terrestrial Resources			
44.	Cooling pond impacts on terrestrial resources	SMALL. Impacts of cooling ponds on terrestrial ecological resources are considered to be of small significance at all sites.	4.3.5.1/4-42
45.	Power line right-of-way management (cutting and herbicide application)	SMALL. The impacts of right-of-way maintenance on wildlife are expected to be of small significance at all sites.	4.5.6.1/4-71
46.	Bird collision with power lines	SMALL. Impacts are expected to be of small significance at all sites.	4.5.6.2/4-74
47.	Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	SMALL. No significant impacts of electromagnetic fields on terrestrial flora and fauna have been identified. Such effects are not expected to be a problem during the license renewal term.	4.5.6.3/4-77
48.	Floodplains and wetlands on power line right of way	SMALL. Periodic vegetation control is necessary in forested wetlands underneath power lines and can be achieved with minimal damage to the wetland. No significant impact is expected at any nuclear power plant during the license renewal term.	4.5.7/4-81
Air Quality			
51.	Air quality effects of transmission lines	SMALL. Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.	4.5.2/4-62
Land Use			
52.	Onsite land use	SMALL. Projected onsite land use changes required during refurbishment and the renewal period would be a small fraction of any nuclear power plant site and would involve land that is controlled by the applicant.	3.2/3-1
53.	Power line right of way	SMALL. Ongoing use of power line right of ways would continue with no change in restrictions. The effects of these restrictions are of small significance.	4.5.3/4-62
Human Health			
56.	Microbiological organisms (occupational health)	SMALL. Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize worker exposures.	4.3.6/4-48
58.	Noise	SMALL. Noise has not been found to be a problem at operating plants and is not expected to be a problem at any plant during the license renewal term.	4.3.7/4-49

TABLE 4-2 (Continued)
CATEGORY 1 AND “NA” ISSUES THAT ARE APPLICABLE TO V.C. SUMMER NUCLEAR STATION (VCSNS)^a

	Issue	NRC Findings^b	GEIS, Ref. 4.0-2 (Section/Page)
60.	Electromagnetic fields, chronic effects	UNCERTAIN. Biological and physical studies of 60-Hz electromagnetic fields have not found consistent evidence linking harmful effects with field exposures. However, research is continuing in this area and a consensus scientific view has not been reached.	4.5.4.2/4-67
61.	Radiation exposures to public (license renewal term)	SMALL. Radiation doses to the public will continue at current levels associated with normal operations.	4.6.2/4-87
62.	Occupational radiation exposures (license renewal term)	SMALL. Projected maximum occupational doses during the license renewal term are within the range of doses experienced during normal operations and normal maintenance outages, and would be well below regulatory limits.	4.6.3/4-95
Socioeconomics			
64.	Public services: public safety, social services, and tourism and recreation	SMALL. Impacts to public safety, social services, and tourism and recreation are expected to be of small significance at all sites.	3.7.4/3-14 (refurbishment – public services) 3.7.4.3/3-18 (refurbishment – safety) 3.7.4.4/3-19 (refurbishment – social) 3.7.4.6/3-20 (refurbishment – tourism, recreation) 4.7.3/4-104 (renewal – public services) 4.7.3.3/4-106 (renewal - safety) 4.7.3.4/4-107 (renewal - social) 4.7.3.6/4-107 (renewal - tourism, recreation)
67.	Public services, education (license renewal term)	SMALL. Only impacts of small significance are expected.	4.7.3.1/4-106
73.	Aesthetic impacts (license renewal term)	SMALL. No significant impacts are expected during the license renewal term.	4.7.6/4-111
74.	Aesthetic impacts of transmission lines (license renewal term)	SMALL. No significant impacts are expected during the license renewal term.	4.5.8/4-83
Postulated Accidents			
75.	Design basis accidents	SMALL. The NRC staff has concluded that the environmental impacts of design basis accidents are of small significance for all plants.	5.3.2/5-11 (design basis) 5.5.1/5-114 (summary)

TABLE 4-2 (Continued)
CATEGORY 1 AND “NA” ISSUES THAT ARE APPLICABLE TO V.C. SUMMER NUCLEAR STATION (VCSNS)^a

Issue	NRC Findings ^b	GEIS, Ref. 4.0-2 (Section/Page)
Uranium Fuel Cycle and Waste Management		
77. Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high level waste)	SMALL. Off-site impacts of the uranium fuel cycle have been considered by the Commission in Table S-3 of this part. Based on information in the GEIS, impacts on individuals from radioactive gaseous and liquid releases including radon-222 and technetium-99 are small.	6.2.4/6-27 6.6/6-87
78. Offsite radiological impacts (collective effects)	<p>The 100-year environmental dose commitment to the U.S. population from the fuel cycle, high-level waste and spent fuel disposal is calculated to be about 14,800 person rem, or 12 cancer fatalities, for each additional 20-year power reactor operating term. Much of this, especially the contribution of radon releases from mines and tailing piles, consists of tiny doses summed over large populations. This same dose calculation can theoretically be extended to include many tiny doses over additional thousands of years as well as doses outside the U.S. The result of such a calculation would be thousands of cancer fatalities from the fuel cycle, but this result assumes that even tiny doses have some statistical adverse health effect, which will not ever be mitigated (for example, no cancer cure in the next thousand years), and that these dose projections over thousands of years are meaningful. However, these assumptions are questionable. In particular, science cannot rule out the possibility that there will be no cancer fatalities from these tiny doses. For perspective, the doses are very small fractions of regulatory limits, and even smaller fractions of natural background exposure to the same populations.</p> <p>Nevertheless, despite all the uncertainty, some judgment as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgment in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the collective effects of the fuel cycle, this issue is considered Category 1.</p>	Not in GEIS.

TABLE 4-2 (Continued)
CATEGORY 1 AND “NA” ISSUES THAT ARE APPLICABLE TO V.C. SUMMER NUCLEAR STATION (VCSNS)^a

Issue	NRC Findings^b	GEIS, Ref. 4.0-2 (Section/Page)
79. Offsite radiological impacts (spent fuel and high level waste disposal)	<p>For the high-level waste and spent fuel disposal component of the fuel cycle, there are no current regulatory limits for offsite releases of radionuclides for the current candidate repository site. However, if we assume that limits are developed along the lines of the 1995 National Academy of Sciences (NAS) report, “Technical Bases for Yucca Mountain Standards,” and that in accordance with the Commission's Waste Confidence Decision, 10 CFR 51.23, a repository can and likely will be developed at some site which will comply with such limits, peak doses to virtually all individuals will be 100 millirem per year or less. However, while the Commission has reasonable confidence that these assumptions will prove correct, there is considerable uncertainty since the limits are yet to be developed, no repository application has been completed or reviewed, and uncertainty is inherent in the models used to evaluate possible pathways to the human environment. The NAS report indicated that 100 millirem per year should be considered as a starting point for limits for individual doses, but notes that some measure of consensus exists among national and international bodies that the limits should be a fraction of the 100 millirem per year. The lifetime individual risk from 100 millirem annual dose limit is about 3×10^{-3}.</p> <p>Estimating cumulative doses to populations over thousands of years is more problematic. The likelihood and consequences of events that could seriously compromise the integrity of a deep geologic repository were evaluated by the U.S. Department of Energy in the “Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste,” October 1980. The evaluation estimated the 70-year whole-body dose commitment to the maximum individual and to the regional population resulting from several modes of breaching a reference repository in the year of closure, after 1,000 years, after 100,000 years, and after 100,000,000 years. Subsequently, the NRC and other federal agencies have expended considerable effort to develop models for the design and for the licensing of a high-level waste repository, especially for the candidate repository at Yucca Mountain. More meaningful estimates of doses to population may be possible in the future as more is understood about the performance of the proposed Yucca Mountain repository. Such estimates would involve very great uncertainty, especially with respect to cumulative population doses over thousands of years. The standard proposed by the NAS is a limit on maximum individual dose. The relationship of potential new regulatory requirements, based on the NAS report, and cumulative population impacts has not been determined, although the report articulates the view that protection of individuals will adequately protect the population for a repository at Yucca</p>	Not in GEIS.

TABLE 4-2 (Continued)
CATEGORY 1 AND “NA” ISSUES THAT ARE APPLICABLE TO V.C. SUMMER NUCLEAR STATION (VCSNS)^a

Issue	NRC Findings ^b	GEIS, Ref. 4.0-2 (Section/Page)
80. Nonradiological impacts of the uranium fuel cycle	<p>Mountain. However, (EPA's) generic repository standards in 40 CFR part 191 generally provide an indication of the order of magnitude of cumulative risk to population that could result from the licensing of a Yucca Mountain repository, assuming the ultimate standards will be within the range of standards now under consideration. The standards in 40 CFR part 191 protect the population by imposing “containment requirements” that limit the cumulative amount of radioactive material released over 10,000 years. The cumulative release limits are based on EPA's population impact goal of 1,000 premature cancer deaths worldwide for a 100,000 metric ton (MTHM) repository.</p> <p>Nevertheless, despite all the uncertainty, some judgment as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgment in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent fuel and high-level waste disposal, this issue is considered Category 1.</p> <p>SMALL. The nonradiological impacts of the uranium fuel cycle resulting from the renewal of an operating license for any plant are found to be small.</p>	<p>6.2.2.6/6-20 (land use) 6.2.2.7/6-20 (water use) 6.2.2.8/6-21 (fossil fuel) 6.2.2.9/6-21 (chemical) 6.6/6-90 (conclusion)</p>
81. Low-level waste storage and disposal	<p>SMALL. The comprehensive regulatory controls that are in place, and the low public doses being achieved at reactors, ensure that the radiological impacts to the environment will remain small during the term of a renewed license. The maximum additional onsite land that may be required for low-level waste storage during the term of a renewed license and associated impacts will be small. Nonradiological impacts on air and water will be negligible. The radiological and nonradiological environmental impacts of long-term disposal of low-level waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient low-level waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.</p>	<p>6.4.2/6-36 (“low-level” definition) 6.4.3/6-37 (low-level volume) 6.4.4/6-48 (renewal effects) 6.6/6-90 (conclusion)</p>

TABLE 4-2 (Continued)
CATEGORY 1 AND “NA” ISSUES THAT ARE APPLICABLE TO V.C. SUMMER NUCLEAR STATION (VCSNS)^a

	Issue	NRC Findings^b	GEIS, Ref. 4.0-2 (Section/Page)
82.	Mixed waste storage and disposal	SMALL. The comprehensive regulatory controls and the facilities and procedures that are in place ensure proper handling and storage, as well as negligible doses and exposure to toxic materials for the public and the environment at all plants. License renewal will not increase the small, continuing risk to human health and the environment posed by mixed waste at all plants. The radiological nonradiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient mixed waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioned consistent with NRC decommissioning requirements.	6.4.5/6-63 6.6/6-91 (conclusion)
83.	On-site spent fuel	SMALL. The expected increase in the volume of spent fuel from an additional 20 years of operation can be safely accommodated on site with small environmental effects through dry or pool storage at all plants if a permanent repository or monitored retrievable storage is not available.	6.4.6/6-70 6.6/6-91 (conclusion)
84.	Nonradiological waste	SMALL. No changes to generating systems are anticipated for license renewal. Facilities and procedures are in place to ensure continued proper handling and disposal at all plants.	6.5/6-86 6.6/6-92 (conclusion)
85.	Transportation	SMALL. The impacts of transporting spent fuel enriched up to 5 percent uranium-235 with average burnup for the peak rod to current levels approved by NRC up to 62,000 MWd/MTU and the cumulative impacts of transporting high-level waste to a single repository, such as Yucca Mountain, Nevada are found to be consistent with the impact values contained in 10 CFR 51.52(c), Summary Table S-4- Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor. If fuel enrichment or burnup conditions are not met, the applicant must submit an assessment of the implications for the environmental impact values reported in §51.52.	Addendum 1
Decommissioning			
86.	Radiation doses	SMALL. Doses to the public will be well below applicable regulatory standards regardless of which decommissioning method is used. Occupational doses would increase no more than 1 man-rem caused by buildup of long-lived radionuclides during the license renewal term.	7.3.1/7-15
87.	Waste management	SMALL. Decommissioning at the end of a 20-year license renewal period would generate no more solid wastes than at the end of the current license term. No increase in the quantities of Class C or greater than Class C wastes would be expected.	7.3.2/7-19 (impacts) 7.4/7-25 (conclusions)

TABLE 4-2 (Continued)
CATEGORY 1 AND “NA” ISSUES THAT ARE APPLICABLE TO V.C. SUMMER NUCLEAR STATION (VCSNS)^a

	Issue	NRC Findings^b	GEIS, Ref. 4.0-2 (Section/Page)
88.	Air quality	SMALL. Air quality impacts of decommissioning are expected to be negligible either at the end of the current operating term or at the end of the license renewal term.	7.3.3/7-21 (air) 7.4/7-25 (conclusion)
89.	Water quality	SMALL. The potential for significant water quality impacts from erosion or spills is no greater whether decommissioning occurs after a 20-year license renewal period or after the original 40-year operation period, and measures are readily available to avoid such impacts.	7.3.4/7-21 (water) 7.4/7-25 (conclusion)
90.	Ecological resources	SMALL. Decommissioning after either the initial operating period or after a 20-year license renewal period is not expected to have any direct ecological impacts.	7.3.5/7-21 (ecological) 7.4/7-25 (conclusion)
91.	Socioeconomic impacts	SMALL. Decommissioning would have some short-term socioeconomic impacts. The impacts would not be increased by delaying decommissioning until the end of a 20-year relicense period, but they might be decreased by population and economic growth.	7.3.7/7-24 (socioeconomic) 7.4/7-25 (conclusion)
92.	Environmental Justice	NONE. The need for and the content of an analysis of environmental justice will be addressed in plant-specific reviews.	Not in GEIS

- CFR = Code of Federal Regulations
 EPA = U.S. Environmental Protection Agency
 GEIS = Generic Environmental Impact Statement (NRC 1996a)
 Hz = Hertz
 NA = Not applicable
 NEPA = National Environmental Policy Act
 NPDES = National Pollutant Discharge Elimination System
 NRC = U.S. Nuclear Regulatory Commission

- a. NRC listed the issues in Table B-1 of 10 CFR 51 Appendix B. SCE&G added issue numbers for expediency.
 b. NRC has defined SMALL to mean that, for the issue, environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, NRC has concluded that those impacts that do not exceed permissible levels in the NRC’s regulations are considered small. (10 CFR 51 Appendix B, Table B-1, Footnote 3).
 c. NRC published, on September 3, 1999, a GEIS addendum in support of its rulemaking that re-categorized Issue 85 from 2 to 1.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**TABLE 4-3
RESULTS OF INDUCED CURRENT ANALYSIS**

Transmission Line	Voltage (kV)	Limiting Case Peak Electric Field Strength (kV/meter)	Limiting Case Induced Current (milliamperes)
SCE&G Template ^a	230	3.8	3.5
Summer-Blythewood ^b	230	2.5	3.9
Summer-Newberry ^b	230	2.5	3.5

- a. Includes Summer-Parr Nos. 1&2, Summer-Fairfield Nos. 1&2, Summer-Denny Terrace Nos. 1&2, Summer-Pineland No. 1, and Summer-Graniteville.
b. Owned and operated by Santee Cooper.

**TABLE 4-4
SUMMARY OF THE DETAILED SAMA ANALYSIS**

Phase 2 SAMA ID	Averted Cost-Risk	Cost of Implementation	Net Value	Cost Beneficial?
2	\$1,238	Not Estimated	Large Negative	No
3	\$103,086	\$150,000 to \$170,000	-\$46,914 to -\$71,914	No
9	\$23,812	Not Estimated	Large Negative	No
10	\$20,630	\$25,000 to \$50,000	-\$4,370 to -\$29,370	No
11/12	\$39,419	Not Estimated	Large Negative	No
13	\$5,788	Not Estimated	Large Negative	No
20	\$17,758	Not Estimated	Large Negative	No
24	\$377,695	\$1,225,000	-\$847,305	No
24a	\$117,629	\$1,225,000	-\$1,107,371	No
25	\$117,413	\$565,000	-\$447,587	No
26	\$13,147	Not Estimated	Large Negative	No
27	\$18,603	Not Estimated	Large Negative	No

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

5.0 ASSESSMENT OF NEW AND SIGNIFICANT INFORMATION

5.1 Discussion

NRC

“The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.” 10 CFR 51.53(c)(3)(iv)

While U.S. Nuclear Regulatory Commission (NRC) regulations do not require that an applicant’s environmental report contain analyses of the impacts of those environmental issues that have been generically resolved [10 CFR 51.53(c)(3)(i)], the regulations do require that an applicant identify any new and significant information of which the applicant is aware [10 CFR 51.53(c)(3)(i)]. The purpose of this requirement is to alert the NRC staff to such information, so the staff can determine whether to seek the Commission’s approval to waive or suspend application of the rule with respect to the affected generic analysis. NRC has explicitly indicated, however, that an applicant is not required to perform a site-specific validation of *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) conclusions (NRC 1996, pg. C9-13, Concern Number NEP.015).

South Carolina Electric and Gas Company (SCE&G) expects that new and significant information would include:

- Information that identifies a significant environmental issue not covered in the GEIS and codified in the regulation, or
- Information that was not covered in the GEIS analyses and that leads to an impact finding different from that codified in the regulation.

NRC does not specifically define the term “significant.” For the purpose of its review, SCE&G used guidance available in Council on Environmental Quality (CEQ) regulations. The National Environmental Policy Act (NEPA) authorizes CEQ to establish implementing regulations for federal agency use. NRC requires license renewal applicants to provide NRC with input, in the form of an environmental report, that NRC will use to meet NEPA requirements as they apply to license renewal (10 CFR 51.10). CEQ guidance provides that federal agencies should prepare environmental impact statements for actions that would significantly affect the environment (40 CFR 1502.3), focus on significant environmental issues (40 CFR 1502.1), and eliminate from detailed study issues that are not significant [40 CFR 1501.7(a)(3)]. The CEQ guidance includes a lengthy definition of “significantly” that requires consideration of the context of the action and the intensity or severity of the impact(s) (40 CFR 1508.27). SCE&G expects that moderate or large impacts, as defined by NRC, would be significant. [Chapter 4](#) presents the NRC definitions of “moderate” and “large” impacts.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

The new and significant assessment process that SCE&G used during preparation of this license renewal application included: (1) interviews with SCE&G subject experts on the validity of the conclusions in the GEIS as they relate to Virgil C. Summer Nuclear Station (VCSNS), (2) an extensive review of documents related to environmental issues at VCSNS, (3) correspondence with state and federal agencies to determine if the agencies had concerns not addressed in the GEIS, (4) a review of internal procedures for reporting to the NRC events that could have environmental impacts, and (5) credit for the oversight provided by inspections of plant facilities by state and federal regulatory agencies.

No new and significant information regarding the environmental impacts of VCSNS license renewal was identified.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

5.2 References

NRC (U.S. Nuclear Regulatory Commission). 1996. Public Comments on the Proposed 10 CFR 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response. Volume 1 and 2. NUREG-1529. Washington, D.C. May.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

6.1 License Renewal Impacts

The environmental impacts of renewing the Virgil C. Summer Nuclear Station (VCSNS) operating license have been reviewed and determined to be small for all resource categories. As a consequence, no mitigation measures are recommended. [Chapter 4](#) incorporates by reference U.S. Nuclear Regulatory Commission (NRC) findings for the 52 Category 1 issues that apply to VCSNS, all of which have impacts that are small ([Table 4-2](#)). The rest of Chapter 4 analyzes Category 2 issues, all of which are either not applicable or have impacts that would be small. [Table 6-1](#) identifies the impacts that VCSNS license renewal would have on resources associated with Category 2 issues.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

6.2 Mitigation

NRC

“The report must contain a consideration of alternatives for reducing adverse impacts...for all Category 2 license renewal issues...” 10 CFR 51.53(c)(3)(iii)

“The environmental report shall include an analysis that considers and balances...alternatives available for reducing or avoiding adverse environmental effects...” 10 CFR 51.45(c) as adopted by 10 CFR 51.53(c)(2)

All impacts of license renewal at VCSNS are small and would not require mitigation. Current operations include mitigation and monitoring activities that would continue during the term of the license renewal. South Carolina Electric & Gas Company (SCE&G) performs routine mitigation and monitoring activities to ensure the safety of workers, the public, and the environment. These activities include the radiological environmental monitoring program, continuous emissions monitoring, effluent chemistry monitoring, effluent toxicity testing, and monitoring the water quality of Monticello Reservoir.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

6.3 Unavoidable Adverse Impacts

NRC

The environmental report shall discuss “[a]ny adverse environmental effects which cannot be avoided should the proposal be implemented;” 10 CFR 51.45(b)(2) as adopted by 10 CFR 51.53(c)(2)

This environmental report adopts by reference NRC findings for applicable Category 1 issues, including discussions of any unavoidable adverse impacts (Table 4-2). SCE&G examined 21 Category 2 issues and identified the following unavoidable adverse impacts of license renewal:

- Some fish are impinged on the traveling screens at the intake structures.
- Some larval fish and shellfish are entrained at the intake structures.
- For purposes of analysis, SCE&G assumed that license renewal would require 60 additional workers, which would create an additional 177 indirect jobs. A total of 237 direct and indirect jobs (213 in the four counties in which the majority of workers reside) would be created. The demand for 213 housing units in the four counties in which the majority of the current VCSNS workers reside would result in small impacts to housing availability, transportation infrastructure, and public utilities that could be characterized as adverse, but would not be significant.

Although license renewal would result in some unavoidable adverse impacts, they would be small and would not noticeably alter any important attribute of the affected resources.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

6.4 Irreversible and Irretrievable Resource Commitments

NRC

The environmental report shall discuss “[a]ny irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.” 10 CFR 51.45(b)(5) as adopted by 10 CFR 51.53(c)(2)

The continued operation of VCSNS for the license renewal term will result in irreversible and irretrievable resource commitments, including the following:

- nuclear fuel, which is consumed in the reactor and converted to radioactive waste;
- the land required to dispose of spent nuclear fuel, low-level radioactive wastes generated as a result of plant operations, and water treatment wastes (e.g., sludge) generated as a result of normal industrial operations;
- elemental materials that will become radioactive; and
- materials used for the normal industrial operations of the plant that cannot be recovered or recycled or that are consumed or reduced to unrecoverable forms.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

6.5 Short-term Use versus Long-term Productivity of the Environment

NRC

The environmental report shall discuss “[t]he relationship between local short-term uses of man’s environment and the maintenance and enhancement of long-term productivity...” 10 CFR 51.45(b)(4) as adopted by 10 CFR 51.53(c)(2)

The current balance between short-term use and long-term productivity at the VCSNS site was established when the station began operating in the early 1980s. Final Environmental Statements (USAEC 1973; NRC 1981) evaluated the impacts of constructing and operating VCSNS in rural Fairfield County, South Carolina. Some 8,000 acres were acquired from private landowners for the development of the VCSNS site, a cooling pond (Monticello Reservoir), a recreational lake (Monticello Subimpoundment), transmission line rights-of-way, and buffer areas. Most of this land was used in the creation of Monticello Reservoir (6,500 acres) and its subimpoundment (300 acres). Approximately 370 acres became the developed (facilities) portion of the VCSNS site (see [Section 2.4](#)). Approximately 125 acres were committed to transmission line rights of way. An additional 890 acres south and east of Monticello Reservoir were left in their natural state, pine forest and mixed pine-hardwood forest.

Of the land that became Monticello Reservoir, 82 percent was forested and 17 percent was farmland/pastureland (SCE&G 1978, pg. 2.1-16). All the land that was cleared, graded, and used for the VCSNS facilities and powerblock area was forested prior to development of the site. Most upland areas that were not inundated by Monticello Reservoir could be reforested or converted to agricultural use (dairy or cattle farming) after VCSNS is decommissioned. However, decisions on the ultimate disposition of these lands have not yet been made. Continued operation for an additional 20 years would not alter this conclusion.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

6.6 References

NRC (U.S. Nuclear Regulatory Commission). 1981. *Final Environmental Statement Related to the Operation of Virgil C. Summer Nuclear Station Unit 1*, South Carolina Electric and Gas Company, Office of Nuclear Reactor Regulation, Washington, D.C.

SCE&G (South Carolina Electric & Gas Company). 1978. *Virgil C. Summer Nuclear Station Operating License Environmental Report* (Volume 1), October 1978.

USAEC (United States Atomic Energy Commission). 1973. *Final Environmental Statement Related to Operation of Virgil C. Summer Nuclear Station Unit 1*, South Carolina Electric & Gas Company, Directorate of Licensing, Washington, D.C.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**TABLE 6-1
ENVIRONMENTAL IMPACTS RELATED TO
LICENSE RENEWAL AT VCSNS**

No.	Issue	Environmental Impact
Surface Water Quality, Hydrology, and Use (for all plants)		
13	Water use conflicts (plants with cooling ponds or cooling towers using make-up water from a small river with low flow)	Small. Evaporative losses from Monticello Reservoir would be less than 1 percent of the mean annual flow of the Broad River and would have little or no effect on the Broad River and its riparian ecological communities.
Aquatic Ecology (for plants with once-through and cooling pond heat dissipation systems)		
25	Entrainment of fish and shellfish in early life stages	Small. SCE&G has a current NPDES permit which constitutes compliance with CWA Section 316(b) requirements to provide best available technology to minimize entrainment.
26	Impingement of fish and shellfish in early life stages	Small. SCE&G has a current NPDES permit which constitutes compliance with CWA Section 316(b) requirements to provide best available technology to minimize impingement.
27	Heat shock	Small. SCE&G has a CWA Section 316(a) variance for facility-specific thermal discharge limits.
Groundwater Use and Quality		
33	Groundwater use conflicts (potable and service water, and dewatering; plants that use > 100 gpm)	None. This issue does not apply because VCSNS does not use groundwater for potable or service water; dewatering operations remove much less than 100 gpm.
34	Groundwater use conflicts (plants using cooling towers or cooling ponds withdrawing make-up water from a small river)	Small. The water in Parr Reservoir would distribute any loss due to evaporative cooling from Monticello Reservoir in such a way as to be insignificant to the alluvial aquifer.
35	Groundwater use conflicts (Ranney wells)	None. This issue does not apply because VCSNS does not use Ranney wells.
39	Groundwater quality degradation (cooling ponds at inland sites)	Small. There is no indication that groundwater quality has been degraded by the operation of VCSNS or its cooling pond. Concentrations of common ions, minerals, and solids are higher in local groundwater than in Monticello Reservoir, suggesting little potential for the cooling pond to degrade groundwater.
Terrestrial Resources		
40	Refurbishment impacts	None. No impacts are expected because VCSNS will not undertake refurbishment.
Threatened or Endangered Species		
49	Threatened or endangered species	Small. Numbers of bald eagles using the Parr Reservoir-Monticello Reservoir system have increased since VCSNS was originally licensed. Construction and operation of the station have had no adverse effect on eagles, and may have had a beneficial effect by expanding foraging and nesting areas. Impacts over the license renewal term would be similar and largely positive. No other threatened or endangered species is known to occur at VCSNS or along its transmission corridors.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**TABLE 6-1 (Continued)
ENVIRONMENTAL IMPACTS RELATED TO
LICENSE RENEWAL AT VCSNS**

No.	Issue	Environmental Impact
Air Quality		
50	Air quality during refurbishment (nonattainment and maintenance areas)	None. No impacts are expected because VCSNS will not undertake refurbishment.
Human Health		
57	Microbiological organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river)	Small. The thermal characteristics of the VCSNS discharge and the absence of a seed source or inoculant are such that plant operations should not stimulate growth or reproduction of thermophilic organisms.
59	Electromagnetic fields, acute effects (electric shock)	Small. The largest modeled induced current under the VCSNS transmission lines would be less than 5.0 milliamperes. Therefore, the VCSNS transmission lines conform to the National Electric Safety Code [®] provisions for preventing electric shock from induced current.
Socioeconomics		
63	Housing impacts	Small. NRC concluded that housing impacts would be small in medium and high population areas having no growth control measures. VCSNS is located in a medium population area that does not have growth control measures.
65	Public services: public utilities	Small. Any increase in public water requirements from 237 new households would not impinge on the water supplies of the affected communities.
66	Public services: education (refurbishment)	None. No impacts are expected because VCSNS will not undertake refurbishment.
68	Offsite land use (refurbishment)	None. No impacts are expected because VCSNS will not undertake refurbishment.
69	Offsite land use (license renewal term)	Small. No plant-induced changes to offsite land use are expected from license renewal. Impacts from continued operation would be positive.
70	Public services: transportation	Small. Any additional employees (up to 60) would be less than the typical refueling outage workforce of 600-800 people. Existing access roads are adequate to support this outage traffic. The impact of up to 60 additional workers would be small.
71	Historic and archaeological resources	Small. Continued operation of VCSNS would not require construction at the site or new transmission lines. Therefore, license renewal would not adversely affect historic or archaeological resources.
Postulated Accidents		
76	Severe accidents	No SAMA candidates were found to be cost-beneficial.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

7.0 ALTERNATIVES TO THE PROPOSED ACTION

NRC

The environmental report shall discuss “[A]lternatives to the proposed action....” 10 CFR 51.45(b)(3), as adopted by reference at 10 CFR 51.53(c)(2).

“...The report is not required to include discussion of need for power or the economic costs and economic benefits of...alternatives to the proposed action except insofar as such costs and benefits are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation....” 10 CFR 51.53(c)(2).

“...While many methods are available for generating electricity, and a huge number of combinations or mixes can be assimilated to meet a defined generating requirement, such expansive consideration would be too unwieldy to perform given the purposes of this analysis. Therefore, NRC has determined that a reasonable set of alternatives should be limited to analysis of single, discrete electric generation sources and only electric generation sources that are technically feasible and commercially viable....” (NRC 1996a, Section 8.1, pg. 8-1)

“...The consideration of alternative energy sources in individual license renewal reviews will consider those alternatives that are reasonable for the region, including power purchases from outside the applicant’s service area....” (NRC 1996b, Section II.H, page 66541, column 3)

Chapter 7 evaluates alternatives to Virgil C. Summer Nuclear Station (VCSNS) Unit 1 license renewal. The chapter identifies actions that South Carolina Electric & Gas Company (SCE&G) might take, and associated environmental impacts, if the U.S. Nuclear Regulatory Commission (NRC) did not renew the plant operating license. The chapter also addresses some of the actions that SCE&G has considered, but would not take, and identifies the bases for determining that such actions would be unreasonable.

The alternatives discussion is divided into two categories, “no action” and “alternatives that meet system generating needs.” In considering the level of detail and analysis that it should provide for each category, SCE&G relied on the NRC decision-making standard for license renewal:

“...the NRC staff, adjudicatory officers, and Commission shall determine whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decision makers would be unreasonable.” [10 CFR 51.95(c)(4)].

The discussion that follows is intended to provide sufficient information to clearly indicate whether an alternative would have a smaller, comparable, or greater environmental impact than the proposed action. Providing additional detail or analysis serves no function if it only brings to light additional adverse impacts of alternatives to license renewal. This approach is consistent with regulations of the Council on Environmental Quality, which provide that the consideration of alternatives (including the proposed action) should enable reviewers to evaluate their comparative merits (40 CFR 1500-1508). Chapter 7 provides sufficient detail about alternatives to establish the basis for necessary comparisons to the Chapter 4 discussion of impacts from the proposed action and support NRC decision making.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

In characterizing environmental impacts of alternatives, SCE&G has used the same definitions of “small,” “moderate,” and “large” that are presented in the introduction to [Chapter 4](#).

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

7.1 No-Action Alternative

SCE&G is using “no-action alternative” to refer to a scenario in which the NRC does not renew the VCSNS operating license. Components of this alternative include replacing the generating capacity of VCSNS and decommissioning the facility, as described below.

Presently, VCSNS generates two-thirds of its electricity for SCE&G. An additional one-third is generated for Santee Cooper. The SCE&G share is approximately 18 percent of the electricity that SCE&G provides to more than 500,000 residential and business customers (SCANA 2001a and 2001b). SCE&G believes that any alternative would be unreasonable if it did not include replacing the VCSNS capacity. Replacement could be accomplished by (1) building new generating capacity, (2) purchasing power from outside the SCE&G service area, or (3) reducing power requirements through demand reduction. [Section 7.2.1](#) describes each of these alternatives in detail, and [Section 7.2.2](#) describes environmental impacts from feasible alternatives.

The *Generic Environmental Impact Statement* (GEIS) (NRC 1996a, pg. 7-1) defines decommissioning as the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits release of the property for unrestricted use and termination of the license. NRC-evaluated decommissioning options include immediate decontamination and dismantlement (DECON), and safe storage of the stabilized and defueled facility (SAFSTOR) for a period of time, followed by decontamination and dismantlement. Regardless of the option chosen, decommissioning must be completed within a 60-year period. Under the no-action alternative, SCE&G would continue operating VCSNS until the current license expires, then initiate decommissioning activities in accordance with NRC requirements. The GEIS describes decommissioning activities based on an evaluation of a larger reactor (the “reference” pressurized-water reactor is the 1,175-megawatt electrical (MWe) Trojan Nuclear Plant). This description bounds decommissioning activities that SCE&G would conduct at VCSNS.

As the GEIS notes, NRC has evaluated environmental impacts from decommissioning. NRC-evaluated impacts include: occupational and public radiation dose; impacts of waste management; impacts to air and water quality; and ecological, economic, and socioeconomic impacts. NRC indicated in Section 4.4 of the generic environmental impact statement on decommissioning (NRC 1988) that the environmental effects of greatest concern (i.e., radiation dose and releases to the environment) are substantially less than the same effects resulting from reactor operations. SCE&G adopts by reference the NRC conclusions regarding environmental impacts of decommissioning.

SCE&G notes that decommissioning activities and their impacts are not discriminators between the proposed action and the no-action alternative. SCE&G will have to decommission VCSNS regardless of the NRC decision on license renewal; license renewal would only postpone decommissioning for another 20 years. The NRC has established in the GEIS that the timing of

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

decommissioning operations does not substantially influence the environmental impacts of decommissioning. SCE&G adopts by reference the NRC findings (10 CFR 51 Appendix B, Table B-1, Decommissioning) to the effect that delaying decommissioning until after the renewal term would have small environmental impacts. The discriminators between the proposed action and the no-action alternative lie within the choice of generation replacement options to be part of the no-action alternative. [Section 7.2.2](#) analyzes the impacts from these options.

Decommissioning impacts under the no-action alternative would not be substantially different from those occurring following license renewal, as identified in the GEIS (NRC 1996a) and in the generic environmental impact statement on decommissioning (NRC 1988, Section 4.4). These impacts would be temporary and would occur at the same time as the impacts from meeting system generating needs.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

7.2 Alternatives that Meet System Generating Needs

Decisions regarding reasonable alternatives for meeting electrical demands in South Carolina are made primarily by two entities, utilities and the Public Service Commission of South Carolina (PSC). The current mix of power generation options in South Carolina is one indicator of what these entities believe to be feasible alternatives within the state. In 2000, South Carolina's electric utility industry had a total generating capacity of 17.7 gigawatts-electric. A gigawatt is one million kilowatts. This capacity includes units fueled by coal (34 percent); nuclear (37 percent); oil (5 percent); gas (4 percent); and hydroelectric (20 percent). Approximately 1.0 gigawatt electric (5 percent of the state's generating capability) was from non-utility sources (EIA 2002, Table 17). Non-utility generators also use a variety of energy sources.

Based on 2000 utilization data, South Carolina utilities relied heavily on nuclear-powered and coal-powered generating plants for meeting electrical demand. Approximately 56 percent of the electricity used in South Carolina was generated by nuclear-powered plants, followed by coal (43 percent), hydroelectric (0.5 percent), oil (0.3 percent), and gas (0.2 percent) (EIA 2001a, Tables A8, A9, A10, A11, A12, and A13).

The difference between capacity and utilization is the result of preferential usage. For example, nuclear power plants represented 37 percent of utilities' installed capacity, but produced 56 percent of the electricity generated by utilities. This reflects South Carolina's preferential reliance on nuclear energy as a base-load generating source. Figures 7-1 and 7-2 below illustrate South Carolina's utility generating capabilities and utilization, respectively.

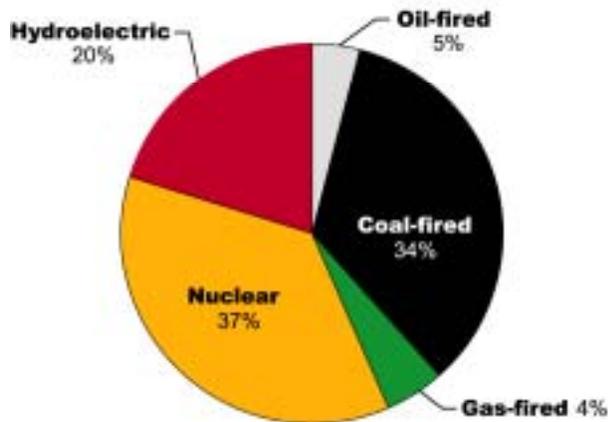


Figure 7-1. South Carolina Utility Generating Capability, 2000

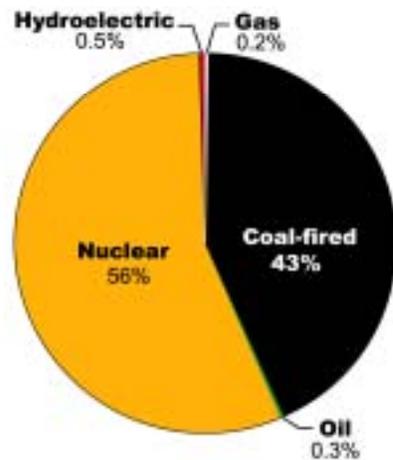


Figure 7-2. South Carolina Utility Generation Utilization, 2000

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Figure 7-3 illustrates the 2000 SCE&G energy capacity mix. Fourteen (14) percent of SCE&G's capacity comes from nuclear, 59 percent from coal, 17 percent from hydroelectric, natural gas provides 8 percent, and other resources provide 2 percent (SCANA 2001a).

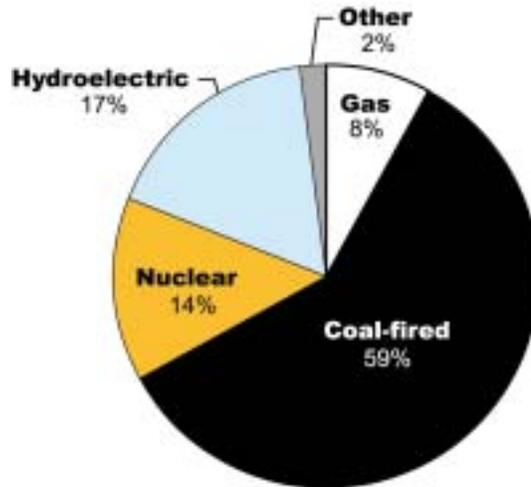


Figure 7-3. SCE&G Energy Capacity

Figure 7-4 illustrates the 2000 SCE&G utilization by fuel type. Nuclear power generated 22 percent, coal generated 77 percent, gas and oil generated 1 percent, and hydroelectric generated 4 percent (SCANA 2001a).

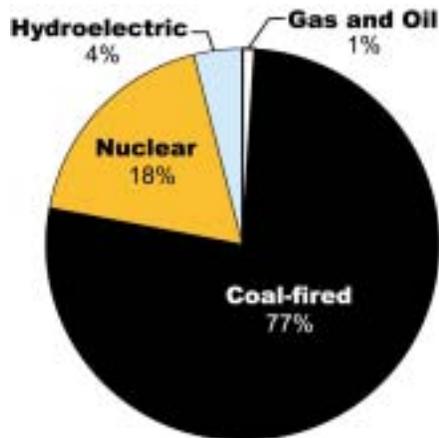


Figure 7-4. SCE&G Utilization by Fuel Type

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Like the State of South Carolina as a whole, SCE&G's utilization reflects a preference for nuclear energy as a base-load generating source, and the difference is offset by diminished reliance on hydroelectric units, which are dependent on weather (rainfall). Nuclear energy represented 14 percent of SCE&G's installed capacity but produced 18 percent of the electricity generated by SCE&G. Hydroelectric power represents 17 percent of SCE&G's installed capacity, but produces 4 percent of the energy generated by the utility (SCANA 2001a).

7.2.1 Alternatives Considered

Technology Choices

SCE&G routinely conducts evaluations of alternative generating technologies. Based on these internal reviews, SCE&G identified candidate technologies that would be capable of replacing the net base-load capacity (966 MWe) of the nuclear unit at VCSNS (see [Section 3.1.1](#)). For consideration of alternatives, the SCE&G evaluation focuses on the 966 MWe capacity.

Based on these evaluations, it was determined that feasible new plant systems to replace the capacity of the VCSNS nuclear unit are limited to pulverized-coal and gas-fired combined-cycle units for base-load operation. This conclusion is borne out by the generation utilization information in the introduction of [Section 7.2](#) that identifies coal as the most heavily utilized non-nuclear generating technology in South Carolina. The high cost of oil has prompted a steady decline in its use for electricity generation. Manufacturers now have large standard sizes of combined-cycle gas turbines that are economically attractive and suitable for high-capacity base-load operation. For the purposes of the VCSNS license renewal environmental report, SCE&G has therefore limited its analysis for new generating capacity alternatives to the technologies it considers feasible: pulverized coal- and gas-fired units. SCE&G chose to evaluate combined-cycle turbines in lieu of simple-cycle turbines because the combined-cycle option is a more economical option. The benefits of lower operating costs for the combine-cycle option outweigh its increased capital costs.

Mixture

The NRC indicated in the GEIS that, while many methods are available for generating electricity and a huge number of combinations or mixes can be assimilated to meet system needs, such expansive consideration would be too unwieldy given the purposes of the alternatives analysis. Therefore, NRC determined that a reasonable set of alternatives should be limited to analysis of single discrete electrical generation sources and only those electric generation technologies that are technically reasonable and commercially viable (NRC 1996a, pg. 8-1). Consistent with the NRC determination, SCE&G has not evaluated mixes of generating sources.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Deregulation

Efforts to deregulate the electric utility industry began with passage of the National Energy Policy Act of 1992 (EPACT). Provisions of this act required electric utilities to allow open access to their transmission lines and encouraged development of a competitive wholesale market for electricity. EPACT did not mandate competition in the retail market, leaving that decision to the states (NEI 2000).

In 1996, the Federal Energy Regulatory Commission (FERC) issued Orders 888 and 889, which opened transmission access to non-utilities and required utilities to share information about available transmission capacity. On December 20, 1999, FERC issued Order 2000 requiring utilities to participate in Regional Transmission Organizations (RTOs). In response to Order 2000, SCE&G is pursuing an agreement with a transmission organization for operation of SCE&G transmission assets.

Over the past few years, deregulation of the electric utility industry has received considerable attention in South Carolina. In 1997, the General Assembly began considering a number of bills that would deregulate the retail electricity market. The Senate Judiciary Committee named a 19-member task force to study the restructuring issue in 1998, and the House Utility Subcommittee has been studying the issue since 1997 (CP&L 2000). While South Carolina's General Assembly has not adopted any restructuring legislation, it continues to debate the issue.

If the electric power industry in South Carolina is deregulated, retail competition would likely replace the electric utilities' mandate to serve the public, and all electricity customers in the state would be able to choose among competing power suppliers, including those located out of state (Chilton et al. 1997). As such, electric generation would be based on the customers' needs and preferences, the lowest price, or the best combination of prices, services, and incentives.

This potential major source of competition for construction and operation of power plants would affect the selection of alternatives for VCSNS license renewal. With the prospect of hundreds of suppliers being licensed to sell electricity in South Carolina, SCE&G could not control demand and would not remain competitive if it offered extensive conservation and load modification incentives. The PSC would probably ensure that the operation of generating units of incumbent utilities would not inhibit the development of competition within the State. Therefore, it is not clear that the PSC would grant SCE&G the authority to construct new generating units to replace VCSNS, if its license was not renewed. However, regardless of the entity that constructed and operated the replacement power sources, certain environmental parameters would be constant among replacement power sources. Therefore, it is appropriate and instructive for SCE&G to discuss the impacts of reasonable alternatives to VCSNS.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Alternatives

The following sections present fossil-fuel-fired generation ([Section 7.2.1.1](#)) and purchased power ([Section 7.2.1.2](#)) as reasonable alternatives to license renewal. [Section 7.2.1.3](#) discusses reduced demand and presents the basis for concluding that it is not a reasonable alternative to license renewal.

7.2.1.1 Construct and Operate Fossil-Fuel-Fired Generation

SCE&G analyzed locating hypothetical new coal- and gas-fired units at the existing VCSNS site. This approach could minimize environmental impacts by building on previously disturbed land and by making the most use possible of existing facilities, such as transmission lines, roads and parking areas, office buildings, and the cooling system. Locating hypothetical units at the existing VCSNS site has been applied to the gas-fired units. However, coal-fired units could be built at the Cope Station, the site of a new state-of-the art coal-fired unit. This site was designed to accommodate two additional units in the future if needed. Co-locating at the Cope Station site would have environmental benefits similar to locating at the VCSNS and would improve the use of existing facilities designed specifically for coal-fired generation. Accordingly, the coal-fired alternative was defined as construction at the Cope Station near Bamberg, South Carolina.

For comparability, gas- and coal-fired units of equal electric power and capacity factors were selected. A scenario of, for example, two units with a net capacity of 483 MWe each could be assumed to replace the 966 MWe VCSNS net capacity. However, SCE&G's experience indicates that, although customized unit sizes can be built, using standardized sizes is more economical. For example, the coal-fired Cope unit of 430 MWe gross capacity operates at a net output of 408 MWe (PSC 2000, pg. 51), and two units nearly identical to the existing unit could be built. Accordingly, SCE&G evaluated constructing two 408 MWe net coal-fired units. The number and the net power of the gas-fired units were set equal to those of the coal-fired units. Although this provides less capacity than the existing unit, it ensures against overestimating environmental impacts from the alternatives. The shortfall in capacity could be replaced by other methods (see Mixture in [Section 7.2.1](#)).

It must be emphasized, however, that these are hypothetical scenarios. There are no plans for such construction at VCSNS or at the Cope Station.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Coal-Fired Generation

NRC has evaluated coal-fired generation alternatives for the Calvert Cliffs Nuclear Power Plant (NRC 1999a, Section 8.2.1) and for the Oconee Nuclear Station (NRC 1999b, Section 8.2.1). For Oconee, NRC analyzed 2,500-MWe of coal-fired generation capacity. SCE&G has reviewed the NRC analysis, believes it to be sound, and notes that it analyzed more generating capacity than the 816 MWe net (i.e., two 408 MWe units) discussed in this analysis. In defining the coal-fired alternative, SCE&G has used the Cope Station unit- and South Carolina-specific input and has scaled from the NRC analysis, where appropriate.

Table 7-1 presents the basic coal-fired alternative emission control characteristics. SCE&G based its emission control technology and percent control assumptions on alternatives that the U.S. Environmental Protection Agency (EPA) has identified as being available for minimizing emissions (EPA 1998). For the purposes of the analysis, it was assumed that coal and calcium hydroxide would be delivered by rail via the rail line that is used for the existing Cope Station unit.

Gas-Fired Generation

SCE&G has chosen to evaluate gas-fired generation, using combined-cycle turbines, because it has determined that the technology is mature, economical, and feasible. This is evidenced by SCE&G's plans to consider simple-cycle and combined-cycle gas-fired turbines to meet projected energy needs and the construction of combined-cycle units as part of the Urquhart Repowering Project (SCE&G 2000). Unit sizes in the planned range (408 MW) are available and economical. Therefore, SCE&G has analyzed 816 MW of net power, consisting of two 408-MW gas-fired units located on VCSNS property. Table 7-2 presents the basic gas-fired alternative characteristics. SCE&G would ensure gas availability through its parent company SCANA Corporation.

7.2.1.2 Purchased Power

SCE&G has evaluated conventional and prospective power supply options that could be reasonably implemented before the current VCSNS license expires in 2022. Because South Carolina is a net exporter of power, SCE&G assumes that in-state power could be purchased. However, in order to purchase replacement capacity for VCSNS (966 MWe net), new construction would probably be required.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

SCE&G assumes that the generating technology used to produce purchased power would be one of those that NRC analyzed in the GEIS. For this reason, SCE&G is adopting by reference the GEIS description of the alternative generating technologies as representative of the purchased power alternative. Of these technologies, simple-cycle combustion turbines or combined-cycle facilities fueled by natural gas are the most cost effective. There has been a corresponding decreased incentive for using boilers fired by coal or residual oil.

Although purchased power could provide replacement power for VCSNS, new construction would be required. SCE&G concluded that it would not be economically or environmentally preferable to purchase power.

Factors that lead to this conclusion include the following:

- The existing power transmission infrastructure currently lacks capacity to import additional power to replace VCSNS capacity from outside the current SCE&G marketing area. The construction of an additional high-capacity [e.g., 500 kilovolt (kV)] transmission line would be required.
- To ensure its continued capability to meet customer demands of reliable and affordable power, SCE&G would limit the amount of power it imports. Under customary import restrictions, it is unlikely that SCE&G could purchase the power generated by VCSNS from the generation market.
- Utility generators providing power to SCE&G would need to increase their capacity with new power units. As described above, the most cost-effective alternative for providing base-load power capacity is large, standard design combined-cycle facilities fueled primarily by natural gas. In light of SCE&G's current focus on becoming "the best provider of customer-driven energy products and services in the southeast" (SCANA 2000, pg. 2), SCE&G would clearly prefer to build its own gas-fired combustion turbines.
- The purchase of power from a non-utility generator would be less economical than SCE&G building its own facility. Non-utility generators have comparable construction and finance costs. A non-utility generator would be expected to make a profit on the sale of electricity and capacity. The additional costs to SCE&G would be passed on to SCE&G customers.
- The State of South Carolina is considering legislation that would deregulate the retail electricity market. If enacted, this legislation would allow non-utility generators to compete directly with utility companies for

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

the retail power market. This would decrease non-utility generators' incentive to provide wholesale power to utility companies, reducing the availability of power for SCE&G purchase.

7.2.1.3 Reduce Demand

In the past, SCE&G has offered demand-side management (DSM) programs that either conserve energy or allow the Company to reduce customers' load requirements during periods of peak demand. SCE&G's DSM programs fall into three categories:

Conservation Programs

- Educational programs that encourage the wise use of energy.

Energy Efficiency Programs

- Discounted residential rates for Good Cents homes and homes that meet specific energy efficiency standards.
- Home Energy Check Program to provide residential energy audits and encourage efficiency upgrades.
- Incentive Programs that encourage customers to replace old, inefficient appliances or equipment with new high-efficiency appliances or equipment.

Load Management Programs

- Standby Generator Program – encourages customers to let SCE&G switch loads to the customer's standby generators during periods of peak demand.
- Interruptible Service Program – encourages customers to allow blocks of their load to be interrupted during periods of peak demand.
- Real Time Pricing – encourages customers to discontinue usage during specific times.

South Carolina electric and natural gas utilities submit annual reports to the South Carolina Public Service Commission describing their DSM programs and activities. Over the past few years, SCE&G and other electric utilities have been scaling back their DSM programs and this trend is expected to continue (South Carolina Energy Office 2002). The market conditions that provided the initial support for utility-sponsored conservation and load

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

management efforts during the late 1970s and early 1980s, can be broadly characterized by:

1. increasing long-term marginal prices for capacity and energy production resources;
2. projecting increasing demand for electricity across the nation;
3. general agreement that conditions (1) and (2) would continue for the foreseeable future;
4. limited competition in the generation of electricity;
5. economies of scale in the generation of electricity, which supported the construction of large central power plants; and
6. the use of average embedded cost as the basis for setting electricity prices within a regulated context.

These market and regulatory conditions would undergo dramatic changes in a deregulated market. Changes that have significantly impacted the cost-effectiveness of utility-sponsored DSM, can be described as follows:

1. a decline in generation costs, due primarily to technological advances that have reduced the cost of constructing new generating units (e.g., combustion turbines); and
2. national energy legislation which has encouraged wholesale competition through open access to the transmission grid, as well as state legislation designed to facilitate retail competition.

Consistent with (1) and (2) above, the utility planning environment features lower capacity and lower energy prices than during earlier periods, shorter planning horizons, lower reserve margins, and increased reliance on market prices to direct utility resource planning. These have greatly reduced the number of cost-effective DSM alternatives.

Other significant changes include:

- The adoption of increasingly stringent national appliance standards for most major energy-using equipment and the adoption of energy efficiency requirements in state building codes. These mandates have further reduced the potential for cost-effective utility-sponsored measures.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

- In states that are currently transitioning into deregulation, third parties are increasingly providing energy services and products in competitive markets at prices that reflect their value to the customer. Market conditions can be expected to continue this shift among providers of cost-effective load management.

DSM programs, which are primarily directed toward load management, are not an effective substitute for large base-load units operating at high capacity factors, including VCSNS.

7.2.2 Environmental Impacts of Alternatives

This section evaluates the environmental impacts from reasonable alternatives to VCSNS license renewal: coal-fired generation, gas-fired generation, and purchased power. Purchased power may not be economically feasible for SCE&G but it is a reasonable alternative under NEPA.

7.2.2.1 Coal-Fired Generation

The NRC evaluated environmental impacts from coal-fired generation alternatives in the GEIS (NRC 1996a, Section 8.3.9). The NRC concluded that construction impacts could be substantial, due in part to the large land area required (which can result in natural habitat loss) and the large workforce needed. NRC pointed out that siting a new coal-fired plant where an existing nuclear plant is located would reduce many construction impacts; similar reductions would occur through construction at the Cope Station. NRC identified major adverse impacts from operations as human health concerns associated with air emissions, waste generation, and losses of aquatic biota due to cooling water withdrawals and discharges.

The coal-fired alternative that SCE&G has defined in [Section 7.2.1.1](#) would be located at Cope Station. As noted previously, the Cope Station site was designed to accommodate two additional units in the future, if needed.

Air Quality

Air quality impacts of coal-fired generation are considerably different from those of nuclear power. A coal-fired plant would emit sulfur oxides, nitrogen oxides (NO_x), particulate matter, and carbon monoxide, all of which are regulated pollutants. As [Section 7.2.1.1](#) indicates, SCE&G has assumed a plant design equivalent to the existing Cope Station unit that would minimize air emissions through a combination of boiler technology and post-combustion

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

pollutant removal. SCE&G estimates the coal-fired alternative emissions to be as follows:

Sulfur oxides = 6,249 tons per year

Nitrogen oxides = 642 tons per year

Carbon monoxide = 642 tons per year

Particulates:

Total suspended particulates = 113 tons per year

PM₁₀ (particulates having a diameter of less than 10 microns) = 26 tons per year

Table 7-3 shows how SCE&G calculated these emissions.

In 1999, emissions of sulfur dioxide and NO_x from South Carolina's generators ranked 15th and 30th nationally, respectively (EIA 2001b). No South Carolina generators were cited in the Clean Air Act Amendments of 1990 to begin compliance in 1995 with stricter emission controls for sulfur dioxide (SO₂) and nitrogen oxides (NO_x). However, it is likely that South Carolina's Public Service Commission will need to design a State Implementation Plan for reducing ground-level ozone in response to a proposal released by the U.S. Environmental Protection Agency in October 1998.

NRC did not quantify coal-fired emissions, but implied that air impacts would be substantial. The NRC noted that adverse human health effects from coal combustion have led to important federal legislation in recent years and that public health risks, such as cancer and emphysema, have been associated with coal combustion. The NRC also mentioned global warming and acid rain as potential impacts. However, sulfur oxide emission allowances, NO_x emission offsets, low NO_x burners, overfire air, fabric filters or electrostatic precipitators, and scrubbers are regulatorily-imposed mitigation measures. As a consequence, the coal-fired alternative would have moderate impacts on air quality; the impacts would be clearly noticeable, but would not destabilize air quality in the area.

Waste Management

SCE&G concurs with the GEIS assessment that the coal-fired alternative would generate substantial solid waste. The coal-fired plant would annually consume approximately 2,570,000 tons of coal having an ash content of

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

8.8 percent (Tables 7-1 and 7-3). After combustion, most (99.9 percent) of this ash, approximately 230,000 tons per year, would be collected and disposed of onsite. In addition, approximately 170,000 tons of scrubber sludge would be disposed of onsite each year (based on annual calcium hydroxide usage of nearly 95,000 tons). SCE&G estimates that ash and scrubber waste disposal over the 40-year plant life would require approximately 210 acres (a square area with sides of approximately 3,000 feet). The Cope site is 1,700 acres. While only half this waste volume and land use would be attributable to the 20-year license renewal period alternative, the total numbers are pertinent as a cumulative impact.

It is believed that with proper siting coupled with current waste management and monitoring practices, waste disposal at the Cope site would not destabilize any resources. There would be space within the site footprint for this disposal. After closure of the waste site and revegetation, the land would be available for other uses. For these reasons, waste disposal for the coal-fired alternative would have moderate impacts; the impacts of increased waste disposal would be clearly noticeable, but would not destabilize any important resource and further mitigation would be unwarranted.

Other Impacts

Construction of the powerblock and coal storage area would impact some land area and associated terrestrial habitat. Because most of this construction would be in previously disturbed areas, impacts would be minimal. For the most part, visual impacts would be consistent with the industrial nature of the site. The (525 foot) exhaust stack would be visible from the Edisto River and for several miles in every direction, however. As with any large construction project, some erosion and sedimentation and fugitive dust emissions could be anticipated, but would be minimized by using best management practices. Construction debris from clearing and grubbing could be disposed of onsite and municipal waste disposal capacity would be available. Socioeconomic impacts from the construction workforce would be minimal, because worker relocation would not be expected due to the site's proximity to Columbia, South Carolina; Charleston, South Carolina; and Augusta, Georgia. Cultural resource impacts would be unlikely, due to the assumed previously disturbed nature of the site.

Impacts to aquatic resources and water quality would be minimal due to the plant's closed-loop cooling system that recycles condenser water and withdraws makeup from four onsite groundwater wells. Although the Cope Station was designed to use the Edisto River as the source of its makeup water,

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

it has in recent years relied on groundwater for makeup. The South Fork of the Edisto River is used as a backup supply only.

The additional stacks, boilers, and rail deliveries would increase the visual impact of the existing site. Socioeconomic impacts would result from a decrease in the operational workforce from approximately 600 employees at VCSNS and an increase in the operational workforce at Cope Station (doubling, to approximately 140 employees). These impacts would be small to moderate, due to Cope Station's proximity to large metropolitan areas (Columbia, Charleston, and Augusta).

Other construction and operation impacts would be small. In most cases, the impacts would be detectable, but they would not destabilize any important attribute of the resource involved. Due to the minor nature of these other impacts, mitigation would not be warranted beyond that mentioned.

7.2.2.2 Gas-Fired Generation

NRC evaluated environmental impacts from gas-fired generation alternatives in the GEIS, focusing on combined-cycle plants. [Section 7.2.1.1](#) presents SCE&G's reasons for defining the gas-fired generation alternative as a combined-cycle plant on the VCSNS site. Land-use impacts from gas-fired units on VCSNS would be less than those of the coal-fired alternative at the Cope Station site due to construction on the existing site and a smaller facility footprint. There would, however, be land use impacts associated with the construction of a new natural gas pipeline (see Other Impacts). A smaller workforce could have adverse socioeconomic impacts. Human health effects associated with air emissions would be of concern. Aquatic biota losses due to cooling water withdrawals would be offset by the concurrent shutdown of the nuclear facility.

The NRC has evaluated the environmental impacts of constructing and operating four 440-MW combined-cycle gas-fired units as an alternative to a nuclear power plant license renewal (NRC 1996a). This analysis is for a generating capacity approximately two times the VCSNS gas-fired alternatives analysis, because SCE&G would install two 424 MW gross units. SCE&G has adopted the rest of the NRC analysis with necessary South Carolina- and SCE&G-specific modifications noted.

Air Quality

Natural gas is a relatively clean-burning fossil fuel; the gas-fired alternative would release similar types of emissions, but in lesser quantities, than the coal-

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

fired alternative. Control technology for gas-fired turbines focuses on NO_x emissions. SCE&G estimates the gas-fired alternative emissions to be as follows:

- Sulfur oxides = 88 tons per year
- NO_x = 332 tons per year
- Carbon monoxide = 435 tons per year
- Filterable Particulates = 130 tons per year (all particulates are PM₁₀)

Table 7-4 shows how SCE&G calculated these emissions.

The Section 7.2.2.1 discussion of regional air quality and Clean Air Act requirements is also applicable to the gas-fired generation alternative. NO_x effects on ozone levels, sulfur dioxide allowances, and NO_x emission offsets could all be issues of concern for gas-fired combustion. While gas-fired turbine emissions are less than coal-fired boiler emissions, and regulatory requirements are less stringent, the emissions are still substantial. Emissions from the gas-fired alternative located at VCSNS would noticeably alter local air quality, but would not destabilize regional resources. Air quality impacts would therefore be moderate, but substantially smaller than those of coal-fired generation.

Waste Management

Gas-fired generation would result in almost no waste generation, producing minor (if any) impacts. Therefore, gas-fired generation waste management impacts would be small.

Other Impacts

As noted previously, building the gas-fired alternative on the existing VCSNS site would reduce some construction-related impacts. NRC estimated in the GEIS that 110 acres would be needed for a plant site; this much previously disturbed acreage is available at VCSNS, reducing loss of terrestrial habitat. Aesthetic impacts, erosion and sedimentation, fugitive dust, and construction debris impacts would be similar to the coal-fired alternative, but smaller because of the reduced site size. The GEIS estimates a work force of 150 for operation of these units. The reduction in work force (relative to the existing VCSNS work force) would result in adverse socioeconomic impacts. These impacts would be small to moderate and would be mitigated by the site's

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

proximity to the large metropolitan areas of Columbia, Charleston, and Augusta.

It would, however, be necessary to upgrade existing South Carolina Pipeline Corporation (a wholly-owned subsidiary of SCANA Corporation) natural gas lines to provide the necessary firm quantities of gas for these combined-cycle base-load units. This would probably involve construction of a new 24-inch dedicated pipeline from South Carolina Pipeline Corporation facilities in Aiken, South Carolina to VCSNS, a distance of some 70 miles. Natural gas would be supplied by Southern Natural Gas (Sonat), which has a terminal in Aiken adjacent to the South Carolina Pipeline Corporation facilities. South Carolina Pipeline Corporation would likely route this new pipeline along existing utility rights-of-way. It would be necessary to widen the existing corridors to accommodate a new pipeline. The South Carolina Public Service Commission has no set-back standards for intra-state natural gas pipelines; companies involved in natural gas transmission and distribution determine right-of-way widths based on site-specific factors (e.g., soils, topography, populations of rare plants and animals, land use in surrounding areas, existing surface and sub-surface utilities) and safety considerations. Rights-of-way for large (24-inch diameter and larger) natural gas pipelines are generally 75 to 100 feet wide during construction, with a permanent width of approximately 50 feet (FERC 2000). Detailed engineering studies would be necessary to determine the increased width of the transmission corridors.

Construction of a new 24-inch pipeline would require widening the existing transmission corridors and could require re-routing through previously-undisturbed areas. Impacts would include disturbance of wildlife from noise and movement of pipeline workers and heavy equipment during construction, as well as potential impacts to water quality from erosion and sedimentation. These impacts would be temporary and limited to the construction phase of the project. Best construction management practices and soil conservation measures would be employed to limit soil loss and potential impacts to down-gradient surface water and wetlands. Some undetermined amount of wildlife habitat would be permanently lost with the widening of the transmission corridors. In addition, cultural resources could be disturbed in the course of building the pipeline (unlikely) and widening the right-of-way (more likely). Impacts would be mitigated by pre-construction surveys and consultations with the SHPO.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

7.2.2.3 Purchased Power

As discussed in [Section 7.2.1.2](#), SCE&G assumes that the generating technology used under the purchased power alternative would be one of those that NRC analyzed in the GEIS. SCE&G is also adopting by reference the NRC analysis of the environmental impacts from those technologies. Under the purchased power alternative, therefore, environmental impacts would still occur, but would be located elsewhere within the state. There is no evidence to suggest that out-of-state imports would be required.

The purchased power alternative would include constructing up to 200 miles of high voltage (i.e., 500 kV) transmission lines to get power from the remote locations in South Carolina to the SCE&G network. Most of the transmission lines could probably be routed along existing rights-of-way. The environmental impacts of constructing up to 200 miles of transmission lines would be moderate. As indicated in the introduction to [Section 7.2.1.1](#), the environmental impacts of construction and operation of new coal- or gas-fired generating capacity for purchased power at a previously-undisturbed greenfield site would exceed those of the gas-fired alternative located on the VCSNS site or the coal-fired alternative located at Cope Station.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

7.3 References

- Chilton, J. B., R. P. Wilder, and D. P. Woodward. 1997. "Whither Electricity Deregulation," *Business & Economic Review*, Volume 43, Issue 4. Division of Research, The Darla Moore School of Business, University of South Carolina. Available at http://research.badm.sc.edu/research/bereview/be43_4/electr.htm. Accessed July 20, 2000.
- CP&L (Carolina Power & Light Company). 2000. "Deregulation Latest News, Update – April, 2000." Available at <http://cplc.com/about/policy/dereg/deregnews.html>. Accessed July 20, 2000.
- EIA (Energy Information Administration). 2000. *Electric Power Annual 1999*, Volume II. October 26. Available at <http://www.eia.doe.gov/cneaf/electricity/epav2/epav2.pdf>. Accessed May 15, 2002.
- EIA (Energy Information Administration). 2001a. "Electric Power Annual 2000, Volume I." DOE/EIA-0348(2000)/1. August 2001. Available at <http://www.eia.doe.gov/cneaf/electricity/epav1/epav1.pdf>. Accessed May 15, 2002.
- EIA (Energy Information Administration). 2001b. "State Electricity Profiles 1999 – South Carolina," November 29. Available at http://www.eia.doe.gov/cneaf/electricity/st_profiles/south_carolina.pdf. Accessed May 23, 2002.
- EIA (Energy Information Administration). 2002. "Inventory of Electric Utility Power Plants in the United States 2000." DOE/EIA-0095(2000). March 2002. Available at http://www.eia.doe.gov/cneaf/electricity/ipp/ipp_sum.html. Accessed May 15, 2002.
- EPA (U.S. Environmental Protection Agency). 1998. *Air Pollutant Emission Factors*. Vol. 1, *Stationary Point Sources and Area Sources*. Section 1.1, "Bituminous and Subbituminous Coal Combustion." AP-42. September 1998. <http://www.epa.gov/ttn/chief/ap42c1.html>. Accessed July 26, 2001.
- EPA (U.S. Environmental Protection Agency). 2000. *Air Pollutant Emission Factors*. Vol. 1, *Stationary Point Sources and Area Sources*. Section 3.1, "Stationary Gas Turbines for Electricity Generation." AP-42. April 2000. <http://www.epa.gov/ttn/chief/ap42c3.html>. July 24, 2000.
- FERC (Federal Energy Regulatory Commission). 2000. "An Interstate Natural Gas Facility On My Land? What Do I Need To Know?" Office of External Affairs, Washington, DC.
- NEI (Nuclear Energy Institute). 2000. "Restructuring the U.S. Electric Power Industry." Available at <http://www.nei.org/doc.asp?catnum=3&catid=621>. Accessed May 29, 2001.
- NRC (U.S. Nuclear Regulatory Commission). 1988. *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*. NUREG-0586. Washington, D.C., August 1988.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

- NRC (U.S. Nuclear Regulatory Commission). 1996a. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG 1437. Washington, DC. May.
- NRC (U.S. Nuclear Regulatory Commission). 1996b. “Supplementary Information to Final Rule.” *Federal Register*. Vol. 61, No. 244. December 18.
- NRC (U.S. Nuclear Regulatory Commission). 1999a. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Calvert Cliffs Nuclear Power Plant*. NUREG-1437, Supplement 1, Final. Office of Nuclear Reactor Regulation, Washington, DC. October 1999.
- NRC (U.S. Nuclear Regulatory Commission). 1999b. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Oconee Nuclear Station*. NUREG-1437, Supplement 2, Final. Office of Nuclear Reactor Regulation, Washington, DC. December 1999.
- PSC (Public Service Commission of South Carolina). 2000. Annual Report 1997 – 1998.
- SCANA. 2000. “Energy for Success,” SCANA Corporation 1999 Annual Report. Available at <http://www.scana.com/finance/REPORTS/annual/1999.pdf>. Accessed July 28, 2000.
- SCANA. 2001a. SCANA Statistical Supplement to the 2000 Annual Report. Available at <http://www.scana.com/pdf/2000supplement.pdf>. Accessed May 15, 2002.
- SCANA. 2001b. “Power for Living” SCANA Corporation 2000 Annual Report. Available at <http://www.scana.com/PDF/2000-annual-report.pdf>. Accessed May 15, 2002.
- SCE&G (South Carolina Electric & Gas Company). 2000. Integrated Resource Plan. South Carolina Electric & Gas Company, Columbia, S.C.
- South Carolina Energy Office. 2002. The Status of Utility Demand-Side Management Activities in South Carolina for 2000. Prepared by South Carolina Energy Office for the South Carolina General Assembly. Available at <http://www.state.sc.us/energy/>. Accessed June 20, 2002.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**TABLE 7-1
COAL-FIRED ALTERNATIVE**

Characteristic	Basis
Unit size = 408 MW ISO rating net ^a	Chosen as equal to existing Cope Station unit
Unit size = 430 MW ISO rating gross ^a	Chosen as equal to existing Cope Station unit
Number of units = 2	Calculated to be < VCSNS Unit gross capacity of approximately 1,000 MW
Boiler type = tangentially fired, dry-bottom	Minimizes nitrogen oxides emissions (EPA 1998, Table 1.1-3 Page 1.1-17).
Fuel type = bituminous, pulverized coal	Typical for coal used in South Carolina
Fuel heating value = 12,783 Btu/lb	1998 value for coal used in South Carolina (EIA 2000, Table 28)
Fuel ash content by weight = 8.8 percent	1998 value for coal used in South Carolina (EIA 2000, Table 28)
Fuel sulfur content by weight = 1.28 percent	1998 value for coal used in South Carolina (EIA 2000, Table 28)
Uncontrolled NO _x emission = 9.7 lb/ton	Typical for pulverized coal, tangentially fired, dry-bottom, pre-NSPS with low- NO _x burner (EPA 1998, Table 1.1-3 Page 1.1-17)
Uncontrolled CO emission = 0.5 lb/ton	
Heat rate = 10,200 Btu/KWh	Typical for coal-fired, single cycle steam turbines (EIA 2000, page 45)
Capacity factor = 0.85	Typical for large coal-fired units (SCE&G experience)
NO _x control = low NO _x burners, overfire air and selective catalytic reduction (95 percent reduction)	Best available and widely demonstrated for minimizing NO _x emissions (EPA 1998, Table 1.1-2 Page 1.1-14).
Particulate control = fabric filters (baghouse- 99.9 percent removal efficiency)	Best available for minimizing particulate emissions (EPA 1998, Page 1.1-6 and -7)
SO _x control = Spray drying (dry scrubber-calcium hydroxide [90 percent removal efficiency])	Best available for minimizing SO _x emissions (EPA 1998, Table 1.1-1 Page 1.1-13)

a. The difference between “net” and “gross” is electricity consumed onsite.

Btu = British thermal unit

ISO rating = International Standards Organization rating at standard atmospheric conditions of 59°F, 60 percent relative humidity, and 14.696 pounds of atmospheric pressure per square inch

KWh = kilowatt hour

NSPS = New Source Performance Standard

Lb = pound

MW = megawatt

NO_x = nitrogen oxides

SO_x = sulfur oxides

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**TABLE 7-2
GAS-FIRED ALTERNATIVE**

Characteristic	Basis
Unit size = 408 MW ISO rating net: ^a Two 135 MW-combustion turbines and a 138 MW-heat recovery boiler	Manufacturer's standard size gas-fired combined cycle plant
Unit size = 424 MW ISO rating gross: ^a Two 140.5 MW-combustion turbines 143 MW-heat recovery boiler	Calculated based on 4 percent onsite power
Number of units = 2	Calculated to be \leq VCSNS unit gross capacity of approximately 1,000 MW
Fuel type = natural gas	Assumed
Fuel heating value = 1,037 Btu/ft ³	1998 value for gas used in South Carolina (EIA 1999)
Fuel sulfur content = not available	SO _x = 0.94S. When sulfur content is not available, use SO _x = 0.0034 lb/MMBTU (EPA 2000, Table 3.1-2a, Page 3.1-11)
SO _x emission = 0.0034 lb/MMBtu	
NO _x control = selective catalytic reduction (SCR)	Best available for minimizing NO _x emissions (EPA 2000, Table 3.1 Database)
Fuel NO _x content = 0.0128 lb/MMBtu	Typical for large SCR-controlled gas fired units (EPA 2000, Table 3.1 Database)
Fuel CO content = 0.0168 lb/MMBtu	Typical for large SCR-controlled gas fired units (EPA 2000, Table 3.1-2 Page 3.1-8)
Heat rate = 8,200 Btu/Kwh	Typical for combined cycle gas-fired turbines (EIA 1997, page 106)
Capacity factor = 0.85	Typical for large gas-fired base load units

a. The difference between "net" and "gross" is electricity consumed onsite.

Btu = British thermal unit

ft³ = cubic foot

ISO rating = International Standards Organization rating at standard atmospheric conditions of 59°F, 60 percent relative humidity, and 14.696 pounds of atmospheric pressure per square inch

Kwh = kilowatt hour

MM = million

MW = megawatt

SO_x = sulfur oxides

NO_x = nitrogen oxides

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**TABLE 7-3
AIR EMISSIONS FROM COAL-FIRED ALTERNATIVE**

Parameter	Calculation	Result
Annual coal consumption	$2 \times 432 \text{ MW} \times \frac{10,200 \text{ Btu}}{\text{kW} \times \text{hr}} \times \frac{1,000 \text{ kW}}{\text{MW}} \times \frac{\text{lb}}{12,783 \text{ Btu}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times 0.85 \times \frac{24 \text{ hr}}{\text{day}} \times \frac{365 \text{ day}}{\text{yr}}$	2,569,546 tons of coal per year
SO ₂ ^{a,c}	$\frac{38 \times 1.28 \text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times (1 - 90/100) \times \frac{2,569,546 \text{ tons}}{\text{yr}}$	6,249 tons SO ₂ per year
NO _x ^{b,c}	$\frac{9.7 \text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times (1 - 95/100) \times \frac{2,569,546 \text{ tons}}{\text{yr}}$	642 tons NO _x per year
CO ^c	$\frac{0.5 \text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{2,569,546 \text{ tons}}{\text{yr}}$	642 tons CO per year
TSP ^d	$\frac{10 \times 8.8 \text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times (1 - 99.9/100) \times \frac{2,569,546 \text{ tons}}{\text{yr}}$	113 tons TSP per year
PM ₁₀ ^d	$\frac{2.3 \times 8.8 \text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times (1 - 99.9/100) \times \frac{2,569,546 \text{ tons}}{\text{yr}}$	26 tons PM ₁₀ per year

a. EPA 1998, Table 1.1-1.

b. EPA 1998, Table 1.1-2.

c. EPA 1998, Table 1.1-3.

d. EPA 1998, Table 1.1-4.

CO = carbon monoxide

NO_x = oxides of nitrogen

PM₁₀ = particulates having diameter less than 10 microns

SO₂ = sulfur oxides

TSP = total suspended particulates

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**TABLE 7-4
AIR EMISSIONS FROM GAS-FIRED ALTERNATIVE**

Parameter	Calculation	Result
Annual gas consumption	$2 \text{ units} \times \frac{424 \text{ MW}}{\text{unit}} \times \frac{8,200 \text{ Btu}}{\text{kW} \times \text{hr}} \times \frac{1,000 \text{ kW}}{\text{MW}} \times 0.85 \times \frac{\text{ft}^3}{1,037 \text{ Btu}} \times \frac{24 \text{ hr}}{\text{day}} \times \frac{365 \text{ day}}{\text{yr}}$	49,966,810,230 ft ³ per year
Annual Btu input	$\frac{49,966,810,230 \text{ ft}^3}{\text{yr}} \times \frac{1,037 \text{ Btu}}{\text{ft}^3} \times \frac{\text{MM Btu}}{10^6 \text{ Btu}}$	51,815,582 MMBtu per year
SO ₂ ^a	$\frac{0.0034 \text{ lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{51,815,582 \text{ MMBtu}}{\text{yr}}$	88 tons SO ₂ per year
NO _x ^b	$\frac{0.0128 \text{ lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{51,815,582 \text{ MMBtu}}{\text{yr}}$	332 tons NO _x per year
CO ^b	$\frac{0.0168 \text{ lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{51,815,582 \text{ MMBtu}}{\text{yr}}$	435 tons CO per year
TSP ^a	$\frac{0.005 \text{ lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{51,815,582 \text{ MMBtu}}{\text{yr}}$	130 tons filterable TSP per year
PM ₁₀ ^a	$\frac{130 \text{ tons TSP}}{\text{yr}}$	130 tons filterable PM ₁₀ per year

a. EPA 2000, Table 3.1-1.

b. EPA 2000, Table 3.1-2.

CO = carbon monoxide

NO_x = oxides of nitrogen

PM₁₀ = particulates having diameter less than 10 microns

SO₂ = sulfur oxides

TSP = total suspended particulates

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**8.0 COMPARISON OF ENVIRONMENTAL IMPACTS OF LICENSE RENEWAL
WITH THE ALTERNATIVES**

NRC

“...To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form;” 10 CFR 51.45(b)(3) as adopted by 51.53(c)(2)

[Chapter 4](#) analyzes environmental impacts of V. C. Summer Nuclear Station (VCSNS) license renewal and [Chapter 7](#) analyzes impacts from renewal alternatives. [Table 8-1](#) summarizes environmental impacts of the proposed action (license renewal) and the alternatives, so the reader can compare them. The environmental impacts compared in [Table 8-1](#) are those that are either Category 2 issues for the proposed action, license renewal, or are issues that the *Generic Environmental Impact Statement* (GEIS) (NRC 1996) identified as major considerations in an alternatives analysis. For example, although the U. S. Nuclear Regulatory Commission (NRC) concluded that air quality impacts from the proposed action would be small (Category 1), the GEIS identified major human health concerns associated with air emissions from alternatives ([Section 7.2.2](#)). Therefore, [Table 8-1](#) compares air impacts among the proposed action and the alternatives. [Table 8-2](#) is a more detailed comparison of the alternatives.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

8.1 References

NRC (U.S. Nuclear Regulatory Commission). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS). Volumes 1 and 2. NUREG-1437. Washington, DC. May.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**TABLE 8-1
IMPACTS COMPARISON SUMMARY**

Impact	Proposed Action (License Renewal)	No-Action Alternative			
		Base (Decommissioning)	With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Land Use	SMALL	SMALL	SMALL	MODERATE	MODERATE
Water Quality	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE
Air Quality	SMALL	SMALL	MODERATE	MODERATE	SMALL to MODERATE
Ecological Resources	SMALL	SMALL	SMALL	MODERATE	SMALL to MODERATE
Threatened or Endangered Species	SMALL	SMALL	SMALL	SMALL	SMALL
Human Health	SMALL	SMALL	MODERATE	SMALL	SMALL to MODERATE
Socioeconomics	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Waste Management	SMALL	SMALL	MODERATE	SMALL	SMALL to MODERATE
Aesthetics	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE
Cultural Resources	SMALL	SMALL	SMALL	SMALL	SMALL

SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. MODERATE - Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource. 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3.

**TABLE 8-2
IMPACTS COMPARISON DETAIL**

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
VCSNS license renewal for 20 years, followed by decommissioning	Decommissioning following expiration of current VCSNS license. Adopting by reference, as bounding VCSNS decommissioning, GEIS description (NRC 1996, Section 7.1)	New construction at an existing site, Cope Station	New construction at the VCSNS site	Would involve construction of new generation capacity in the state. Adopting by reference GEIS description of alternate technologies (Section 7.2.1.2)
		Use existing rail spur.	Construct 70 miles of gas pipeline along existing rights-of-way to the extent practicable. Widen rights-of-way to accommodate new 24-inch pipeline.	Assumed construction of up to 200 miles of transmission lines
		Use existing switchyard and transmission lines. Two 408-MW tangentially-fired, dry bottom units; capacity factor 0.85	Use existing switchyard and transmission lines Two 424-MW units; each consisting of two 140.5-MW combustion turbines and a 143-MW heat recovery boiler; capacity factor 0.85	
		Existing closed-cycle Cope Station cooling water system with Edisto River water as back-up Pulverized bituminous coal, 12,783 Btu/pound; 10,200 Btu/kWh; 8.8% ash; 1.28% sulfur; 9.7 lb/ton nitrogen oxides; 2,569,546 tons coal/yr	Existing VCSNS intake/discharge canal system Natural gas, 1,037 Btu/ft ³ ; 8,200 Btu/kWh; 0.0034 lb sulfur/MMBtu; 0.0128 lb NO _x /MMBtu; 49,996,810,230 ft ³ gas/yr	

TABLE 8-2 (Continued)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
600 workers		<p>Low NO_x burners, overfire air (95% NO_x reduction efficiency).</p> <p>Dry scrubber – calcium hydroxide desulfurization system (90% SO_x removal efficiency); 95,000 tons limestone/yr</p> <p>Fabric filters or electrostatic precipitators (99.9% particulate removal efficiency)</p> <p>70 additional workers (Section 7.2.2.1)</p>	<p>Low NO_x burners, selective catalytic reduction with overfire air</p> <p>150 workers (Section 7.2.2.2)</p>	
Land Use Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 52, 53)	SMALL – Not an impact evaluated by GEIS (NRC 1996, Section 7.3)	SMALL – Cope site was designed to accommodate two additional units and could use existing rail lines and transportation corridors. Twenty years of ash and scrubber waste disposal would require 105 acres of forested land (Section 7.2.2.1).	MODERATE – 110 acres for facility at VCSNS location; pipeline would be routed along existing rights-of-way when practicable. Would be necessary to widen existing rights-of-way (Section 7.2.2.2).	MODERATE – Most transmission facilities could be constructed along existing transmission corridors (Section 7.2.2.3). Adopting by reference GEIS description of land use impacts from alternate technologies (NRC 1996, Section 8.2)

TABLE 8-2 (Continued)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Water Quality Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 3, 5, 6, 7-12). Two Category 2 groundwater issues not applicable (Section 4.5, Issue 33; and Section 4.7, Issue 35). Evaporative loss from cooling pond would have minimal effect on biological communities (Section 4.1, Issue 13) and aquifer recharge (Section 4.6, Issue 34) or groundwater degradation (Section 4.8, Issue 39).	SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 89).	SMALL – Construction impacts minimized by use of best management practices. Operational impacts minimized by use of existing close-loop system that recycles cooling water and withdraws makeup water from onsite wells (Section 7.2.2.1).	SMALL – Reduced cooling water demands, inherent in combined-cycle design (Section 7.2.2.2) Construction of pipeline could cause temporary erosion and sedimentation in streams crossed by right of way (Section 7.2.2.2).	SMALL to MODERATE – Adopting by reference GEIS description of water quality impacts from alternate technologies (NRC 1996, Section 8.2)
Air Quality Impacts				
SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 51). Category 2 issue not applicable (Section 4.11, Issue 50).	SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issue 88)	MODERATE – <ul style="list-style-type: none"> • 6,249 tons SO_x/yr • 642 tons NO_x/yr • 642 tons CO/yr • 113 tons TSP/yr • 26 tons PM₁₀/yr (Section 7.2.2.1)	MODERATE – <ul style="list-style-type: none"> • 88 tons SO_x/yr • 332 tons NO_x/yr • 435 tons CO/yr • 130 tons PM₁₀/yr^a (Section 7.2.2.2).	SMALL to MODERATE – Adopting by reference GEIS description of air quality impacts from alternate technologies (NRC 1996, Section 8.2)

TABLE 8-2 (Continued)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Ecological Resource Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 15-24, 28-30, 41-48). One Category 2 issue not applicable (Section 4.9, Issue 40). VCSNS holds a current NPDES permit, which constitutes compliance with Clean Water Act Section 316(b) (Section 4.2, Issue 25; Section 4.3, Issue 26) and 316(a) (Section 4.4, Issue 27)	SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 90)	SMALL – 105 acres of forested land could be required for ash/sludge disposal over 20-year license renewal term (Section 7.2.2.1).	MODERATE – Construction of new pipeline would require widening of existing right-of-way, with noise disturbance during construction and permanent loss of wildlife habitat (Section 7.2.2.2).	SMALL to MODERATE – Adopting by reference GEIS description of ecological resource impacts from alternate technologies (NRC 1996, Section 8.2)
Threatened or Endangered Species Impacts				
SMALL – Only one threatened or endangered species (bald eagle) is known to occur in the vicinity of the site or along transmission corridors, and no impacts have been observed to date (Section 4.10, Issue 49).	SMALL – Not an impact evaluated by GEIS (NRC 1996, Section 7.3)	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats.	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats.	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats.
Human Health Impacts				
SMALL – Category 1 issues (Table 4-2, Issues 56, 58, 61, 62). Risk from microbiological organisms minimal due to low discharge temperatures (Section 4.12, Issue 57). Risk due to transmission-line induced currents minimal due to conformance with code (Section 4.13, Issue 59)	SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 86)	MODERATE – Adopting by reference GEIS conclusion that risks such as cancer and emphysema from emissions are likely (NRC 1996, Section 8.3.9)	SMALL – Adopting by reference GEIS conclusion that some risk of cancer and emphysema exists from emissions (NRC 1996, Table 8.2)	SMALL to MODERATE – Adopting by reference GEIS description of human health impacts from alternate technologies (NRC 1996, Section 8.2)

TABLE 8-2 (Continued)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Socioeconomic Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 64, 67). Two Category 2 issues not applicable (Section 4.16, Issue 66 and Section 4.17.1, Issue 68). Location in medium population area with limited growth controls minimizes potential for housing impacts. (Section 4.14, Issue 63). Plant contribution to county tax base is significant, and continued plant operation would benefit county (Section 4.17.2, Issue 69). Capacity of public water supply and transportation infrastructure minimizes potential for related impacts (Section 4.15, Issue 65 and Section 4.18, Issue 70)	SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 91)	SMALL to MODERATE – Reduction in permanent work force at VCSNS could adversely affect surrounding counties (Section 7.2.2.1).	SMALL to MODERATE – Reduction in permanent work force at VCSNS could adversely affect surrounding counties (Section 7.2.2.2).	SMALL to MODERATE – Adopting by reference GEIS description of socioeconomic impacts from alternate technologies (NRC 1996, Section 8.2)
Waste Management Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 77-85)	SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 87)	MODERATE – 230,000 tons of coal ash and 170,000 tons of scrubber sludge would require 105 acres over 20-year license renewal term. Industrial waste generated annually (Section 7.2.2.1).	SMALL – Almost no waste generation (Section 7.2.2.2).	SMALL to MODERATE – Adopting by reference GEIS description of waste management impacts from alternate technologies (NRC 1996, Section 8.2)

TABLE 8-2 (Continued)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Aesthetic Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 73, 74)	SMALL – Not an impact evaluated by GEIS (NRC 1996, Section 7.3)	SMALL – The coal-fired power block and the (525 foot) exhaust stack would be visible from the Edisto River from a moderate offsite distance (Section 7.2.2.1).	SMALL – Steam turbines and stacks (approximately 200 feet tall) would create visual impacts comparable to those from existing VCSNS facilities (Section 7.2.2.2).	SMALL to MODERATE – Adopting by reference GEIS description of aesthetic impacts from alternate technologies (NRC 1996, Section 8.2)
Cultural Resource Impacts				
SMALL – SHPO consultation minimizes potential for impact (Section 4.19, Issue 71)	SMALL – Not an impact evaluated by GEIS (NRC 1996, Section 7.3)	SMALL – Impacts to cultural resources would be unlikely due to developed nature of the site (Section 7.2.2.1)	SMALL – Widening ROW to accommodate new pipeline could impact cultural resources, if present. But impacts would be mitigated by pre-construction surveys and consultation with SHPO. (Section 7.2.2.2).	SMALL – Adopting by reference GEIS description of cultural resource impacts from alternate technologies (NRC 1996, Section 8.2)

SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. MODERATE Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource. 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3.

Btu = British thermal unit

ft³ = cubic foot

gal = gallon

GEIS = Generic Environmental Impact Statement (NRC 1996)

kWh = kilowatt hour

lb = pound

MM = million

a. All TSP for gas-fired alternative is PM₁₀.

MW = megawatt

NO_x = nitrogen oxide

PM₁₀ = particulates having diameter less than 10 microns

SHPO = State Historic Preservation Officer

SO₂ = sulfur dioxide

TSP = total suspended particulates

yr = year

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

9.0 STATUS OF COMPLIANCE

9.1 Proposed Action

NRC

**“The environmental report shall list all Federal permits, licenses, approvals and other entitlements which must be obtained in connection with the proposed action and shall describe the status of compliance with these requirements. The environmental report shall also include a discussion of the status of compliance with applicable environmental quality standards and requirements including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements which have been imposed by Federal, State, regional, and local agencies having responsibility for environmental protection....”
10 CFR 51.45(d) as adopted by 10 CFR 51.53(c)(2)**

9.1.1 General

Table 9-1 lists environmental authorizations that South Carolina Electric & Gas Company (SCE&G) has obtained for current Virgil C. Summer Nuclear Station (VCSNS) operations. In this context, SCE&G uses “authorizations” to include any permits, licenses, approvals, or other entitlements. SCE&G expects to continue renewing these authorizations during the current license period and through the U.S. Nuclear Regulatory Commission (NRC) license renewal period. Based on the new and significant information identification process described in Chapter 5, VCSNS is in compliance with applicable environmental standards and requirements.

Table 9-2 lists additional environmental authorizations and consultations that would be conditions precedent to NRC renewal of the VCSNS license to operate. As indicated, SCE&G anticipates needing relatively few such authorizations and consultations. Sections 9.1.2 through 9.1.5 discuss some of these items in more detail.

9.1.2 Threatened or Endangered Species

Section 7 of the Endangered Species Act (16 USC 1531 et seq.) requires federal agencies to ensure that agency action is not likely to jeopardize any species that is listed or proposed for listing as threatened or endangered. Depending on the action involved, the Act requires consultation with the U.S. Fish and Wildlife Service (FWS) regarding effects on non-marine species, the National Marine Fisheries Service (NMFS) for marine species, or both. FWS and NMFS have issued joint procedural regulations at 50 CFR 402, Subpart B, that address consultation, and FWS maintains the joint list of threatened and endangered species at 50 CFR 17.

Although not required by federal law or NRC regulation, SCE&G has chosen to invite comment from federal and state agencies regarding potential effects that VCSNS license renewal might have. Appendix C includes copies of SCE&G correspondence with FWS

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

and the South Carolina Department of Natural Resources (SCDNR). SCE&G did not consult with NMFS because species under the auspices of NMFS are not found in the vicinity of VCSNS.

9.1.3 Coastal Zone Management Program

The federal Coastal Zone Management Act (16 USC 1451 et seq.) imposes requirements on applicants for a federal license to conduct an activity that could affect a state's coastal zone. VCSNS, located in Fairfield County, is not within the South Carolina coastal zone (Code Laws of South Carolina, Section 48-39-10) and, due to its distance (approximately 90 miles) from the coastal zone, is not expected to affect the South Carolina coastal zone. Coastal zone management requirements are not applicable to VCSNS license renewal.

9.1.4 Historic Preservation

Section 106 of the National Historic Preservation Act (16 USC 470 et seq.) requires federal agencies having the authority to license any undertaking to, prior to issuing the license, take into account the effect of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. Council regulations provide for establishing an agreement with any State Historic Preservation Officer (SHPO) to substitute state review for Committee review (35 CFR 800.7). Although not required of an applicant by federal law or NRC regulation, SCE&G has chosen to invite comment by the South Carolina SHPO. Appendix E includes a copy of SCE&G correspondence with the SHPO regarding potential effects that VCSNS license renewal might have on historic or cultural resources. Based on the SCE&G submittal and other information, the SHPO concurred with SCE&G's conclusion that continued operation of VCSNS would have no effect on historic properties, noting that "these (continuing) operations are usually not associated with new construction or expansion of plant boundaries."

9.1.5 Water Quality (401) Certification

Federal Clean Water Act (CWA) Section 401 requires that applicants for a federal license to conduct an activity that might result in a discharge into navigable waters provide the licensing agency a certification from the state that the discharge will comply with applicable CWA requirements (33 USC 1341). NRC has indicated in its *Generic Environmental Impact Statement for License Renewal* (NRC 1996) that issuance of a National Pollutant Discharge Elimination System (NPDES) permit implies certification by the state. SCE&G is applying to NRC for license renewal to continue VCSNS operations. Appendix B contains excerpts from the VCSNS NPDES permit.

Consistent with the GEIS, SCE&G is providing the VCSNS NPDES permit as evidence of state water quality (401) certification.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

9.2 Alternatives

NRC

“...The discussion of alternatives in the report shall include a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements.” 10 CFR 54.45(d) as adopted by 10 CFR 51.53(c)(2)

The coal, gas, and purchased power alternatives discussed in [Section 7.2.1](#) probably could be constructed and operated to comply with all applicable environmental quality standards and requirements. SCE&G notes that increasingly stringent air quality protection requirements could make the construction of a large fossil-fueled power plant infeasible in many locations. SCE&G also notes that the U.S. Environmental Protection Agency has revised requirements that could affect the design of cooling water intake structures for new facilities (EPA 2001) and has proposed requirements that could affect modifications at existing facilities (EPA 2002). These requirements could necessitate construction of cooling towers for the coal- and gas-fired alternatives if surface water were used for cooling.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

9.3 References

Code of Laws of South Carolina. Section 48-39-10. Chapter 39. Coastal Tidelands and Wetlands. Available at <http://www.lpitr/state/sc/us/code/t48c039/htm>. Accessed June 20, 2000.

EPA (U.S. Environmental Protection Agency). 2001. "National Pollutant Discharge Elimination System: Regulations Addressing Cooling Water Intake Structures for New Facilities; Final Rule." *Federal Register*. Vol. 66, No. 243. December 18.

EPA (U.S. Environmental Protection Agency). 2002. "National Pollutant Discharge Elimination System: Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities; Proposed Rule." *Federal Register*. Vol. 67, No. 68. April 19.

NRC (U.S. Nuclear Regulatory Commission). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS). Volumes 1 and 2. NUREG-1437. Washington, DC. May.

TABLE 9-1
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT
VCSNS OPERATIONS

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Covered
Federal Requirements to License Renewal					
U. S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011, et seq.), 10 CFR 50.10	License to operate	NPF-12	Issued on 8/6/82 Expires on 8/6/22	Operation of Unit 1
U.S. Environmental Protection Agency (EPA); South Carolina Department of Health and Environmental Control (SCDHEC) – Bureau of Water	Clean Water Act (33 USC Section 1251 et seq.); Pollution Control Act of South Carolina (S.C. Code Sections 48-1-10, et seq.)	Individual Discharge Permit	SC0030856	Issued on 10/1/97 Expires on 9/30/02	Contains effluent limits for VCSNS discharges to Monticello Reservoir and the Broad River
SCDHEC- Bureau of Air Quality	Pollution Control Act (Sections 48-1-50[5] and 48-1-110[a]; Code of Laws of South Carolina (Regulation 61-62)	Conditional Major Permit	CM-1000-0012	Issued on 8/10/99 Expires on 7/31/04	Establishes emissions limits
SCDHEC – Division of Radioactive Waste Management, Bureau of Land and Waste Management	Atomic Energy and Radiation Control Act (S.C. Code of Laws, Sections 13-7-40, et seq.)	Radioactive Material License	No. 517, Amendment 02	Issued on 9/30/99 Expires on 9/30/04	Authorizes storage of radioactive material in three steam generators removed from service in 1994.

TABLE 9-1 (CONTINUED)
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT
VCSNS OPERATIONS

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Covered
Federal Requirements to License Renewal					
SCDHEC – Division of Waste Management	South Carolina Radioactive Waste Transportation and Disposal Act (S.C. Code of Laws 13-7- 110 et seq.)	Radioactive Waste Transport Permit	0163-39-02	Issued 12/18/01 Expires 12/31/02	Authorizes shipment of radioactive waste to licensed collecting/processing facilities within state of South Carolina.
Tennessee Dept. of Environment and Conservation – Division of Radiological Health	Tennessee Code Annotated 68-202- 206	License to Ship Radioactive Material	T-SC001-LO2	Issued 1/1/02 Expires 12/31/02	Authorizes shipment of radioactive waste to licensed disposal/processing facilities within state of Tennessee.

CFR = Code of Federal Regulations
 SCDHEC = Department of Health and Environmental Control
 EPA = U.S Environmental Protection Agency

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**TABLE 9-2
ENVIRONMENTAL AUTHORIZATIONS FOR
VCSNS LICENSE RENEWAL**

Agency	Authority	Requirement	Remarks
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011 et seq.)	License renewal	Environmental Report submitted in support of license renewal application
U.S. Fish and Wildlife Service (FWS)	Endangered Species Act Section 7 (16 USC 1536)	Consultation	Requires federal agency issuing a license to consult with FWS
South Carolina Department of Archives and History	National Historic Preservation Act Section 106 (16 USC 470f)	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with State Historic Preservation Officer (SHPO). SHPO has concurred that license renewal will not affect any sites listed or eligible for listing
SCDHEC – Bureau of Water	Clean Water Act Section 401 (33 USC 1341)	Certification of compliance with state water quality standards	Discharges during license renewal term

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

APPENDIX A

NRC NEPA ISSUES FOR LICENSE RENEWAL OF NUCLEAR POWER PLANTS

South Carolina Electric & Gas Company (SCE&G) has prepared this Environmental Report in accordance with the requirements of U.S. Nuclear Regulatory Commission (NRC) regulation 10 CFR 51.53. NRC included in the regulation a list of National Environmental Policy Act issues for license renewal of nuclear power plants. [Table A-1](#) lists these 92 issues and identifies the section in which SCE&G addressed each issue in the Environmental Report. For expediency, SCE&G has assigned a number to each issue and uses the issue numbers throughout the Environmental Report.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**TABLE A-1
VIRGIL C. SUMMER NUCLEAR STATION
ENVIRONMENTAL REPORT DISCUSSION OF
LICENSE RENEWAL NEPA ISSUES^a**

Issue	Category	Section of this Environmental Report
1. Impacts of refurbishment on surface water quality	1	4.0
2. Impacts of refurbishment on surface water use	1	4.0
3. Altered current patterns at intake and discharge structures	1	4.0
4. Altered salinity gradients	1	4.0
5. Altered thermal stratification of lakes	1	4.0
6. Temperature effects on sediment transport capacity	1	4.0
7. Scouring caused by discharged cooling water	1	4.0
8. Eutrophication	1	4.0
9. Discharge of chlorine or other biocides	1	4.0
10. Discharge of sanitary wastes and minor chemical spills	1	4.0
11. Discharge of other metals in waste water	1	4.0
12. Water use conflicts (plants with once-through cooling systems)	1	4.0
13. Water use conflicts (plants with cooling ponds or cooling towers using make-up water from a small river with low flow)	2	4.1
14. Refurbishment impacts to aquatic resources	1	4.0
15. Accumulation of contaminants in sediments or biota	1	4.0
16. Entrainment of phytoplankton and zooplankton	1	4.0
17. Cold shock	1	4.0
18. Thermal plume barrier to migrating fish	1	4.0
19. Distribution of aquatic organisms	1	4.0
20. Premature emergence of aquatic insects	1	4.0
21. Gas supersaturation (gas bubble disease)	1	4.0
22. Low dissolved oxygen in the discharge	1	4.0
23. Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	1	4.0
24. Stimulation of nuisance organisms (e.g., shipworms)	1	4.0
25. Entrainment of fish and shellfish in early life stages for plants with once-through and cooling pond heat dissipation systems	2	4.2
26. Impingement of fish and shellfish for plants with once-through and cooling pond heat dissipation systems	2	4.3
27. Heat shock for plants with once-through and cooling pond heat dissipation systems	2	4.4
28. Entrainment of fish and shellfish in early life stages for plants with cooling-tower-based heat dissipation systems	1	4.0
29. Impingement of fish and shellfish for plants with cooling-tower-based heat dissipation systems	1	4.0
30. Heat shock for plants with cooling-tower-based heat dissipation systems	1	4.0
31. Impacts of refurbishment on groundwater use and quality	1	4.0
32. Groundwater use conflicts (potable and service water; plants that use < 100 gpm)	1	4.0
33. Groundwater use conflicts (potable, service water, and dewatering; plants that use > 100 gpm)	2	4.5

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**TABLE A-1 (CONT'D)
VIRGIL C. SUMMER NUCLEAR STATION
ENVIRONMENTAL REPORT DISCUSSION OF
LICENSE RENEWAL NEPA ISSUES^a**

Issue	Category	Section of this Environmental Report
34. Groundwater use conflicts (plants using cooling towers withdrawing make-up water from a small river)	2	4.6
35. Groundwater use conflicts (Ranney wells)	2	4.7
36. Groundwater quality degradation (Ranney wells)	1	4.0
37. Groundwater quality degradation (saltwater intrusion)	1	4.0
38. Groundwater quality degradation (cooling ponds in salt marshes)	1	4.0
39. Groundwater quality degradation (cooling ponds at inland sites)	2	4.8
40. Refurbishment impacts to terrestrial resources	2	4.9
41. Cooling tower impacts on crops and ornamental vegetation	1	4.0
42. Cooling tower impacts on native plants	1	4.0
43. Bird collisions with cooling towers	1	4.0
44. Cooling pond impacts on terrestrial resources	1	4.0
45. Power line right-of-way management (cutting and herbicide application)	1	4.0
46. Bird collisions with power lines	1	4.0
47. Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	1	4.0
48. Floodplains and wetlands on power line right-of-way	1	4.0
49. Threatened or endangered species	2	4.10
50. Air quality during refurbishment (non-attainment and maintenance areas)	2	4.11
51. Air quality effects of transmission lines	1	4.0
52. Onsite land use	1	4.0
53. Power line right-of-way land use impacts	1	4.0
54. Radiation exposures to the public during refurbishment	1	4.0
55. Occupational radiation exposures during refurbishment	1	4.0
56. Microbiological organisms (occupational health)	1	4.0
57. Microbiological organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river)	2	4.12
58. Noise	1	4.0
59. Electromagnetic fields, acute effects (electric shock)	2	4.13
60. Electromagnetic fields, chronic effects	NA ^b	4.0
61. Radiation exposures to public (license renewal term)	1	4.0
62. Occupational radiation exposures (license renewal term)	1	4.0
63. Housing impacts	2	4.14
64. Public services: public safety, social services, and tourism and recreation	1	4.0
65. Public services: public utilities	2	4.15
66. Public services: education (refurbishment)	2	4.16
67. Public services: education (license renewal term)	1	4.0
68. Offsite land use (refurbishment)	2	4.17.1
69. Offsite land use (license renewal term)	2	4.17.2

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**TABLE A-1 (CONT'D)
VIRGIL C. SUMMER NUCLEAR STATION
ENVIRONMENTAL REPORT DISCUSSION OF
LICENSE RENEWAL NEPA ISSUES^a**

Issue	Category	Section of this Environmental Report
70. Public services: transportation	2	4.18
71. Historic and archaeological resources	2	4.19
72. Aesthetic impacts (refurbishment)	1	4.0
73. Aesthetic impacts (license renewal term)	1	4.0
74. Aesthetic impacts of transmission lines (license renewal term)	1	4.0
75. Design basis accidents	1	4.0
76. Severe accidents	2	4.20
77. Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high-level waste)	1	4.0
78. Offsite radiological impacts (collective effects)	1	4.0
79. Offsite radiological impacts (spent fuel and high-level waste disposal)	1	4.0
80. Nonradiological impacts of the uranium fuel cycle	1	4.0
81. Low-level waste storage and disposal	1	4.0
82. Mixed waste storage and disposal	1	4.0
83. Onsite spent fuel	1	4.0
84. Nonradiological waste	1	4.0
85. Transportation	1	4.0
86. Radiation doses (decommissioning)	1	4.0
87. Waste management (decommissioning)	1	4.0
88. Air quality (decommissioning)	1	4.0
89. Water quality (decommissioning)	1	4.0
90. Ecological resources (decommissioning)	1	4.0
91. Socioeconomic impacts (decommissioning)	1	4.0
92. Environmental justice	NA ^b	2.11

a. Source: 10 CFR 51, Subpart A, Appendix A, Table B-1. (Issue numbers added to facilitate discussion.)

b. Not applicable. Regulation does not categorize this issue.

NEPA = National Environmental Policy Act.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

APPENDIX B

NPDES PERMIT

The NPDES permit for Virgil C. Summer Nuclear Station is approximately 75 pages long. Only the cover page, providing the authority to discharge to Monticello Reservoir and the Broad River, and pages related to the Section 316(a) variance and Section 316(b) determination are provided.

VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT



***National Pollutant Discharge
Elimination System Permit***

for Discharge to Surface Waters

This Permit Certifies That

SCE&G Virgil C. Summer Nuclear Station

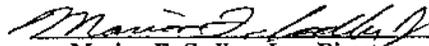
has been granted permission to discharge from a facility located at

Jenkinsville, Fairfield County, South Carolina

to receiving waters named

Monticello Reservoir and Broad River

accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof. This permit is issued in accordance with the provisions of the Pollution Control Act of South Carolina (S.C. Code Sections 48-1-10 *et seq.*, 1976), Regulation 61-9 and with the provisions of the Federal Clean Water Act (PL 92-500), as amended, 33 U.S.C. 1251 *et seq.*, the "Act."



Marion F. Sadler, Jr., Director
Industrial, Agricultural, and Storm Water Permitting Division
Bureau of Water

Issued: *September 29, 1997*

Expires: *September 30, 2002*

Effective: *October 1, 1997*

Permit No.: *SC0030856*

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Page 7

- 2.0 mg/l (max)
5. Human Health: 0.05 mg/l
 6. Detection Limit: 0.01 mg/l
 7. Conclusion: Based upon sampling data and reasonable potential procedures, no limit for manganese will be proposed.

Flouride

1. Form 2C Value: 0.123 mg/l
2. Previous Permit: none
3. Effluent Guidelines: Not applicable
4. Water Quality Criteria: none
5. Drinking Water MCL: 4.0 mg/l
6. Detection Limit: 0.01 mg/l
7. Conclusion: Based upon sampling data and reasonable potential procedures, no limit for flouride will be proposed.

Sulfate

1. Form 2C Value: 6.14 mg/l
2. Previous Permit: none
3. Effluent Guidelines: Not applicable
4. Water Quality Criteria: none
5. Drinking Water MCL: 250 mg/l
6. Detection Limit: 0.005 mg/l
7. Conclusion: Based upon sampling data and reasonable potential procedures, no limit for sulfate will be proposed.

Nitrate-nitrite

1. Form 2C Value: 0.36 mg/l
2. Previous Permit: none
3. Effluent Guidelines: Not applicable
4. Water Quality Criteria: none
5. Drinking Water MCL: 10 mg/l
6. Detection Limit: 0.02 mg/l
7. Conclusion: Based upon sampling data and reasonable potential procedures, no limit for nitrate-nitrite will be proposed.

1. 316(a)

The thermal component of the discharge from this facility is subject to compliance with South Carolina Water Classifications and Standards (Reg. 61-68). Section D.(8)(a) of the standards stipulates that the water temperature of all Class A waters "shall not be increased more than 5°F(2.8°C) above natural temperature conditions or exceed a maximum of 90°F(32.2°C) as a result of the discharge of heated liquids," unless a different temperature standard has been established, a mixing zone has been established, or a Section 316(a) determination under the Federal Clean Water Act (the Act) has been completed. Section 316(a) of the Act allows the permitting authority to impose alternative and less stringent thermal limitations after demonstration that the water quality standards limitations are more

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Rationale
Page 8

stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the receiving water.

On April 7, 1975, as a part of permitting activities of the original NPDES permit, SCE&G provided information to support its request that alternative thermal effluent limitations be allowed under Section 316(a) of the Act. In April 30, 1976, a determination was made that the permittee had submitted adequate information to demonstrate that the alternative limitations for the thermal component of the discharge would assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the Monticello Reservoir. The alternate maximum discharge temperature for Outfall 001 is 45°C(113°F). A maximum thermal plume temperature of 32.2°C(90°F) and temperature rise of 1.66°C(3.0°F) is also imposed.

On July 1, 1984 a continuation of the 316(a) variance was allowed by the reissuance of the NPDES permit. On January 3, 1989, a request to continue the variance was included as part of the application for reissuance of the NPDES Permit. To support the request, the permittee has indicated there has been no change in facility operation and no change in the biological community. A tentative determination was made that continuation of the 316(a) variance was appropriate in the reissuance of this permit.

On April 3, 1997, the permittee submitted an application for reissuance of the permit. A request to continue the 316(a) variance was included as part of the application. On June 19, 1997, the Department determined that continuance was appropriate.

2. Section 316(b)

Section 316(b) of the Act requires that the location, design, construction, and capacity of a cooling water intake structure reflect the best technology available for minimizing environmental impact.

On April 19, 1985, a determination was made, in accordance with Section 316(b) of the Act, that the location, design, construction, and capacity of the cooling water intake structure(s) reflects the best technology available for minimizing adverse environmental impact. This determination was based on information submitted by SCE&G in a 316(b) Demonstration (March 1977).

Outfall 002

Outfall 002 consists of house service water for cooling of emergency generators, cooling heat exchangers and reactor building cooling units and is discharged at

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

APPENDIX C

SPECIAL-STATUS SPECIES CORRESPONDENCE

<u>Letter</u>	<u>Page</u>
Byrne, SCE&G, to Holling, SCDNR	C-2
Holling, SCDNR, to Byrne, SCE&G	C-9
Byrne, SCE&G, to Banks, USF&WS	C-14
Duncan, USF&WS, to Summer, SCE&G	C-21

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**



January 19, 2001
RC-01-0003

Ms. Julie Holling
Data Manager
Wildlife and Freshwater Fisheries Division
South Carolina Heritage Trust Program
South Carolina Dept. of Natural Resources
P.O. Box 167
Columbia, SC 29202

Stephen A. Byrne
Vice President
Nuclear Operations
803.345.4622

Dear Ms. Holling:

Subject: VIRGIL C. SUMMER NUCLEAR STATION LICENSE RENEWAL
REQUEST FOR INFORMATION ON
LISTED SPECIES AND IMPORTANT HABITATS

South Carolina Electric & Gas Co.
Virgil C. Summer Nuclear Station
P. O. Box 88
Jenkinsville, South Carolina
29065

803.345.4344
803.345.5209
www.sceg.com

South Carolina Electric and Gas Company (SCE&G) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for Virgil C. Summer Nuclear Station, which expires in August 2022. SCE&G intends to submit this application for license renewal in August 2002. As part of the license renewal process, the NRC requires license applicants to "assess the impact of the proposed action on threatened or endangered species in accordance with the Endangered Species Act" (10 CFR 51.53). The NRC will consult with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act and may also seek your assistance in the identification of important species and habitats in the project area. By contacting you in advance, we hope to identify any issues that need to be addressed or information required to expedite the NRC's consultation.

SCE&G has operated Virgil C. Summer Nuclear Station (Summer Station) and associated transmission lines since 1982. Summer Station is in Fairfield County, South Carolina, approximately 15 miles southwest of the town of Winnsboro and approximately 26 miles northwest of Columbia (latitude 34.295833; longitude 81.320278) (see Figure 2-1). The plant lies on the south shore of Monticello Reservoir (see Figure 2-2), which serves as its cooling water source and heat sink. The Summer Station property (Figure 2-3) is defined as the area within approximately one mile of the reactor building and includes the southern portion of Monticello Reservoir. It totals approximately 2,200 acres.

SCE&G, which owns two-thirds of the plant, built eight transmission lines for the specific purpose of connecting Summer Station to the regional transmission system (see Figure 3-3). South Carolina Public Service Authority (commonly referred to as "Santee Cooper"), owner of the remaining one-third of the plant, built two additional lines to connect to the regional grid. Beginning at Summer Station, the SCE&G lines

NUCLEAR EXCELLENCE - A SUMMER TRADITION!

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Ms. Julie Holling, SCDNR
Page 2 of 2

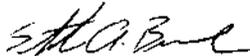
generally run in a southerly direction, with five terminations very near Summer Station; one near Aiken, South Carolina; and two near Columbia (see Figure 3-2). The Santee Cooper lines run roughly east and west to substations near Blythewood and Newberry, South Carolina, respectively.

SCE&G is committed to the conservation of significant natural habitats and protected species, and believes that operation of Summer Station and its transmission lines since 1982 has had no adverse impact on any threatened or endangered species. Only one listed species, the bald eagle, is known to occur in the vicinity of Summer Station. Bald eagles are commonly observed foraging around Monticello Reservoir, Parr Reservoir, and on the Broad River downstream of Parr Shoals dam. There were two active bald eagle nests on Parr Reservoir in 1999-2000, one on the Cannons Creek arm of the reservoir (approximately 2 miles east of the station) and one on the Hellers Creek arm of the reservoir (approximately 4 miles northeast of the station).

SCE&G has no plans to alter current operations over the license renewal period. Any maintenance activities necessary to support license renewal would be limited to previously-disturbed areas. No major expansion of existing facilities is planned, and no additional land disturbance is anticipated in support of license renewal. As a consequence, we believe that operation of the plant, including maintenance of the transmission lines, over the license renewal period (an additional 20 years) would not adversely affect any threatened or endangered species. Although SCE&G has not identified any rare plants in the transmission corridors, control of woody vegetation in these corridors could provide habitat for rare plants and animals that depend on open conditions (grassland and bog-type habitats) that are maintained by regular mowing and selective application of approved herbicides.

We would appreciate your providing us with any information you may have about any State or Federally listed species or ecologically significant habitats that may occur on the 2,200-acre Summer Station site or along associated transmission corridors by March 1, 2001. This will enable us to meet our application preparation schedule. We will include a copy of this letter and your response in the license renewal application that we submit to the NRC. Please inform Mr. Stephen E. Summer at (803) 345-4252 if you have any questions or require any additional information to review this action.

Very truly yours,



Stephen A. Byrne

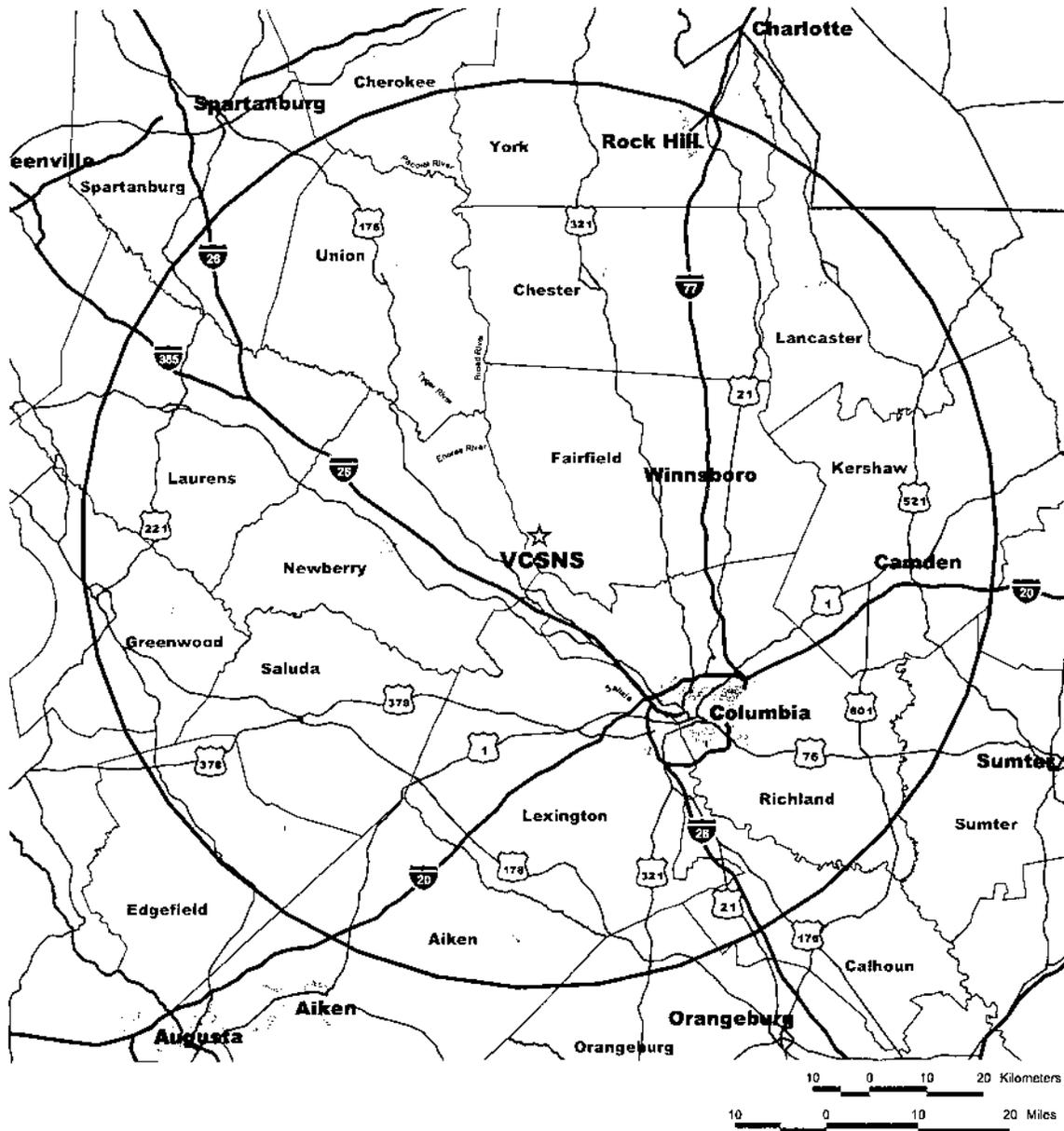
SES/SAB

attachments

c: R. B. Clary (800)
W. R. Higgins (830)
P. R. Moore (Tetra Tech NUS)
File (821.01)
DMS (RC-01-0003)

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION

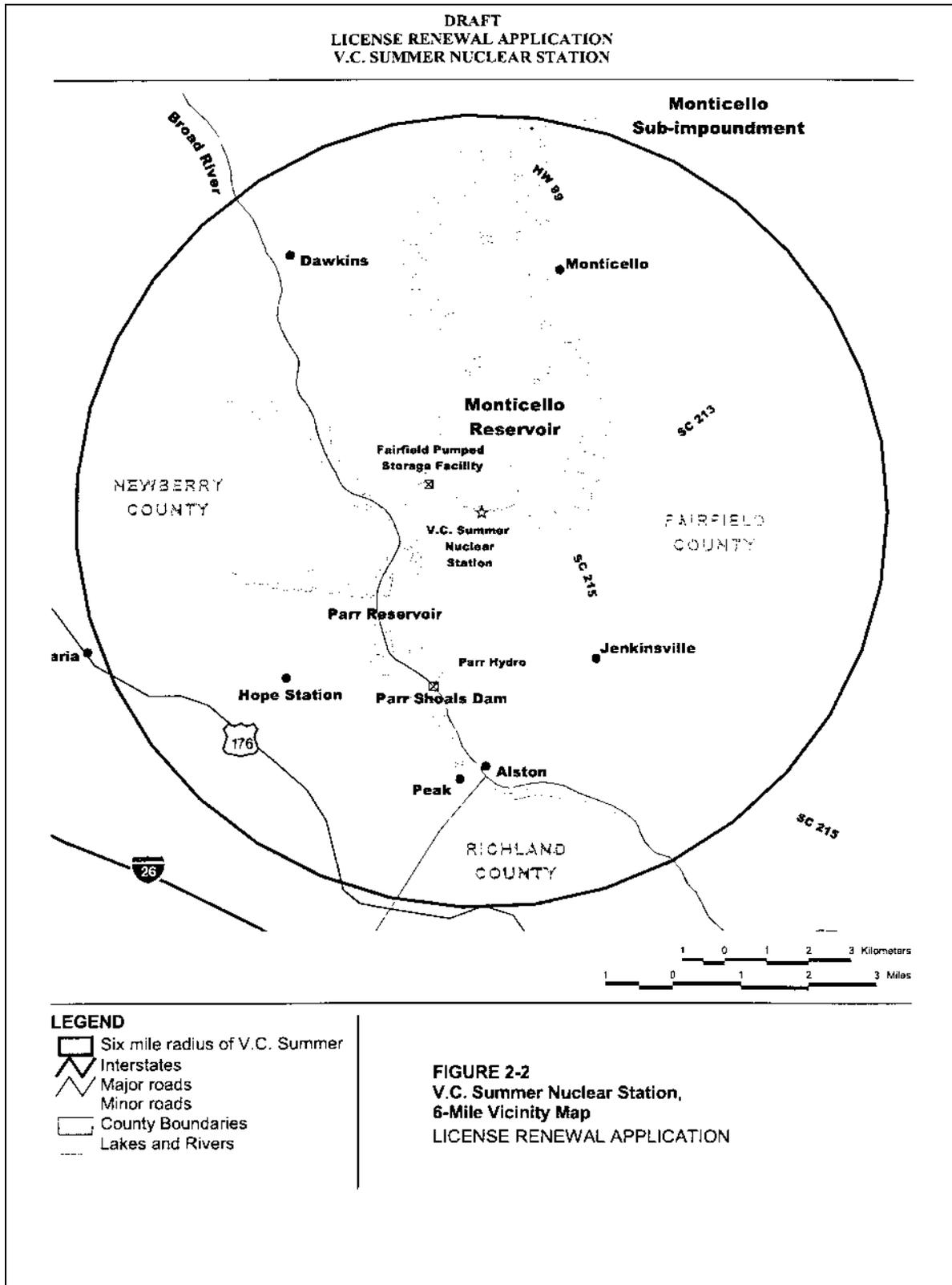


LEGEND

- ★ V.C. Summer Nuclear Station
- 50 mile radius of V.C. Summer
- ▬ Interstates
- ▬ Major roads
- ▭ County Boundaries
- ▭ State Boundary
- ▭ Lakes and Rivers
- Major Urban Areas

FIGURE 2-1
V.C. Summer Nuclear Station,
50-Mile Locational Vicinity Map
LICENSE RENEWAL APPLICATION

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**



VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT

DRAFT
ENVIRONMENTAL REPORT FOR LICENSE RENEWAL
VIRGIL C. SUMMER NUCLEAR STATION

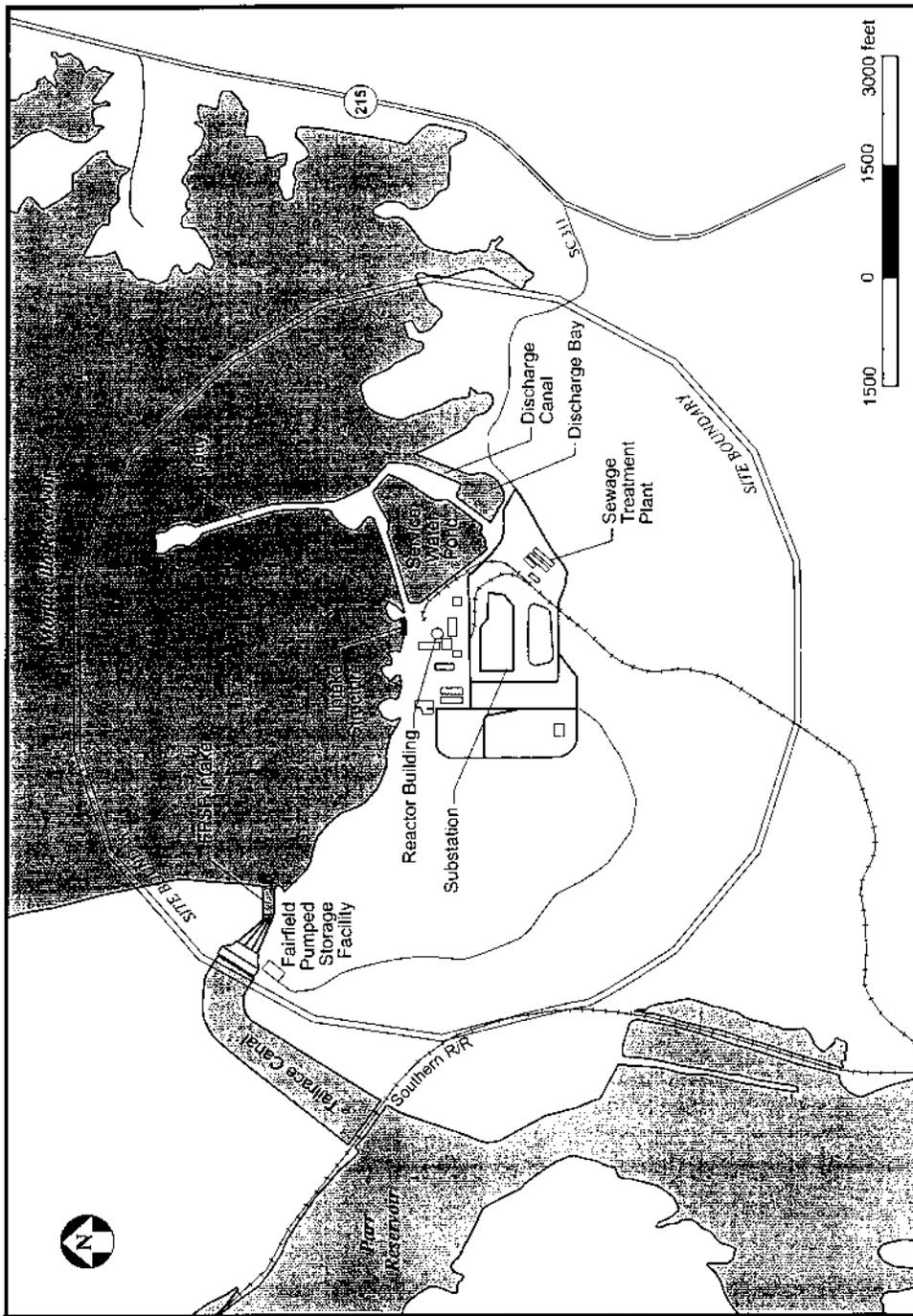
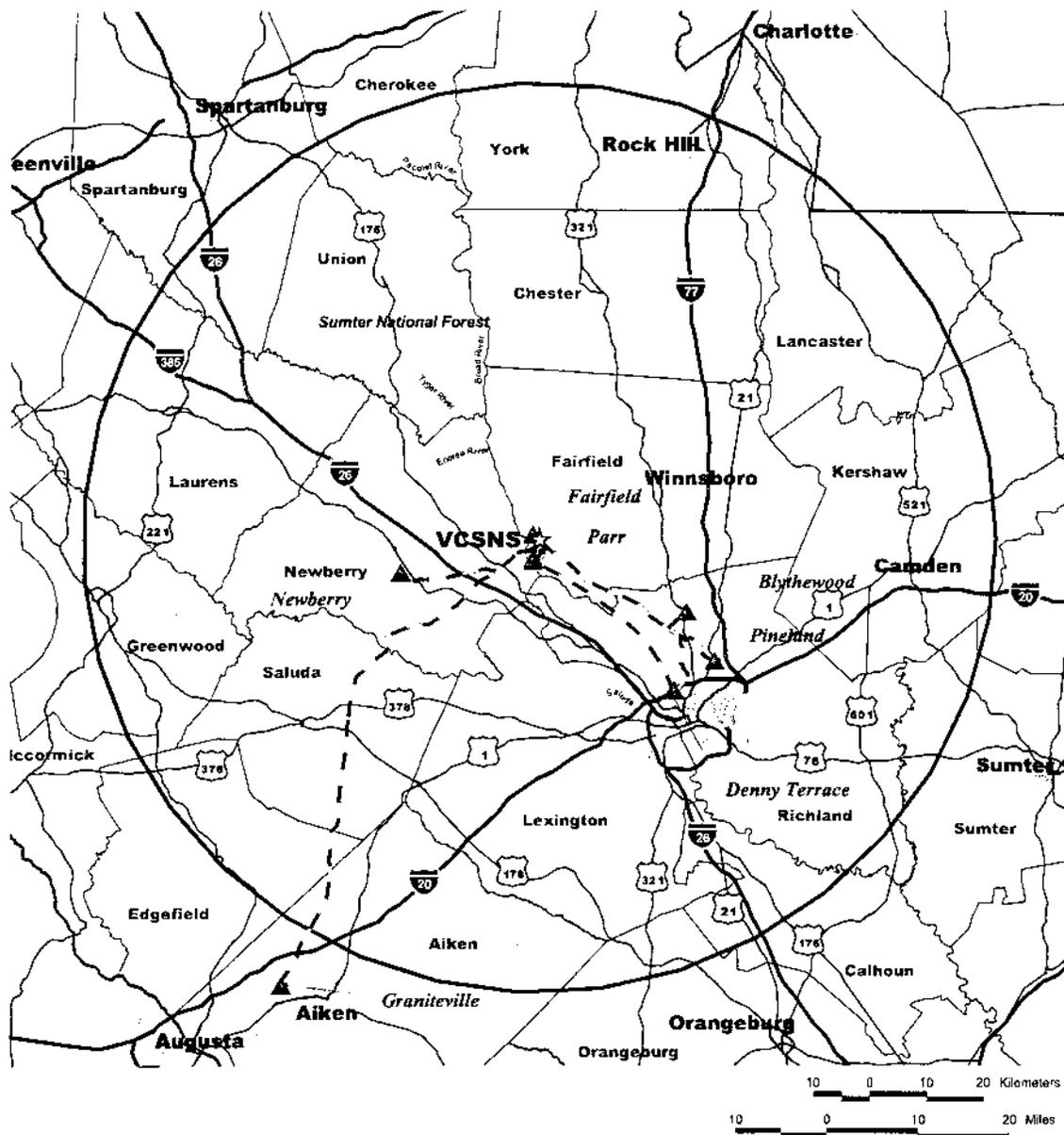


Figure 2-3. South Carolina Electric & Gas Company, Virgil C. Summer Nuclear Station Site Area Map.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

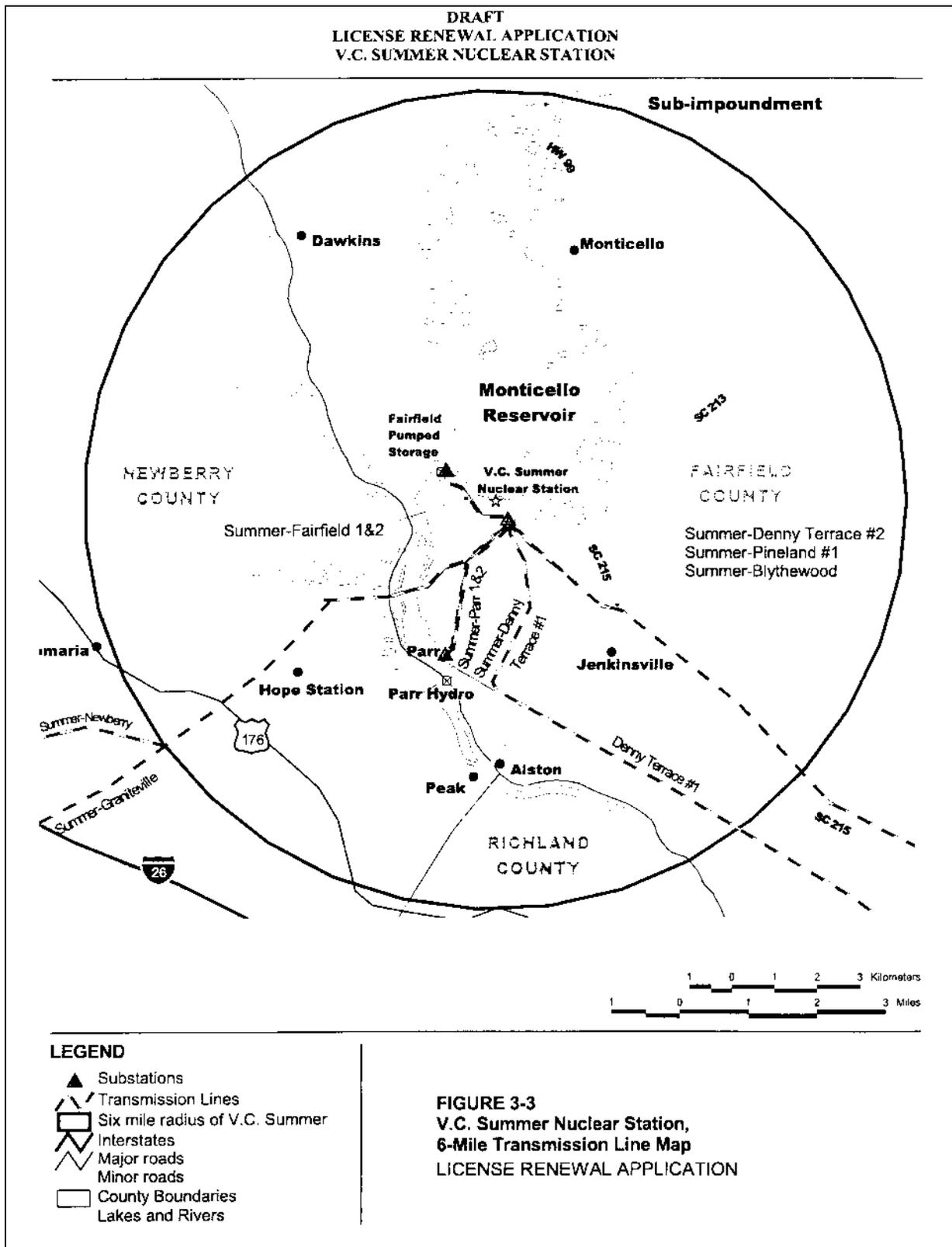
DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION



- LEGEND**
- ☆ V.C. Summer Nuclear Station
 - ▲ Substations
 - Transmission Lines
 - 50 mile radius of V.C. Summer
 - Interstate
 - Major roads
 - County Boundaries
 - State Boundary
 - Lakes and Rivers
 - National Forests

FIGURE 3-2
V.C. Summer Nuclear Station,
50-Mile Transmission Line Map
LICENSE RENEWAL APPLICATION

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**



VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT

2-20-01; 2:58PM;

1345 4255

2 / 6

South Carolina Department of
Natural Resources



Paul A. Sandifer, Ph.D.
Director

William S. McTeer
Deputy Director for
**Wildlife and
Freshwater Fisheries**

February 15, 2001

Stephen A. Byrne, Vice President, Nuclear Operations
SCE&G, Virgil C. Summer Nuclear Station
P.O. Box 88
Jenkinsville, SC 29065

RE: Virgil C. Summer Nuclear Station License Renewal
Request for Information on Listed Species and Important Habitats

Dear Mr. Byrne,

I have checked our database, and there are no occurrences of any federally or state threatened or endangered species within one mile of the project area. There are a number of known Bald Eagle nesting sites within a five mile radius. I've included a map indicating those locations for your information. Please understand that our database does not represent a comprehensive biological inventory of the state. Field work remains the responsibility of the investigator.

As an indication of other potential occurrences in the area, I have enclosed the lists of rare and endangered species for Fairfield, Newberry, and Richland counties. The highlighted ones are of legal significance. The remaining species on the list are of concern in the state.

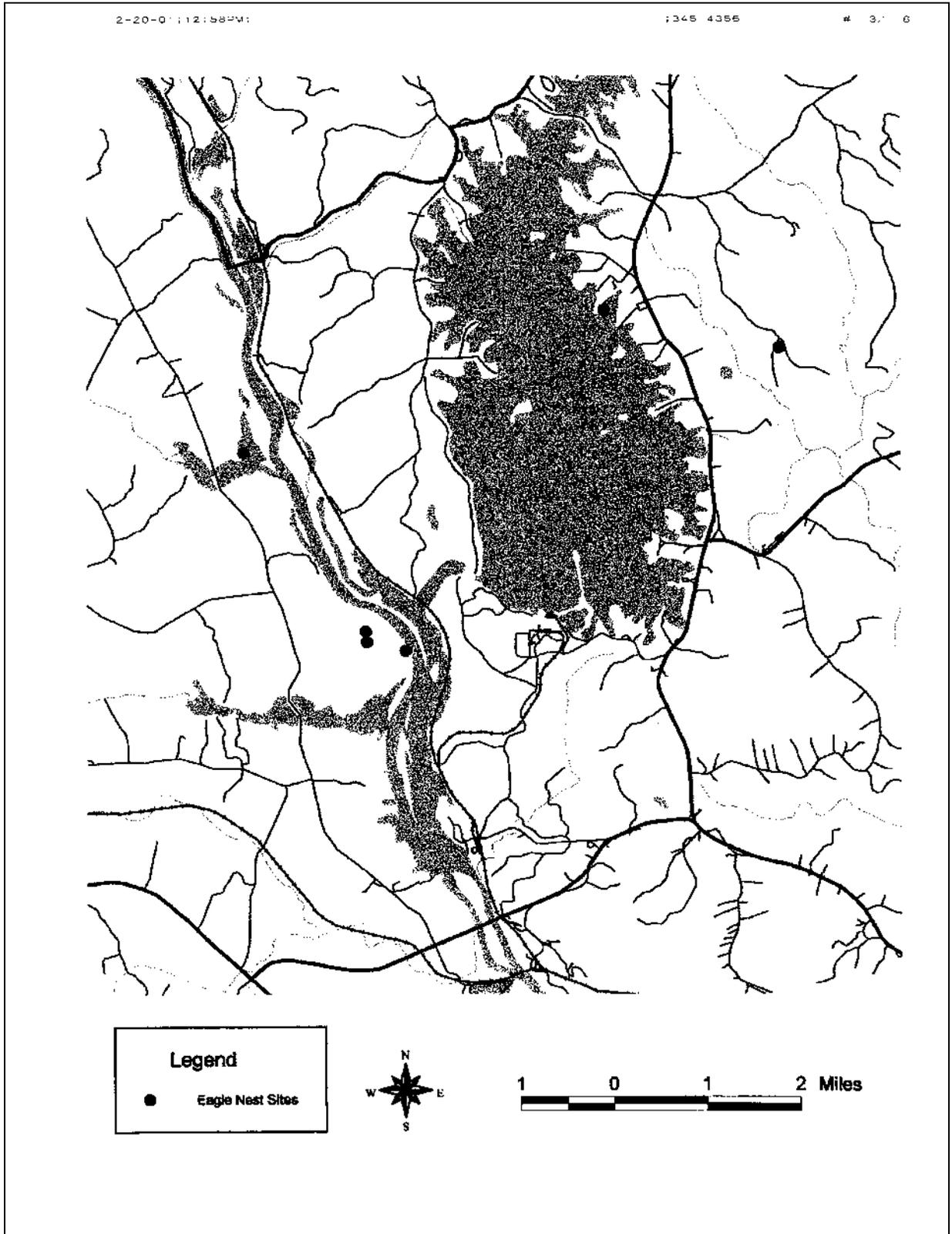
If you need additional assistance, please contact me by phone at 803/734-3917 or by e-mail at JulieH@scdnr.state.sc.us.

Sincerely,

A handwritten signature in cursive script that reads "Julie Holling".

Julie Holling
SC Department of Natural Resources
Heritage Trust Program

VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT



**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

2-20-01 12:58PM;

1945 4355

4. 6

RARE, THREATENED, AND ENDANGERED SPECIES OF FAIRFIELD COUNTY

STATUS... GRANK...SRANK...SCIENTIFIC NAME..... COMMON NAME.....
ANIMALS:

SC	G3	S?	ETHIOSTOMA COLLIS	CAROLINA DARTER
FT/SE	G4	S2	HALIAEETUS LEUCOCEPHALUS	BALD EAGLE
SC	G5	S?	PYGANODON CATARACTA	EASTERN FLOATER
SC	G5	S4	SCIURUS NIGER	EASTERN FOX SQUIRREL
SC	G4	S?	VILLOSA DELUMBIS	EASTERN CREEKSHELL

PLANTS:

SC	G2G3	S?	ASTER GEORGIANUS	GEORGIA ASTER
SC	G4	S?	CAREX OLIGOCARPA	EASTERN FEW-FRUIT SEDGE
SC	G4	S?	DIRCA PALUSTRIS	EASTERN LEATHERWOOD
RC	G5	S1	FRASERA CAROLINIENSIS	COLUMBO
SC	G3	S2	ISOETES PIEDMONTANA	PIEDMONT QUILLWORT
SC	G4	S?	MINUARTIA UNIFLORA	ONE-FLOWER STITCHWORT
SC	G5	S?	OSMORHIZA CLAYTONII	HAIRY SWEET-CICELY
SC	G5	S1	PHILADELPHUS HIRSUTUS	STREAMBANK MOCK-ORANGE
SC	G4	S?	SCUTELLARIA PARVULA	SMALL SKULLCAP
NC	G3	S2	SEDUM PUSILLUM	GRANITE ROCK STONECROP

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

2-20-01 12:58PM:

1345 4366

5/ 5

RARE, THREATENED, AND ENDANGERED SPECIES OF LEXINGTON COUNTY

STATUS...	GRANK...	SRANK...	SCIENTIFIC NAME.....	COMMON NAME.....
ANIMALS:				
FT/SE	G4	S2	HALIAEETUS LEUCOCEPHALUS	BALD EAGLE
SC	G2	S?	HETERODON SIMUS	SOUTHERN HOGNOSE SNAKE
SC	G5	S2	MICRURUS PULVIUS	EASTERN CORAL SNAKE
FE/SE	G3	S2	PICOIDES BOREALIS	RED-COCKADED WOODPECKER
SC	G5	S4	SCIURUS NIGER	EASTERN FOX SQUIRREL
SC	G6	S?	SEMINATRIX PYGAEA	BLACK SWAMP SNAKE
PLANTS:				
SC	G5T3T4	S1	ANDROPOGON PERANGUSTATUS	NARROW LEAVED BLUESTEM
SC	G4?	S?	ARISTIDA CONDENSATA	PIEDMONT THREE-AWNEED GRASS
SC	G4	S1	ASPLENIUM PINNATIFIDUM	LOBED SPLEENWORT
SC	G4G5	S?	BURMANNIA BIFLORA	NORTHERN BURMANNIA
SC	G4	S1	CAREX COLLINSII	COLLINS' SEDGE
SC	G4G5	S1S2	CHRYSOMA PAUCIFLOSCULOSA	WOODY GOLDENROD
SC	G3G5	S?	CORBOPSIS GLADIATA	SOUTHEASTERN TICKSEED
SC	G5	S1	EUONYMUS ATROPURPUREUS	Wahoo
SC	G4	S?	GAYLUSSACIA MOSTERI	WOOLLY-BERRY
NC	G2Q	S2	HYMENOCALLIS CORONARIA	SHOALS SPIDER-LILY
SC	G4	S?	HYPERICUM NITIDUM	CAROLINA ST. JOHN'S-WORT
SC	G4	S3	ILEX AMELANCHIER	SARYIS HOLLY
SC	G3G4	S?	LITATRIS MICROCEPHALA	SMALL-HEAD GAYFEATHER
SC	G?	S?	LOBELIA SP 1	LOBELIA
SC	G3	S?	LYCOPIUS COKERI	CAROLINA BUGLEWEED
SC	G5	S?	MENISPERMUM CANADENSE	CANADA MOONSEED
RC	G3	S2	MYRIOPHYLLUM LAXUM	PIEDMONT WATER-MILFOIL
SC	G3G5	S?	NOLINA GEORGIANA	GEORGIA BEARGRASS
SC	G3	S?	OXYPOLIS TERNATA	PIEDMONT COWBANE
SC	G4	S?	PITYOPSIS PINIFOLIA	PINE-LEAVED GOLDEN ASTER
SC	G5	S1S2	POLYGALA NANA	DWARF MILKWORT
SC	G5	S1	RHYNCHOSPORA ALBA	WHITE BEAKRUSH
SC	G3G4	S?	RHYNCHOSPORA INUNDATA	DROWNED HORNEDRUSH
	G3	SR	RHYNCHOSPORA LEPTOCARPA	
SC	G4	S?	RHYNCHOSPORA STENOPHYLLA	CHAPMAN BEAKRUSH
SC	G5	S?	RORIPPA SESSILIFLORA	STALKLESS YELLOWCRESS
SC	G3G4	S2	SAGITTARIA ISOETIFORMIS	SLENDER ARROW-HEAD
SC	G3	S1	SARRACENIA RUBRA	SWEET PITCHER-PLANT
SC	G4G5	S?	SCIRPUS SUBTERMINALIS	WATER BULRUSH
NC	G1G2	S1	SPOROBOLUS TERETIFOLIUS	WIRE-LEAVED DROPSSEED
SC	G4T2T3	S1	STYLISMA PICKERINGII VAR PICKERINGII	PICKERING'S MORNING-GLORY
SC	G3?	S?	TRIDENS CAROLINIANUS	CAROLINA FLUFF GRASS
NC	G4G5T1	S1	VACCINIUM CRASSIFOLIUM SSP SEMPERVIRENS	RAYNER'S BLUEBERRY
SC	G3	S?	XYRIS CHAPMANII	CHAPMAN'S YELLOW-BYED GRASS

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

2-20-C11: 2:58PM;

: 345 4358

6 / 6

RARE, THREATENED, AND ENDANGERED SPECIES OF NEWBERRY COUNTY

STATUS.. GRANK.. SRANK... SCIENTIFIC NAME..... COMMON NAME.....
ANIMALS:

SC	G1	S1	DISTOCAMBARUS YOUNGINERI	A CRAYFISH
SC	G2G3	S?	ELLIPTIO LANCEOLATA	YELLOW LANCE
FT/SE	G4	S2	HALIAEETUS LEUCOCEPHALUS	BALD EAGLE
SC	G5	S3?	URSUS AMERICANUS	BLACK BEAR

PLANTS:

SC	G4	S?	DIRCA PALUSTRIS	EASTERN LEATHERWOOD
SC	G5?	S?	EUPATORIUM FISTULOSUM	HOLLOW JOE-PYE WEED
RC	G5	S1	FRASERA CAROLINIENSIS	COLUMBO
SC	G5	S?	HETERANTHERA RENIFORMIS	KIDNEYLEAF MUD-PLANTAIN
SC	G5	S?	LIPARIS LILIIFOLIA	LARGE TWAYBLADE
RC	G4	S1	MAGNOLIA PYRAMIDATA	PYRAMID MAGNOLIA
RC	G3	S1	MONOTROPSIS ODORATA	SWEET PINESAP
SC	G5T5	S?	VIOLA PUBESCENS VAR LEIOCARPON	YELLOW VIOLET

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**



January 19, 2001
RC-01-0004

Mr. Roger Banks
Field Supervisor
U.S. Fish and Wildlife Service
P.O. Box 12559
217 Fort Jackson Road
Charleston, SC 29202

Dear Mr. Banks:

Stephen A. Byrne
Vice President
Nuclear Operations
803.345.4622

Subject: VIRGIL C. SUMMER NUCLEAR STATION LICENSE RENEWAL
REQUEST FOR INFORMATION ON
LISTED SPECIES AND IMPORTANT HABITATS

South Carolina Electric & Gas Co.
Virgil C. Summer Nuclear Station
P.O. Box 88
Jenkinsville, South Carolina
29055

803.345.4644
803.345.5209
www.sceg.com

South Carolina Electric and Gas Company (SCE&G) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for Virgil C. Summer Nuclear Station, which expires in August 2022. SCE&G intends to submit this application for license renewal in August 2002. As part of the license renewal process, the NRC requires license applicants to "assess the impact of the proposed action on threatened or endangered species in accordance with the Endangered Species Act" (10 CFR 51.53). The NRC will consult with your office under Section 7 of the Endangered Species Act to determine if any listed species or critical habitat occurs in the project area. By contacting you in advance, we hope to identify any issues that need to be addressed or information required to expedite the NRC's consultation.

SCE&G has operated Virgil C. Summer Nuclear Station (Summer Station) and associated transmission lines since 1982. Summer Station is in Fairfield County, South Carolina, approximately 15 miles southwest of the town of Winnsboro and approximately 26 miles northwest of Columbia (latitude 34.295833; longitude 81.320278) (see Figure 2-1). The plant lies on the south shore of Monticello Reservoir (see Figure 2-2), which serves as its cooling water source and heat sink. The Summer Station property (Figure 2-3) is defined as the area within approximately one-mile of the reactor building and includes the southern portion of Monticello Reservoir. It totals approximately 2,200 acres.

SCE&G, which owns two-thirds of the plant, built eight transmission lines for the specific purpose of connecting Summer Station to the regional transmission system (see Figure 3-3). South Carolina Public Service Authority (commonly referred to as "Santee Cooper"), owner of the remaining one-third of the plant, built two additional lines to connect to the regional grid. Beginning at Summer Station, the SCE&G lines generally run in a southerly direction, with five terminations very near Summer Station; one near Aiken, South Carolina; and two near Columbia (see Figure 3-2).

NUCLEAR EXCELLENCE - A SUMMER TRADITION!

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Mr. Roger Banks, USFWS
Page 2 of 2

The Santee Cooper lines run roughly east and west to substations near Blythewood and Newberry, South Carolina, respectively.

SCE&G is committed to the conservation of significant natural habitats and protected species, and believes that operation of the station and its transmission lines since 1982 has had no adverse impact on any threatened or endangered species. Only one Federally-listed species, the bald eagle, is known to occur in the vicinity of Summer Station. Bald eagles are commonly observed foraging around Monticello Reservoir, Parr Reservoir, and on the Broad River downstream of Parr Shoals dam. There were two active bald eagle nests on Parr Reservoir in 1999-2000, one on the Cannons Creek arm of the reservoir (approximately 2 miles east of the station) and one on the Hellers Creek arm of the reservoir (approximately 4 miles northeast of the station).

SCE&G has no plans to alter current operations over the license renewal period. Any maintenance activities necessary to support license renewal would be limited to previously disturbed areas. No major expansion of existing facilities is planned, and no additional land disturbance is anticipated in support of license renewal. As a consequence, we believe that operation of Summer Station, including maintenance of the transmission lines, over the license renewal period (an additional 20 years) would not adversely affect any threatened or endangered species.

We would appreciate your providing us with any information you may have about any threatened or endangered species or ecologically significant habitats that may occur on the 2,200-acre Summer Station site or along associated transmission corridors by March 1, 2001. This will enable us to meet our application preparation schedule. We will include a copy of this letter and your response in the license renewal application that we submit to the NRC. Please call Mr. Stephen E. Summer at (803) 345-4252 if you have any questions or require any additional information to review the proposed action.

Very truly yours,



Stephen A. Byrne

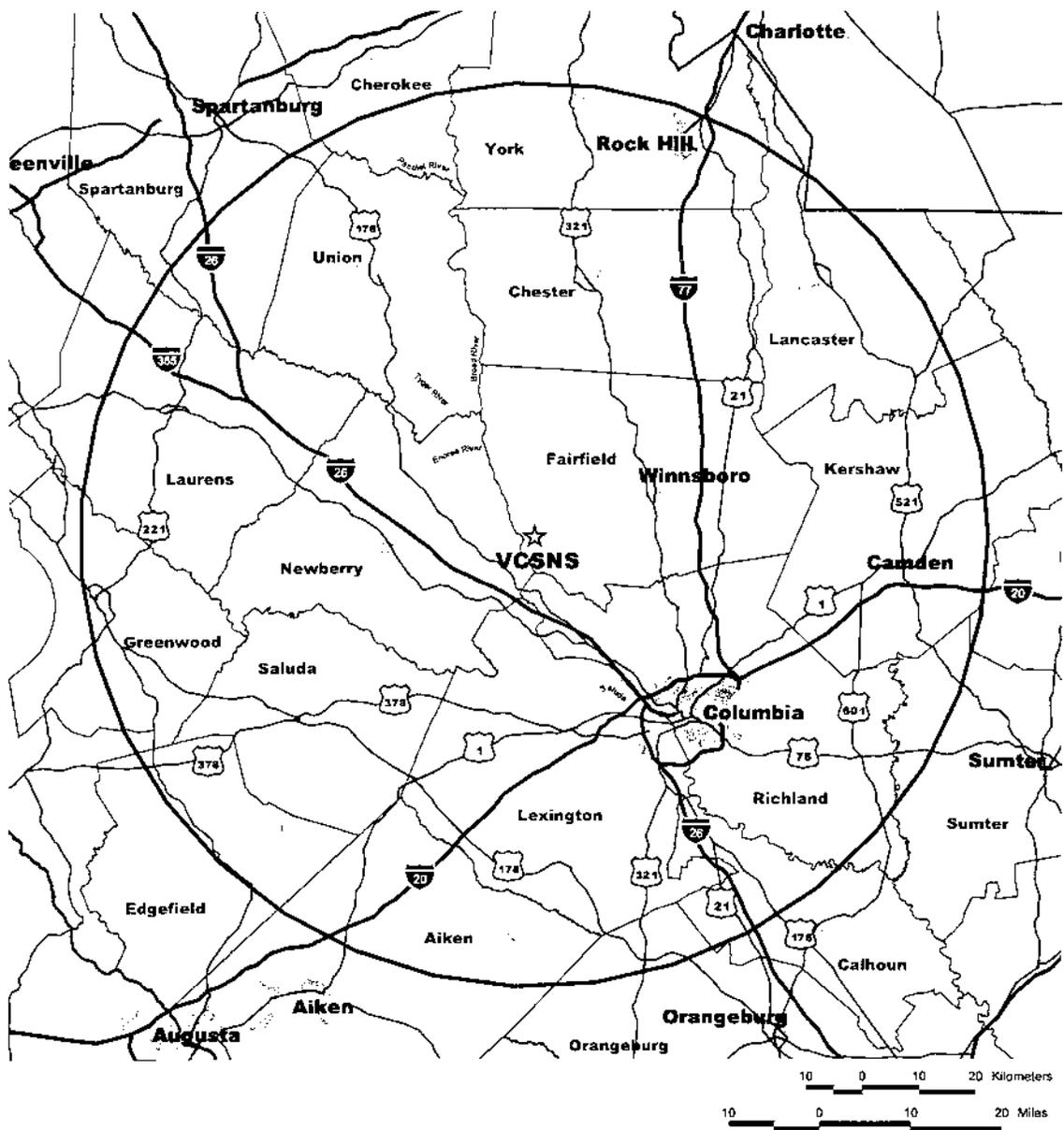
SES/SAB

attachments

c: R. B. Clary (800)
W. R. Higgins (830)
P. R. Moore (Tetra Tech NUS)
File (821.01)
DMS (RC-01-0004)

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION

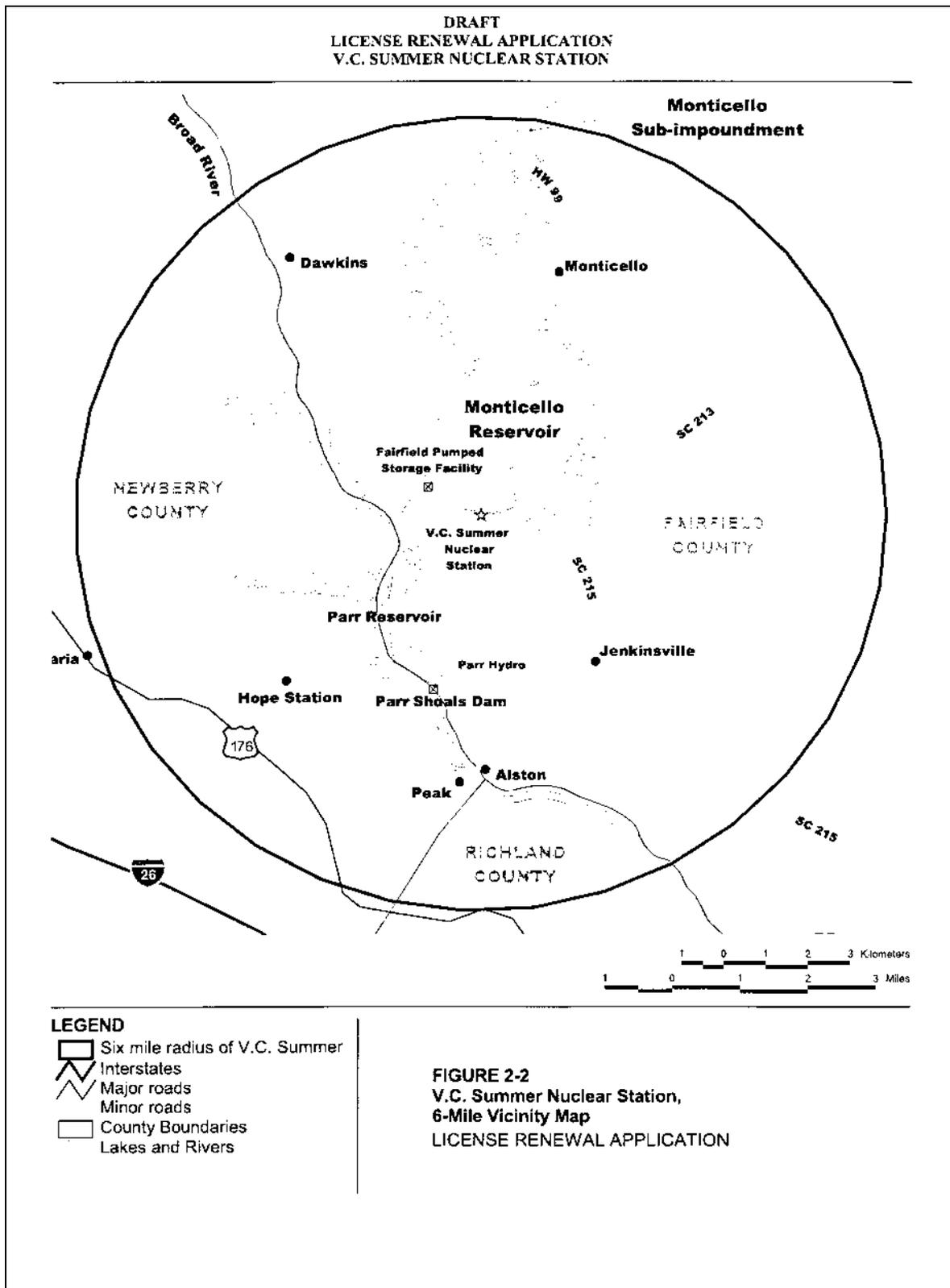


LEGEND

- ★ V.C. Summer Nuclear Station
- 50 mile radius of V.C. Summer
- ▬ Interstates
- ▬ Major roads
- ▬ County Boundaries
- ▬ State Boundary
- ▬ Lakes and Rivers
- ▬ Major Urban Areas

FIGURE 2-1
V.C. Summer Nuclear Station,
50-Mile Locational Vicinity Map
LICENSE RENEWAL APPLICATION

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**



VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT

DRAFT
ENVIRONMENTAL REPORT FOR LICENSE RENEWAL
VIRGIL C. SUMMER NUCLEAR STATION

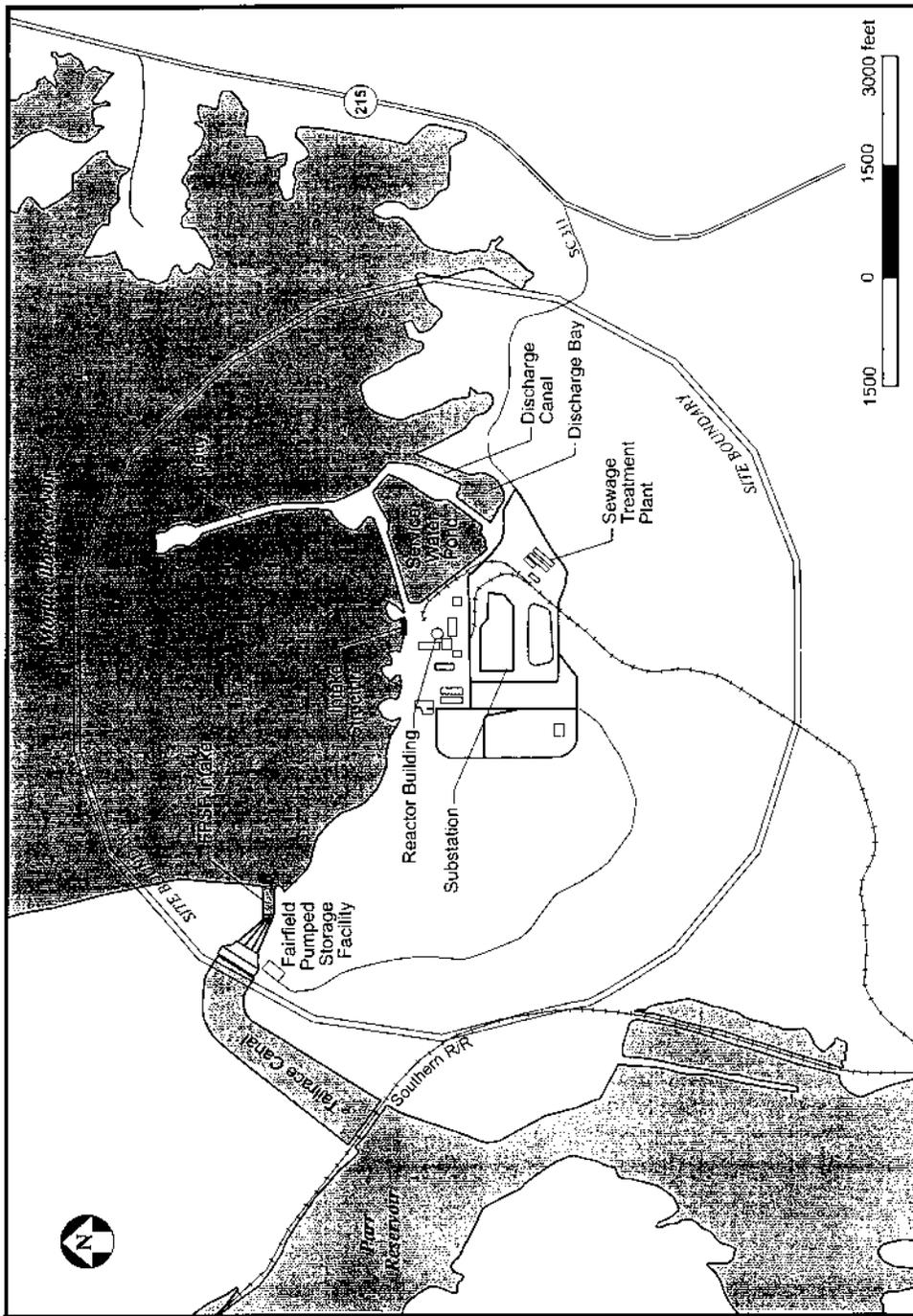
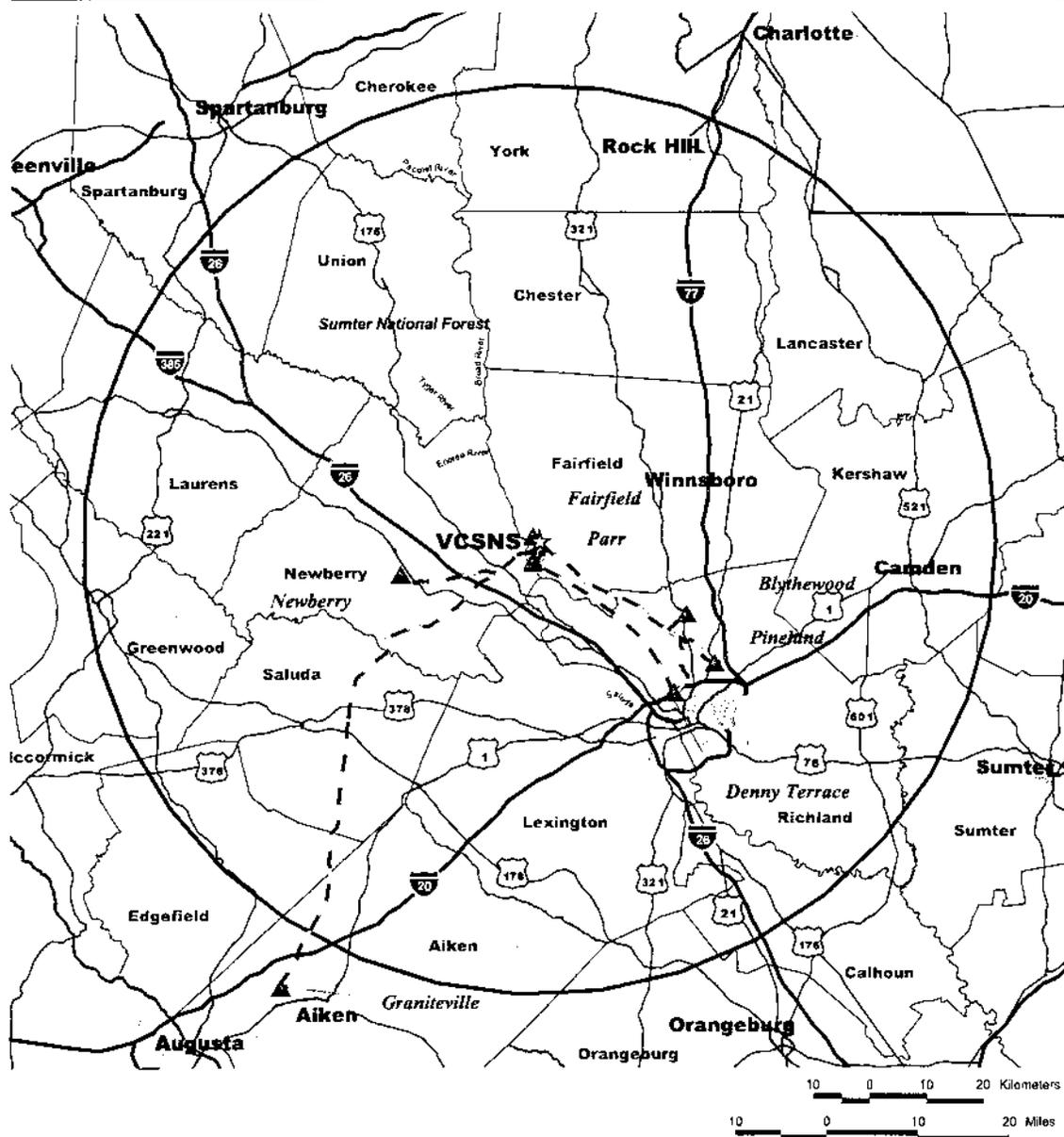


Figure 2-3. South Carolina Electric & Gas Company, Virgil C. Summer Nuclear Station Site Area Map.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

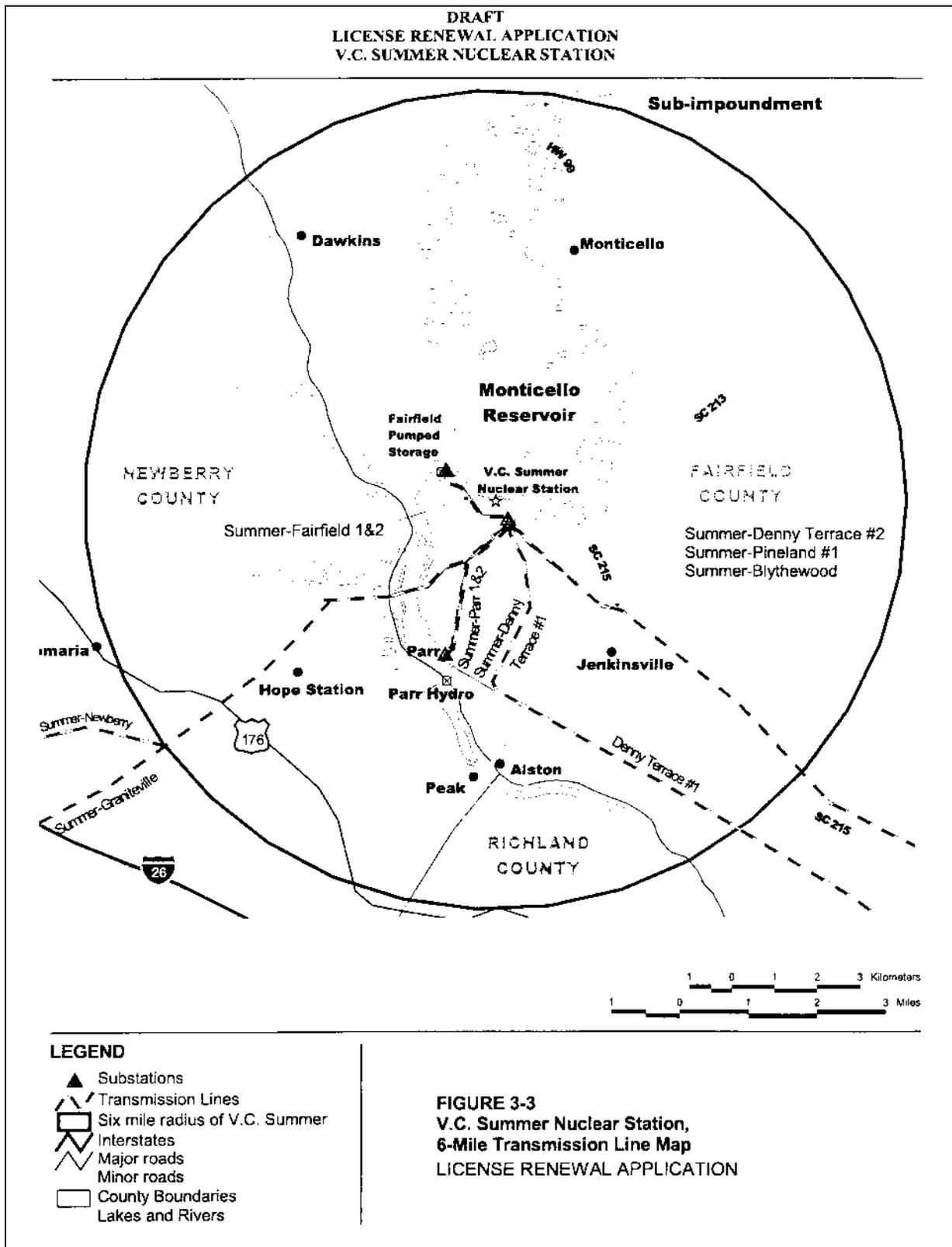
DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION



- LEGEND**
- ☆ V.C. Summer Nuclear Station
 - ▲ Substations
 - Transmission Lines
 - 50 mile radius of V.C. Summer
 - Interstates
 - Major roads
 - County Boundaries
 - State Boundary
 - Lakes and Rivers
 - National Forests

FIGURE 3-2
V.C. Summer Nuclear Station,
50-Mile Transmission Line Map
LICENSE RENEWAL APPLICATION

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**



**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

-----Original Message-----

From: Lori_Duncan@fws.gov [mailto:Lori_Duncan@fws.gov]
Sent: Thursday, March 15, 2001 12:45 PM
To: ssummer@scana.com
Cc: Steve_Gilbert@fws.gov; Jason_Ayers@fws.gov
Subject: Virgil C. Summer Nuclear Station License Renewal

Please find attached a Word Perfect document with the Federally listed and candidate species and species of concern for South Carolina. Please use this list to aid you in analyzing potential impacts your project may have on these species. Thank you.

(See attached file: listetcsc.wpd)

Lori A.W. Duncan
U.S. Fish and Wildlife Service
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407
(843) 727-4707 ext. 21
(843) 727-4218 fax
lori_duncan@fws.gov

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

**South Carolina Distribution Records of
Endangered, Threatened, Candidate and Species of Concern
March 8, 2001**

- E Federally endangered
T Federally threatened
P Proposed in the Federal Register
CH Critical Habitat
C The U.S. Fish and Wildlife Service or the National Marine Fisheries Service has on file sufficient information on biological vulnerability and threat(s) to support proposals to list these species
S/A Federally protected due to similarity of appearance to a listed species
SC Federal Species of concern. These species are rare or limited in distribution but are not currently legally protected under the Endangered Species Act.
* Contact the National Marine Fisheries Service for more information on this species

These lists should be used only as a guideline, not as the final authority. The lists include known occurrences and areas where the species has a high possibility of occurring. Records are updated continually and may be different from the following.

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrence</u>
Abbeville	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Georgia aster	<i>Aster georgianus</i>	C	Known
Aiken	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Wood stork	<i>Mycteria americana</i>	E	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum</i> *	E	Known
	Relict trillium	<i>Trillium reliquum</i>	E	Known
	Piedmont bishop-weed	<i>Ptilimnium nodosum</i>	E	Known
	Smooth coneflower	<i>Echinacea laevigata</i>	E	Known
	Dwarf burhead	<i>Echinodorus parvulus</i>	SC	Known
	Bog spicebush	<i>Lindera subcoriacea</i>	SC	Known
	Carolina bogmint	<i>Macbridea caroliniana</i>	SC	Known
	Gopher frog	<i>Rana capito</i>	SC	Known
	Pickering's morning-glory	<i>Stylisma pickeringii</i> var. <i>pickeringii</i>	SC	Known
	Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	SC	Known
Shoals spider-lily	<i>Hymenocallis coronaria</i>	SC	Known	
Allendale	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Wood stork	<i>Mycteria americana</i>	E	Possible
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum</i> *	E	Known
	Smooth coneflower	<i>Echinacea laevigata</i>	E	Known
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Known
	Awnead meadowbeauty	<i>Rhexia aristosa</i>	SC	Known
	Boykin's lobelia	<i>Lobelia boykinii</i>	SC	Known
	False coco	<i>Pteroglossaspis ecristata</i>	SC	Known
	Yellow lampmussel	<i>Lampsilis cariosa</i>	SC	Known
	Savannah lilliput	<i>Toxolasma pullus</i>	SC	Known

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrences</u>
Anderson	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Smooth coneflower	<i>Echinacea laevigata</i>	E	Known
	Carolina darter	<i>Etheostoma collis</i>	SC	Known
Bamberg	Wood stork	<i>Mycteria americana</i>	E	Possible
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Possible
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Known
	Dwarf burhead	<i>Echinodorus parvulus</i>	SC	Known
	Awned meadowbeauty	<i>Rhexia aristosa</i>	SC	Known
	Boykin's lobelia	<i>Lobelia boykinii</i>	SC	Known
	Chapman's sedge	<i>Carex chapmanii</i>	SC	Known
Barnwell	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Wood stork	<i>Mycteria americana</i>	E	Possible
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Known
	Smooth coneflower	<i>Echinacea laevigata</i>	E	Known
	Pondberry	<i>Lindera melissifolia</i>	E	Possible
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Known
	Piedmont bishop-weed	<i>Ptilimnium nodosum</i>	E	Known
	American chaffseed	<i>Schwalbea americana</i>	E	Possible
	Dwarf burhead	<i>Echinodorus parvulus</i>	SC	Known
	Awned meadowbeauty	<i>Rhexia aristosa</i>	SC	Known
	Bog spicebush	<i>Lindera subcoriacea</i>	SC	Known
	Boykin's lobelia	<i>Lobelia boykinii</i>	SC	Known
	Carolina bogmint	<i>Macbridea caroliniana</i>	SC	Known
	Creeping St. John's wort	<i>Hypericum adpressum</i>	SC	Known
	Gopher frog	<i>Rana capito</i>	SC	Known
	Sandhills milk-vetch	<i>Astragalus michauxii</i>	SC	Known
Yellow lampmussel	<i>Lampsilis cariosa</i>	SC	Known	
Beaufort	West Indian manatee	<i>Trichechus manatus</i>	E	Known
	Finback whale	<i>Balaenoptera physalus*</i>	E	Known
	Humpback whale	<i>Megaptera novaeangliae*</i>	E	Known
	Northern right whale	<i>Eubaleana glacialis*</i>	E	Known
	Sei whale	<i>Balaenoptera borealis*</i>	E	Known
	Sperm whale	<i>Physeter catodon*</i>	E	Known
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Wood stork	<i>Mycteria americana</i>	E	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Piping plover	<i>Charadrius melodus</i>	T/PCH	Known
	Kemp's ridley sea turtle	<i>Lepidochelys kempii*</i>	E	Known
	Leatherback sea turtle	<i>Dermochelys coriacea*</i>	E	Known
	Loggerhead sea turtle	<i>Caretta caretta</i>	T	Known
	Green sea turtle	<i>Chelonia mydas*</i>	T	Known
	Flatwoods salamander	<i>Ambystoma cingulatum</i>	T	Known
Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Known	

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrences</u>
Beaufort (cont.)	Pondberry	<i>Lindera melissifolia</i>	E	Known
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Possible
	Chaff-seed	<i>Schwalbea americana</i>	E	Known
	Dusky shark	<i>Carcharhinus obscurus*</i>	C	Possible
	Sand tiger shark	<i>Odontaspis taurus*</i>	C	Possible
	Night shark	<i>Carcharhinus signatus*</i>	C	Possible
	Speckled hind	<i>Epinephelus drummondhayi*</i>	C	Possible
	Jewfish	<i>E. itajara*</i>	C	Possible
	Warsaw grouper	<i>E. nigrilus*</i>	C	Possible
	Nassau grouper	<i>E. striatus*</i>	C	Possible
	Cupgrass	<i>Eriochloa michauxii</i>	SC	Known
	Pondspice	<i>Litsea aestivalis</i>	SC	Known
	Southeastern myotis	<i>Myotis austroriparius</i>	SC	Known
	Berkeley	West Indian manatee	<i>Trichechus manatus</i>	E
Bald eagle		<i>Haliaeetus leucoccephalus</i>	T	Known
Wood stork		<i>Mycteria americana</i>	E	Known
Red-cockaded woodpecker		<i>Picoides borealis</i>	E	Known
Loggerhead sea turtle		<i>Caretta caretta</i>	T	Known
Flatwoods salamander		<i>Ambystoma cingulatum</i>	T	Known
Shortnose sturgeon		<i>Acipenser brevirostrum*</i>	E	Known
Pondberry		<i>Lindera melissifolia</i>	E	Known
Canby's dropwort		<i>Oxypolis canbyi</i>	E	Known
Chaff-seed		<i>Schwalbea americana</i>	E	Known
Awned meadowbeauty		<i>Rhexis aristosa</i>	SC	Known
Boykin's lobelia		<i>Lobelia boykinii</i>	SC	Known
Chapman's sedge		<i>Carex chapmanii</i>	SC	Known
False coco		<i>Pteroglossaspis ecristata</i>	SC	Known
Gopher frog		<i>Rana capito</i>	SC	Known
Incised groovebur		<i>Agrimonia incisa</i>	SC	Known
Least trillium		<i>Trillium pusillum var. pusillum</i>	SC	Known
Pineland plantain		<i>Plantago sparsiflora</i>	SC	Known
Pondspice		<i>Litsea aestivalis</i>	SC	Known
Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	SC	Known	
Sun-facing coneflower	<i>Rudbeckia heliopsisidis</i>	SC	Known	
County	Common Name	Scientific Name	Status	Occurrences
Calhoun	Bald eagle	<i>Haliaeetus leucoccephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Possible
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Known
	Least trillium	<i>Trillium pusillum var. pusillum</i>	SC	Known

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrences</u>
Charleston				
	West Indian manatee	<i>Trichechus manatus</i>	E	Known
	Finback whale	<i>Balaenoptera physalus</i> *	E	Known
	Humpback whale	<i>Megaptera novaeangliae</i> *	E	Known
	Northern right whale	<i>Eubaleana glacialis</i> *	E	Known
	Sei whale	<i>Balaenoptera borealis</i> *	E	Known
	Sperm whale	<i>Physeter catodon</i> *	E	Known
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Bachman's warbler	<i>Vermivora bachmanii</i>	E	Known
	Wood stork	<i>Mycteria americana</i>	E	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Piping plover	<i>Charadrius melodus</i>	T/CH	Known
	Kemp's ridley sea turtle	<i>Lepidochelys kempii</i> *	E	Known
	Leatherback sea turtle	<i>Dermodochelys coriacea</i> *	E	Known
	Loggerhead sea turtle	<i>Caretta caretta</i>	T	Known
	Green sea turtle	<i>Cheilonia mydas</i> *	T	Known
	Flatwoods salamander	<i>Ambystoma cingulatum</i>	T	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum</i> *	E	Known
	Sea-beach amaranth	<i>Amaranthus pumilus</i>	T	Known
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Possible
	Pondberry	<i>Lindera melissifolia</i>	E	Possible
	Chaff-seed	<i>Schwalbea americana</i>	E	Known
	Dusky shark	<i>Carcharhinus obscurus</i> *	C	Possible
	Sand tiger shark	<i>Odontaspis taurus</i> *	C	Possible
	Night shark	<i>Carcharhinus signatus</i> *	C	Possible
	Speckled hind	<i>Epinephelus drummondhayi</i> *	C	Possible
	Jewfish	<i>E. itajara</i> *	C	Possible
	Warsaw grouper	<i>E. nigrilus</i> *	C	Possible
	Nassau grouper	<i>E. striatus</i> *	C	Possible
	Bachman's sparrow	<i>Aimophila aestivalis</i>	SC	Known
	Boykin's lobelia	<i>Lobelia boykinii</i>	SC	Known
	Gopher frog	<i>Rana capito</i>	SC	Known
	Island glass lizard	<i>Ophisaurus compressus</i>	SC	Known
	Incised groovebur	<i>Agrimonia incisa</i>	SC	Known
	Pondspice	<i>Litsea aestivalis</i>	SC	Known
	Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	SC	Known
	Southeastern myotis	<i>Myotis austroriparius</i>	SC	Known
	Sweet pinesap	<i>Monotropsis odorata</i>	SC	Known
	Venus' fly-trap	<i>Dionaea muscipula</i>	SC	Known
Cherokee				
	Dwarf-flowered heartleaf	<i>Hexastylis naniflora</i>	T	Known
	Georgia aster	<i>Aster georgianus</i>	C	Known
	Southeastern myotis	<i>Myotis austroriparius</i>	SC	Known
Chester				
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Possible
	Georgia aster	<i>Aster georgianus</i>	C	Known
	Shoals spider-lily	<i>Hymenocallis coronaria</i>	SC	Known

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrences</u>
Chesterfield				
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum</i> *	E	Possible
	Carolina heelsplitter	<i>Lasmigona decorata</i>	E	Known
	Carolina dropseed	<i>Sporobolus sp1</i>	SC	Known
	Pine or Gopher snake	<i>Pituophis melanoleucus</i>	SC	Known
	Spring-flowering goldenrod	<i>Solidago verna</i>	SC	Known
	Well's pixie-moss	<i>Pyxidantha brevifolia</i>	SC	Known
	Wire-leaved dropseed	<i>Sporobolus teretifolius</i>	SC	Known
Clarendon				
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum</i> *	E	Known
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Known
	Chaff-seed	<i>Schwalbea americana</i>	E	Known
	Awmed meadowbeauty	<i>Rhexia aristosa</i>	SC	Known
	Boykin's lobelia	<i>Lobelia boykinii</i>	SC	Known
	Creeping St. John's wort	<i>Hypericum adpressum</i>	SC	Known
	Dwarf burhead	<i>Echinodorus parvulus</i>	SC	Known
	False coco	<i>Pteroglossaspis ecristata</i>	SC	Known
Colleton				
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Wood stork	<i>Mycteria americana</i>	E	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Piping plover	<i>Charadrius melodus</i>	T/PCH	Known
	Kemp's ridley sea turtle	<i>Lepidochelys kempii</i> *	E	Known
	Leatherback sea turtle	<i>Dermochelys coriacea</i> *	E	Known
	Loggerhead sea turtle	<i>Caretta caretta</i>	T	Known
	Green sea turtle	<i>Chelonia mydas</i> *	T	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum</i> *	E	Known
	Pondberry	<i>Lindera melissifolia</i>	E	Possible
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Known
	Dusky shark	<i>Carcharhinus obscurus</i> *	C	Possible
	Sand tiger shark	<i>Odontaspis taurus</i> *	C	Possible
	Night shark	<i>Carcharhinus signatus</i> *	C	Possible
	Speckled hind	<i>Epinephelus drummondhayi</i> *	C	Possible
	Jewfish	<i>E. itijara</i> *	C	Possible
	Warsaw grouper	<i>E. nigrilus</i> *	C	Possible
	Nassau grouper	<i>E. striatus</i> *	C	Possible
	Carolina bird-in-a-nest	<i>Macbridea caroliniana</i>	SC	Known
	Crested fringed orchid	<i>Pteroglossaspis ecristata</i>	SC	Known
	Island glass lizard	<i>Ophisaurus compressus</i>	SC	Known
	Pondspice	<i>Litsea aestivalis</i>	SC	Known

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrences</u>
Darlington (cont.)				
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Possible
	Rough-leaved loosestrife	<i>Lysimachia asperulaefolia</i>	E	Known
	Awed meadowbeauty	<i>Rhexia aristosa</i>	SC	Known
	Carolina bogmint	<i>Macbridea caroliniana</i>	SC	Known
	Georgia lead-plant	<i>Amorpha georgiana</i> var. <i>georgiana</i>	SC	Known
	Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	SC	Known
	Sandhills milkvetch	<i>Astragalus michauxii</i>	SC	Known
	Spring-flowering goldenrod	<i>Solidago verna</i>	SC	Known
	Well's pixie-moss	<i>Pyxidantha brevifolia</i>	SC	Known
	White false-asphodel	<i>Tofieldia glabra</i>	SC	Known
Dillon				
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Possible
	Carolina bogmint	<i>Macbridea caroliniana</i>	SC	Known
	False coco	<i>Pteroglossaspis ecristata</i>	SC	Known
	Pine barrens bonneset	<i>Eupatorium resinosum</i>	SC	Known
Dorchester				
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Wood stork	<i>Mycteria americana</i>	E	Possible
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Possible
	Pondberry	<i>Lindera melissifolia</i>	E	Known
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Possible
	Bog asphodel	<i>Nartheccium americanum</i>	C	Known
	False coco	<i>Pteroglossaspis ecristata</i>	SC	Known
	Gopher frog	<i>Rana capito</i>	SC	Known
	Least trillium	<i>Trillium pusillum</i> var. <i>pusillum</i>	SC	Known
	Pineland plantain	<i>Plantago sparsiflora</i>	SC	Known
	Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	SC	Known
	Southeastern myotis	<i>Myotis austroriparius</i>	SC	Known
Edgefield				
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Carolina heelsplitter	<i>Lasmigona decorata</i>	E	Known
	Micosukee gooseberry	<i>Ribes echinellum</i>	T	Possible
	Relict trillium	<i>Trillium reliquum</i>	E	Known
	Georgia aster	<i>Aster georgianus</i>	C	Known
	Brook floater	<i>Alasmidonta varicosa</i>	SC	Known
	Shoals spider-lily	<i>Hymenocallis coronaria</i>	SC	Known
	Yellow lampmussel	<i>Lampsilis cariosa</i>	SC	Known
Fairfield				
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Georgia aster	<i>Aster georgianus</i>	C	Known
	Carolina darter	<i>Etheostoma collis</i>	SC	Known

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrences</u>
Florence	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Known
	Chaffseed	<i>Schwalbea americana</i>	E	Known
	Carolina bogmint	<i>Macbridea caroliniana</i>	SC	Known
	Georgia lead-plant	<i>Amorpha georgiana</i> var. <i>georgiana</i>	SC	Known
	Ovate catchfly	<i>Silene ovata</i>	SC	Known
Georgetown	West Indian manatee	<i>Trichechus manatus</i>	E	Known
	Finback whale	<i>Balaenoptera physalus*</i>	E	Known
	Humpback whale	<i>Megaptera novaeangliae*</i>	E	Known
	Northern right whale	<i>Eubaleana glacialis*</i>	E	Known
	Sei whale	<i>Balaenoptera borealis*</i>	E	Known
	Sperm whale	<i>Physeter catodon*</i>	E	Known
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Wood stork	<i>Mycteria americana</i>	E	Known
	Piping plover	<i>Charadrius melodus</i>	T/PCH	Known
	Kemp's ridley sea turtle	<i>Lepidochelys kempi*</i>	E	Known
	Leatherback sea turtle	<i>Dermochelys coriacea*</i>	E	Known
	Loggerhead sea turtle	<i>Caretta caretta</i>	T	Known
	Green sea turtle	<i>Chelonia mydas*</i>	T	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Known
	Sea-beach amaranth	<i>Amaranthus pumilus</i>	T	Known
	Pondberry	<i>Lindera melissifolia</i>	E	Possible
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Possible
	Chaffseed	<i>Schwalbea americana</i>	E	Possible
	Dusky shark	<i>Carcharhinus obscurus*</i>	C	Possible
	Sand tiger shark	<i>Odontaspis taurus*</i>	C	Possible
	Night shark	<i>Carcharhinus signatus*</i>	C	Possible
	Speckled hind	<i>Epinephelus drummondhayi*</i>	C	Possible
	Jewfish	<i>E. itijara*</i>	C	Possible
	Warsaw grouper	<i>E. nigrilus*</i>	C	Possible
	Nassau grouper	<i>E. striatus*</i>	C	Possible
	Awmed meadowbeauty	<i>Rhexia aristosa</i>	SC	Known
	Bachman's sparrow	<i>Almophia aestivalis</i>	SC	Known
	Carolina pygmy sunfish	<i>Elassoma boehlkei</i>	SC	Known
	Carolina grass-of-parnassus	<i>Parnassia caroliniana</i>	SC	Known
	Dune bluecurls	<i>Trichostema</i> sp 1	SC	Known
	One-flower balduina	<i>Balduina uniflora</i>	SC	Known
Pineland plantain	<i>Plantago sparsiflora</i>	SC	Known	
Pondspice	<i>Litsea aestivalis</i>	SC	Known	
Reclined meadow-rue	<i>Thalictrum subrotundum</i>	SC	Known	
Wire-leaved dropseed	<i>Sporobolus teretifolius</i>	SC	Known	
Venus' fly-trap	<i>Dionaea muscipula</i>	SC	Known	

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrences</u>
Greenville				
	Bog turtle	<i>Clemmys muhlenbergii</i>	T S/A	Known
	Swamp-pink	<i>Heloniopsis bullata</i>	T	Known
	Dwarf-flowered heartleaf	<i>Hexastylis naniflora</i>	T	Known
	Small whorled pogonia	<i>Isotria medeoloides</i>	T	Known
	Bunched arrowhead	<i>Sagittaria fasciculata</i>	E	Known
	Mountain sweet pitcher-plant	<i>Sarracenia rubra ssp. jonesii</i>	E	Known
	White irisette	<i>Sisyrinchium dichotomum</i>	E	Known
	Rock gnome lichen	<i>Gymnoderma lineare</i>	E	Known
	White fringeless orchid	<i>Platanthera integrilabia</i>	C	Known
	Green salamander	<i>Aneides aeneus</i>	SC	Known
	Oconee-bells	<i>Shortia galacifolia</i>	SC	Known
	Piedmont ragwort	<i>Senecio millefolium</i>	SC	Known
	Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	SC	Known
	Southeastern myotis	<i>Myotis austroriparius</i>	SC	Known
	Southern Appalachian woodrat	<i>Neotoma floridana haematoresia</i>	SC	Known
	Sweet pinesap	<i>Monotropsis odorata</i>	SC	Known
Greenwood				
	Carolina heelsplitter	<i>Lasmigona decorata</i>	E	Known
Hampton				
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Wood stork	<i>Mycteria americana</i>	E	Known
	Eastern indigo snake	<i>Drymarchon corais couperi</i>	T	Possible
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Known
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Known
	Boykin's lobelia	<i>Lobelia boykinii</i>	SC	Known
	Carolina bogmint	<i>Macbridea caroliniana</i>	SC	Known
	Chapman's sedge	<i>Carex chapmanii</i>	SC	Known
	False coco	<i>Pteroglossaspis ecristata</i>	SC	Known
	Gopher frog	<i>Rana capito</i>	SC	Known
	Pine or Gopher snake	<i>Pituophis melanoleucus</i>	SC	Known
	Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	SC	Known
Horry				
	West Indian manatee	<i>Trichechus manatus</i>	E	Known
	Finback whale	<i>Balaenoptera physalus*</i>	E	Known
	Humpback whale	<i>Megaptera novaeangliae*</i>	E	Known
	Northern right whale	<i>Eubaleana glacialis*</i>	E	Known
	Sei whale	<i>Balaenoptera borealis*</i>	E	Known
	Sperm whale	<i>Physeter catodon*</i>	E	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Wood stork	<i>Mycteria americana</i>	E	Known
	Piping plover	<i>Charadrius melodus</i>	T/PCH	Known

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrences</u>	
Horry (cont.)	Kemp's ridley sea turtle	<i>Lepidochelys kempi</i> *	E	Known	
	Leatherback sea turtle	<i>Dermodochelys coriacea</i> *	E	Known	
	Loggerhead sea turtle	<i>Caretta caretta</i>	T	Known	
	Green sea turtle	<i>Chelonia mydas</i> *	T	Possible	
	Shortnose sturgeon	<i>Acipenser brevirostrum</i> *	E	Known	
	Sea-beach amaranth	<i>Amaranthus pumilus</i>	T	Known	
	Pondberry	<i>Lindera melissifolia</i>	E	Possible	
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Possible	
	Chaff-seed	<i>Schwalbea americana</i>	E	Known	
	Dusky shark	<i>Carcharhinus obscurus</i> *	C	Possible	
	Sand tiger shark	<i>Odontaspis taurus</i> *	C	Possible	
	Night shark	<i>Carcharhinus signatus</i> *	C	Possible	
	Speckled hind	<i>Epinephelus drummondhayi</i> *	C	Possible	
	Jewfish	<i>E. itajara</i> *	C	Possible	
	Warsaw grouper	<i>E. nigritus</i> *	C	Possible	
	Nassau grouper	<i>E. striatus</i> *	C	Possible	
	Dwarf burhead	<i>Echinodorus parvulus</i>	SC	Known	
	Carolina grass-of-parnassus	<i>Parnassia caroliniana</i>	SC	Known	
	Crested fringed orchid	<i>Pteroglossaspis ecristata</i>	SC	Known	
	Dwarf burhead	<i>Echinodorus parvulus</i>	SC	Known	
	Harper's fimbriatilis	<i>Fimbristylis perpusilla</i>	SC	Known	
	One-flower baldwinia	<i>Baldwinia uniflora</i>	SC	Known	
	Pickering's morning-glory	<i>Stylisma pickeringii</i> var. <i>pickeringii</i>	SC	Known	
	Piedmont cowbane	<i>Oxypolis ternata</i>	SC	Known	
	Pine or Gopher snake	<i>Pituophis melanoleucus</i>	SC	Known	
	Pineland plantain	<i>Plantago sparsiflora</i>	SC	Known	
	Pondspice	<i>Litsea aestivalis</i>	SC	Known	
	Venus' fly-trap	<i>Dionaea muscipula</i>	SC	Known	
	Well's Pyxie Moss	<i>Pyxidantha barbulate</i> var. <i>barbulate</i>	var. SC	Known	
	White false-asphodel	<i>Tofieldia glabra</i>	SC	Known	
	Wire-leaved dropseed	<i>Sporobolus teretifolius</i>	SC	Known	
	Jasper	West Indian manatee	<i>Trichechus manatus</i>	E	Known
		Finback whale	<i>Balaenoptera physalus</i>	E	Known
Humpback whale		<i>Megaptera novaeangliae</i>	E	Known	
Right whale		<i>Eubalaena glacialis</i>	E	Known	
Sei whale		<i>Balaenoptera borealis</i>	E	Known	
Sperm whale		<i>Physeter catodon</i>	E	Known	
Bald eagle		<i>Haliaeetus leucocephalus</i>	T	Known	
Red-cockaded woodpecker		<i>Picoides borealis</i>	E	Known	
Wood stork		<i>Mycteria americana</i>	E	Known	
Piping plover		<i>Charadrius melodus</i>	T	Possible	
Eastern indigo snake		<i>Drymarchon corais couperi</i>	T	Possible	
Kemp's ridley sea turtle		<i>Lepidochelys kempi</i> *	E	Known	
Leatherback sea turtle		<i>Dermodochelys coriacea</i> *	E	Known	
Loggerhead sea turtle		<i>Caretta caretta</i>	T	Known	
Green sea turtle		<i>Chelonia mydas</i> *	T	Possible	

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrences</u>	
Jasper (cont.)	Flatwoods salamander	<i>Ambystoma cingulatum</i>	T	Known	
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Known	
	Pondberry	<i>Lindera melissifolia</i>	E	Possible	
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Possible	
	Chaff-seed	<i>Schwalbea americana</i>	E	Known	
	Dusky shark	<i>Carcharhinus obscurus*</i>	C	Possible	
	Sand tiger shark	<i>Odontaspis taurus*</i>	C	Possible	
	Night shark	<i>Carcharhinus signatus*</i>	C	Possible	
	Speckled hind	<i>Epinephelus drummondhayi*</i>	C	Possible	
	Jewfish	<i>E. itijara*</i>	C	Possible	
	Warsaw grouper	<i>E. nigritus*</i>	C	Possible	
	Nassau grouper	<i>E. striatus*</i>	C	Possible	
	Bachman's sparrow	<i>Aimophila aestivalis</i>	SC	Known	
	Creeping St. Johns-wort	<i>Hypericum adpressum</i>	SC	Known	
	Crested fringed orchid	<i>Pteroglossaspis ecristata</i>	SC	Known	
	Florida pine snake	<i>Pituophis melanoleucus</i>	SC	Known	
	Mimic glass lizard	<i>Ophisaurus mimicus</i>	SC	Known	
	Pine or Gopher snake	<i>Pituophis melanoleucus</i>	SC	Known	
	Pineland plantain	<i>Plantago sparsiflora</i>	SC	Known	
	Pondspice	<i>Litsea aestivalis</i>	SC	Known	
	Yellow lampmussel	<i>Lampsilis cariosa</i>	SC	Known	
	Kershaw	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
		Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
Carolina heelsplitter		<i>Lasmigona decorata</i>	E	Known	
Michaux's sumac		<i>Rhus michauxii</i>	E	Known	
Georgia aster		<i>Aster georgianus</i>	C	Known	
Carolina pygmy sunfish		<i>Elassoma boehlkei</i>	SC	Known	
One-flower stitchwort		<i>inuartia uniflora</i>	SC	Known	
Pondspice		<i>Litsea aestivalis</i>	SC	Known	
Southeastern myotis		<i>Myotis austroriparius</i>	SC	Known	
White-false-asphodel		<i>Tofieldia glabra</i>	SC	Known	
White-wicky		<i>Kalmia cuneata</i>	SC	Known	
Wire-leaved dropseed		<i>Sporobolus teretifolius</i>	SC	Known	
Lancaster		Carolina heelsplitter	<i>Lasmigona decorata</i>	E	Known
	Little amphianthus	<i>Amphianthus pusillus</i>	T	Known	
	Smooth coneflower	<i>Echinacea laevigata</i>	E	Known	
	Schweinitz's sunflower	<i>Helianthus schweinitzii</i>	E	Known	
	Black-spored quillwort	<i>Isoetes melanospora</i>	E	Known	
	Brook floater	<i>Alasmidonta varicosa</i>	SC	Known	
	Shoals spider-lily	<i>Hymenocallis coronaria</i>	SC	Known	
Laurens	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known	
	Georgia aster	<i>Aster georganus</i>	C	Known	

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrences</u>
Lee	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Known
	Chaffseed	<i>Schwalbea americana</i>	E	Known
	Awned meadowbeauty	<i>Rhexia aristosa</i>	SC	Known
Lexington	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Possible
	Smooth coneflower	<i>Echinacea laevigata</i>	E	Possible
	Schweinitz's sunflower	<i>Helianthus schweinitzii</i>	E	Known
	Pickering's morning-glory	<i>Stylisma pickeringii</i> var. <i>pickeringii</i>	SC	Known
	Piedmont cowbane	<i>Oxypolis ternata</i>	SC	Known
	Rayner's blueberry	<i>Vaccinium crassifolium</i> ssp. <i>sempervirens</i>	SC	Known
Shoal's spider-lily	<i>Hymenocallis coronaria</i>	SC	Known	
Marion	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Wood stork	<i>Myctena americana</i>	E	Possible
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Known
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Known
	Yellow lampmussel	<i>Lampsilis cariosa</i>	SC	Known
Marlboro	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Possible
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Possible
	Awned meadowbeauty	<i>Rhexia aristosa</i>	SC	Known
	Pickering's morning-glory	<i>Stylisma pickeringii</i> var. <i>pickeringii</i>	SC	Known
	Spring-flowering goldenrod	<i>Solidago verna</i>	SC	Known
	Yellow lampmussel	<i>Lampsilis cariosa</i>	SC	Known
McCormick	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Carolina heelsplitter	<i>Lasmigona decorata</i>	E	Known
	Miccosukee gooseberry	<i>Ribes echinellum</i>	T	Known
	Georgia aster	<i>Aster georgianus</i>	C	Known
	Brook floater	<i>Alasmidonta varicosa</i>	SC	Known
	Shoals spider-lily	<i>Hymenocallis coronaria</i>	SC	Known
	Yellow lampmussel	<i>Lampsilis cariosa</i>	SC	Known

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrences</u>
Newberry	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Saluda crayfish	<i>Distocambarus youngineri</i>	SC	Known
	Sweet pinesap	<i>Monotropsis odorata</i>	SC	Known
Oconee	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Smooth coneflower	<i>Echinacea laevigata</i>	E	Known
	Small whorled pogonia	<i>Isotria medeoloides</i>	T	Known
	Persistent trillium	<i>Trillium persistens</i>	E	Known
	Georgia aster	<i>Aster georgianus</i>	C	Known
	Brook floater	<i>Alasmidonta varicosa</i>	SC	Known
	Fort mountain sedge	<i>Carex amplisquama</i>	SC	Known
	Fraser loosestrife	<i>Lysimachia fraseri</i>	SC	Known
	Green salamander	<i>Aneides aeneus</i>	SC	Known
	Heilbender	<i>Cryptobranchus alleganiensis</i>	SC	Known
	Manhart's sedge	<i>Carex manhartii</i>	SC	Known
	Oconee-bells	<i>Shortia galacifolia</i>	SC	Known
	Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	SC	Known
	Southern appalachian woodrat	<i>Neotoma floridana</i>	SC	Known
		<i>haematorea</i>		
Sun-facing coneflower	<i>Rudbeckia heliopsidis</i>	SC	Known	
Sweet pinesap	<i>Monotropsis odorata</i>	SC	Known	
Orangeburg	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Flatwoods salamander	<i>Ambystoma cingulatum</i>	T	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Known
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Known
	Awnead meadowbeauty	<i>Rhexia aristosa</i>	SC	Known
	Boykin's lobelia	<i>Lobelia boykinii</i>	SC	Known
	Florida pine snake	<i>Pituophis melanoleucus</i>	SC	Known
		<i>mugitus</i>		
	Gopher frog	<i>Rana capito</i>	SC	Known
	Incised groovebur	<i>Agrimonia incisa</i>	SC	Known
	Pondspice	<i>Litsea aestivalis</i>	SC	Known
	Southeastern myotis	<i>Myotis austroriparius</i>	SC	Known
Pickens	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Possible
	Bog turtle	<i>Clemmys muhlenbergii</i>	T S/A	Known
	Smooth coneflower	<i>Echinacea laevigata</i>	E	Known
	Dwarf-flowered heartleaf	<i>Hexastylis naniflora</i>	T	Possible
	Black-spored quillwort	<i>Isoetes melanospora</i>	E	Known
	Mountain sweet pitcher-plant	<i>Sarracenia rubra ssp. jonesii</i>	E	Known
	Georgia aster	<i>Aster georgianus</i>	C	Known
	Alexander's rock aster	<i>Aster avitus</i>	SC	Known
	Fort Mountain sedge	<i>Carex amplisquana</i>	SC	Known
	Green salamander	<i>Aneides aeneus</i>	SC	Known
	Oconee-bells	<i>Shortia galacifolia</i>	SC	Known

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrences</u>
Pickens (cont.)	Biltmore greenbrier	<i>Smilax biltmoreana</i>	SC	
	Manhart sedge	<i>Carex manhartii</i>	SC	Known
	Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	SC	Known
	Southern appalachian woodrat	<i>Neotoma floridana haematoresia</i>	SC	Known
	Sweet pinesap	<i>Monotropsis odorata</i>	SC	Known
Richland	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Known
	Smooth coneflower	<i>Echinacea laevigata</i>	E	Known
	Rough-leaved loosestrife	<i>Lysimachia asperulaefolia</i>	E	Known
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Known
	Georgia aster	<i>Aster georgianus</i>	C	Known
	Awnead meadowbeauty	<i>Rhexia aristosa</i>	SC	Known
	Bog spicebush	<i>Lindera subcoriacea</i>	SC	Known
	Carolina bogmint	<i>Macbridea caroliniana</i>	SC	Known
	Carolina darter	<i>Etheostoma collis</i>	SC	Known
	Creeping St. John's wort	<i>Hypericum adpressum</i>	SC	Known
	False coco	<i>Pteroglossaspis cristata</i>	SC	Known
	Purple balduina	<i>Balduina atropurpurea</i>	SC	Known
	Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	SC	Known
	Rayner's blueberry	<i>Vaccinium crassifolium</i> <i>empervirens</i>	ssp. SC	Known
	Sandhills milk-vetch	<i>Astragalus michauxii</i>	SC	Known
	Shoals spider-lily	<i>Hymenocallis coronaria</i>	SC	Known
	Southern hognose snake	<i>Heterodon simus</i>	SC	Known
	White false-asphodel	<i>Tofieldia glabra</i>	SC	Known
Saluda	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Little amphianthus	<i>Amphianthus pusillus</i>	T	Known
	Piedmont bishop-weed	<i>Ptilimnium nodosum</i>	E	Known
	Creeping St. John's wort	<i>Hypericum adpressum</i>	SC	Known
	Dwarf burhead	<i>Echinodorus parvulus</i>	SC	Known
	Savannah lilliput	<i>Toxolasma pullus</i>	SC	Known
Spartanburg	Dwarf-flowered heartleaf	<i>Hexastylis naniflora</i>	T	Known
	Sweet pinesap	<i>Monotropsis odorata</i>	SC	Known
Sumter	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Known
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Known
	Chaff-seed	<i>Schwalbea americana</i>	E	Known
	Dwarf burhead	<i>Echinodorus parvulus</i>	SC	Known
	Awnead meadowbeauty	<i>Rhexia aristosa</i>	SC	Known
	Boykin's lobelia	<i>Lobelia boykinii</i>	SC	Known

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

<u>County</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Occurrences</u>
Union				
	Georgia aster	<i>Aster georgianus</i>	C	Known
	Shoals spider-lily	<i>Hymenocallis coronaria</i>	SC	Known
	Sweet pinesap	<i>Monotropsis odorata</i>	SC	Known
Williamsburg				
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Wood stork	<i>Mycteria americana</i>	E	Possible
	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	Known
	Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E	Known
	Canby's dropwort	<i>Oxypolis canbyi</i>	E	Known
	Chaff-seed	<i>Schwalbea americana</i>	E	Known
York				
	Bald eagle	<i>Haliaeetus leucocephalus</i>	T	Known
	Little amphianthus	<i>Amphianthus pusillus</i>	T	Known
	Schweinitz' sunflower	<i>Helianthus schweinitzii</i>	E	Known
	Dwarf-flowered heartleaf	<i>Hexastylis naniflora</i>	T	Possible
	Georgia aster	<i>Aster georgianus</i>	C	Known
	Carolina darter	<i>Etheostoma collis</i>	SC	Known
	Shoals spider-lily	<i>Hymenocallis coronaria</i>	SC	Known
	Sun-facing coneflower	<i>Rudbeckia heliopsisidis</i>	SC	Known

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

APPENDIX D

MICROBIOLOGICAL ORGANISMS CORRESPONDENCE

<u>Letter</u>	<u>Page</u>
Byrne, SCE&G, to Brown, SCDHEC	D-2
Brown, SCDHEC, to Byrne, SCE&G	D-4

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**



January 19, 2001
RC-01-0005

Dr. John F. Brown
State Toxicologist
S.C. Dept. of Health and Environmental Control
Division of Health Hazard Evaluation
2600 Bull Street
Columbia, SC 29212

Dear Dr. Brown:

Stephen A. Byrne
Vice President
Nuclear Operations
803.345.4622

Subject: VIRGIL C. SUMMER NUCLEAR STATION LICENSE RENEWAL
REQUEST FOR INFORMATION ON
THERMOPHILIC MICROORGANISMS

South Carolina Electric and Gas Company (SCE&G) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for Virgil C. Summer Nuclear Station. This application would provide for an additional 20 years of operation beyond the current license term, which ends in the year 2022.

As part of the license renewal process, the NRC requires license applicants to provide "...an assessment of the impact of the proposed action (license renewal) on public health from thermophilic organisms in the affected water" (10 CFR 51.53). The NRC regulations state that "these organisms are not expected to be a problem at most operating plants" but state further that "without site-specific data, it is not possible to predict the effects generically."

South Carolina Electric & Gas Co
Virgil C. Summer Nuclear Station
P. O. Box 88
Jenkinsville, South Carolina
29065

803.345.4344
803.345.5209
www.scana.com

SCE&G has operated Virgil C. Summer Nuclear Station (Summer Station) since 1982. The plant lies on the south shore of Monticello Reservoir, in Fairfield County, approximately 26 miles northwest of Columbia. Summer Station's cooling system is a once-through system (no recirculation of cooling water) that withdraws from and discharges to a cooling reservoir (Monticello Reservoir). Discharge limits and monitoring requirements for Summer Station are set forth in NPDES Permit No. SC0030856, issued by the South Carolina Department of Health and Environmental Control (SCDHEC) in September 1997, and subsequent permit modifications dated April 1, 1998 and April 1, 2000.

SCE&G requests any information that SCDHEC may have compiled on the occurrence of thermophilic microorganisms in Monticello Reservoir in the vicinity of Summer Station, including results of any monitoring or special studies that might have been conducted by SCDHEC or its subcontractors. We are particularly interested in determining if there is a concern about the possible presence of *Naegleria fowleri* in the Reservoir. We would appreciate your sending us a letter by March 1, 2001 detailing any concerns you may have about thermophilic

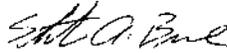
NUCLEAR EXCELLENCE - A SUMMER TRADITION!

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Dr. John Brown, SCDHEC
Page 2 of 2

microorganisms and potential public health effects over the license renewal term in order that we might meet our application preparation schedule. Please call Mr. Stephen E. Summer at (803) 345-4252 if you have any questions or require any additional information to review the proposed action.

Very truly yours,



Stephen A. Byrne

SES/SAB

c: R. B. Clary (800)
W. R. Higgins (830)
P. R. Moore (Tetra Tech NUS)
File (821.01)
DMS (RC-01-0005)

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**



Mills/Jarrett Complex
Box 101106
Columbia, SC 29211-0106

COMMISSIONER:
Douglas E. Bryant

BOARD:
Bradford W. Wyche
Chairman

William M. Hull, Jr., MD
Vice Chairman

Mark B. Kent
Secretary

Howard L. Brilliant, MD

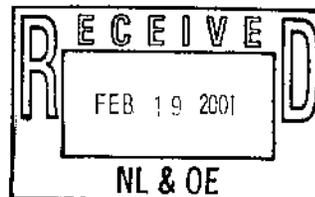
Brian K. Smith

Rudney L. Grandy

Larry R. Chewning, Jr., DMD

Mr. Stephen A. Byrne
Vice President
Nuclear Operations
SCE&G
Virgil C. Summer Nuclear Station
PO Box 88 (M.C. 830)
Jenkinsville, SC 29065-0088

February 13, 2001



Dear Mr. Byrne:

**SUBJECT: RESPONSE RE VIRGIL C. SUMMER NUCLEAR
STATION LICENSE RENEWAL REQUEST FOR INFORMATION ON
THERMOPHILIC MICROORGANISMS**

Thank you for your attached letter of January 19, 2001 requesting results of any monitoring or special studies that might have been conducted on thermophilic microorganisms in the Monticello Reservoir in Fairfield County, South Carolina. Also, you request any concerns that DHEC may have regarding thermophilic microorganisms and potential public health effects.

In regard to the first request, I am not aware of any monitoring or special studies performed by DHEC on stated reservoir. I would refer you to Mr. Jeffrey P. DeBessonnet, PE, Director of Water Facilities Permitting, Division of Industrial, Agricultural, & Stormwater, Bureau of Water, DHEC/EQC, 2600 Bull Street, Columbia, S.C. 29201 whose telephone number is (803) 898-4157. He should be aware of any studies that may have been done on stated reservoir.

While some microorganisms associated with thermal water discharges, especially related to air conditioning cooling towers, have been demonstrated to have deleterious human health effects, these events have occurred rarely and none have been identified with heated water sources associated with nuclear power plants, to my knowledge.

Pathogenic species of Legionella bacteria and Naegleria amoeba have been identified in heated cooling waters associated with nuclear plants. In most cases, the heated waters showed a very small increase

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

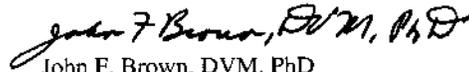
Mr. Stephen A. Byrne
Page 2
February 9, 2001

(approximately 10-fold) over unheated source waters, but were substantially higher in source waters in a few cases.

The most likely exposure to Legionella aerosol would be to workers within the plant. This would not impact the general public beyond the plant boundaries. A similar exposure possibility exists for Naegleria amoeba, with slightly greater exposure potential for swimmers.

The potential public health hazard from pathogenic microorganisms whose abundance might be promoted by artificial warming of recreational waters is largely theoretical and not substantiated by available data. There is some justification for providing appropriate respiratory and dermal protection for workers regularly exposed to known contaminated water, but there seems no significant health threat to off-site persons near such heated recreational waters. Routine monitoring for pathogenic microorganisms could be established if suspicious illnesses arose or if there were significant community concerns. Please contact me at (803) 896-9723 if you desire additional discussion of this matter.

Sincerely,



John F. Brown, DVM, PhD
State Toxicologist

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

APPENDIX E

CULTURAL RESOURCES CORRESPONDENCE

<u>Letter</u>	<u>Page</u>
Byrne, SCE&G, to Morton, S.C. Archives and History	E-2
Brock, S.C. Archives and History, to Byrne, SCE&G	E-9

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

January 19, 2001
RC-01-0006



Ms. Elizabeth Morton
State Historic Preservation Office Representative
Central Midlands Region
South Carolina Department of Archives and History
The South Carolina Archives & History Center
8301 Parklane Road
Columbia, SC 29223

Dear Ms. Morton:

Stephen A. Byrne
Vice President
Nuclear Operations
803.345.4622

Subject: VIRGIL C. SUMMER NUCLEAR STATION LICENSE RENEWAL
REQUEST FOR INFORMATION ON
HISTORIC / ARCHAEOLOGICAL RESOURCES

South Carolina Electric & Gas Co.
Virgil C. Summer Nuclear Station
P. O. Box 86
Jenkinsville, South Carolina
29065

South Carolina Electric and Gas Company (SCE&G) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for Virgil C. Summer Nuclear Station, which expires in August 2002. SCE&G intends to submit this application for license renewal in August 2002. As part of the license renewal process, the NRC requires license applicants to "assess whether any historic or archaeological properties will be affected by the proposed project." The NRC may also request an informal consultation with your office at a later date under Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470) and Federal Advisory Council on Historic Preservation regulations (36 CFR 800). By contacting you early in the application process, we hope to identify any issues that need to be addressed or any information your office may need to expedite the NRC consultation.

803.345.5209
803.345.3461

SCE&G has operated Virgil C. Summer Nuclear Station (Summer Station) and associated transmission lines since 1982. Summer Station is in Fairfield County, South Carolina, approximately 15 miles southwest of the town of Winnsboro and approximately 26 miles northwest of Columbia (latitude 34.295833; longitude 81.320278) (see Figure 2-1). The plant lies on the south shore of Monticello Reservoir (see Figure 2-2), which serves as its cooling water source and heat sink. The Summer Station property (Figure 2-3) is defined as the area within approximately one mile of the reactor building and includes the southern portion of Monticello Reservoir. It totals approximately 2,200 acres.

SCE&G, which owns two-thirds of the plant, built eight transmission lines for the specific purpose of connecting Summer Station to the regional transmission system (see Figure 3-3). South Carolina Public Service Authority (commonly referred to as "Santee Cooper"), owner of the remaining one-third of the plant, built two additional lines to connect to the regional grid. Beginning at Summer Station, the SCE&G lines

NUCLEAR EXCELLENCE - A SUMMER TRADITION!

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

Ms. Elizabeth Morton, SHPO
Page 2 of 2

generally run in a southerly direction, with five terminations very near Summer Station; one near Aiken, South Carolina; and two near Columbia (see Figure 3-2). The Santee Cooper lines run roughly east and west to substations near Blythewood and Newberry, South Carolina, respectively.

Using the National Register Information System (NRIS) on-line database, we have compiled a list of sites on the National Register of Historic Places within a 6-mile radius of the Summer Station property. In addition, a contractor spent several days at the S.C. Institute of Archaeology and Anthropology discussing the project with Institute staff and reviewing files on archeological sites in the project area. One site, designated FA 47 by the Institute of Archeology and Anthropology, lies between the access road (SC 311) to Summer Station and Monticello Reservoir. Based on the appearance of the area (mowed grass, for the most part), it is presumed to have been disturbed during construction of the station in the 1970s. We will provide all of this information to the NRC to aid in their evaluation of the license application.

SCE&G does not expect the operation of Summer Station through the license renewal term (an additional 20 years) to adversely affect cultural or historical resources in the area and region. SCE&G has no plans to alter current operations over the license renewal period. No major expansion of existing facilities is planned, and no major structural modifications have been identified for the purposes of supporting license renewal. No additional land disturbance is anticipated in support of license renewal.

We would appreciate your sending us a letter by March 1, 2001 detailing any concerns you may have about historic/archaeological properties in the area or confirming SCE&G's conclusion that operation of Summer Station over the license renewal term would have no effect on any historic or archaeological properties in South Carolina. This will enable us to meet our application preparation schedule. SCE&G will include a copy of this letter and your response in the license renewal application that we submit to the NRC. Please call Mr. Stephen E. Summer at (803) 345-4252 if you have any questions or require any additional information to review the proposed action.

Very truly yours,



Stephen A. Byrne

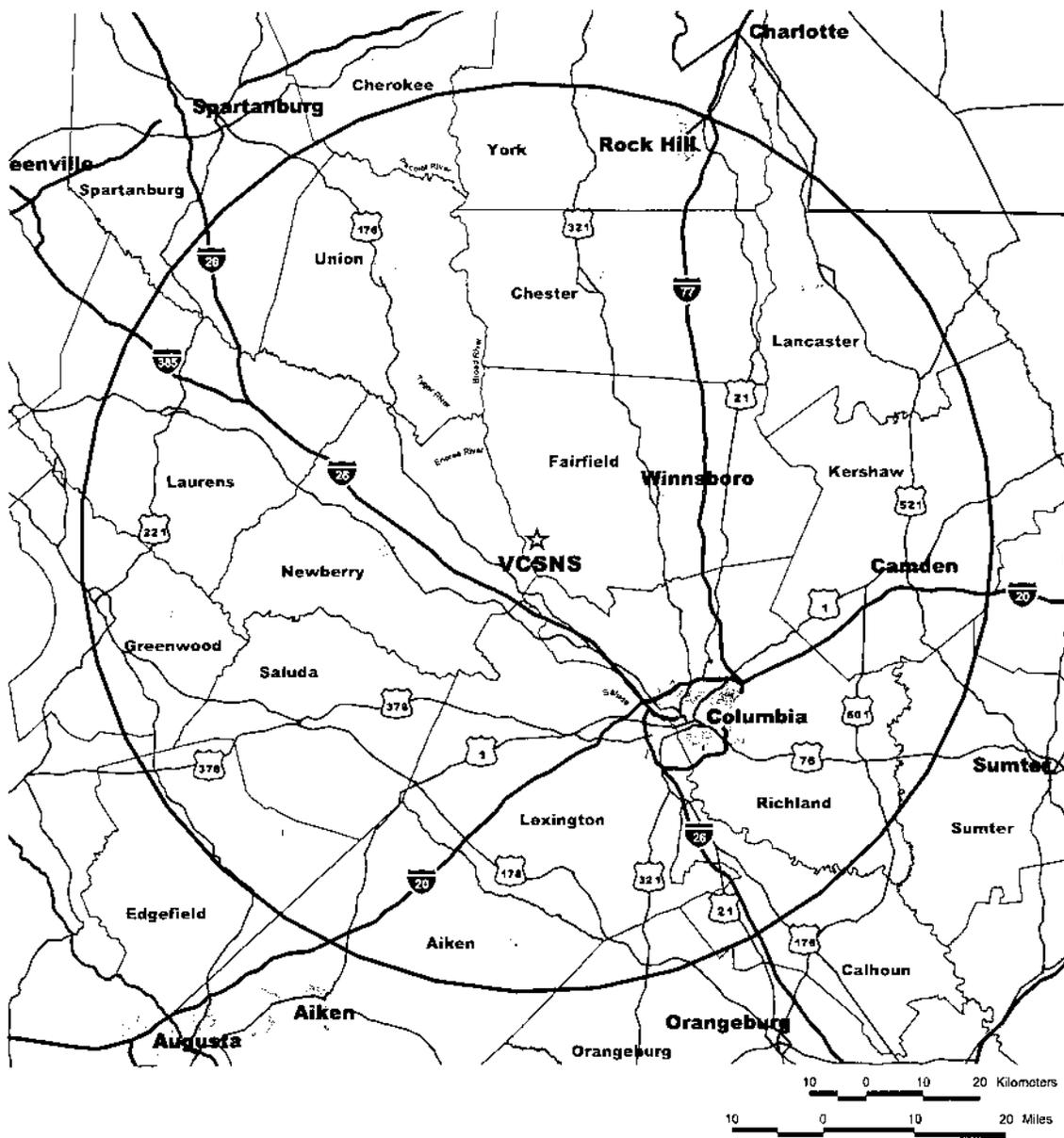
SES/SAB

attachments

c: R. B. Clary (800)
W. R. Higgins (830)
P. R. Moore (Tetra Tech NUS)
File (821.01)
DMS (RC-01-0006)

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION

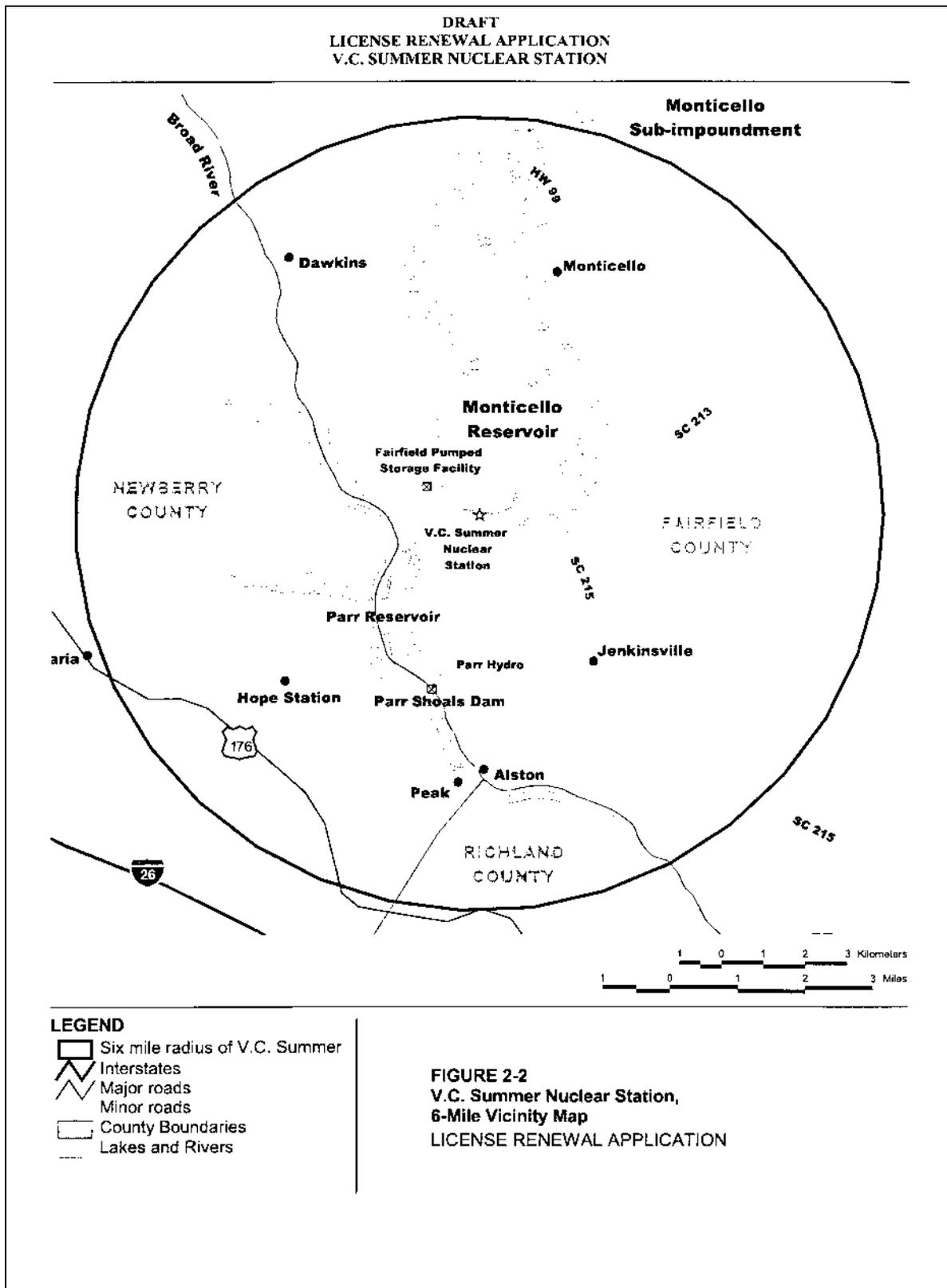


LEGEND

- ☆ V.C. Summer Nuclear Station
- 50 mile radius of V.C. Summer
- ▬ Interstates
- ▬ Major roads
- ▭ County Boundaries
- ▭ State Boundary
- ▭ Lakes and Rivers
- ⊙ Main Urban Areas

FIGURE 2-1
V.C. Summer Nuclear Station,
50-Mile Locational Vicinity Map
LICENSE RENEWAL APPLICATION

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**



VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT

DRAFT
ENVIRONMENTAL REPORT FOR LICENSE RENEWAL
VIRGIL C. SUMMER NUCLEAR STATION

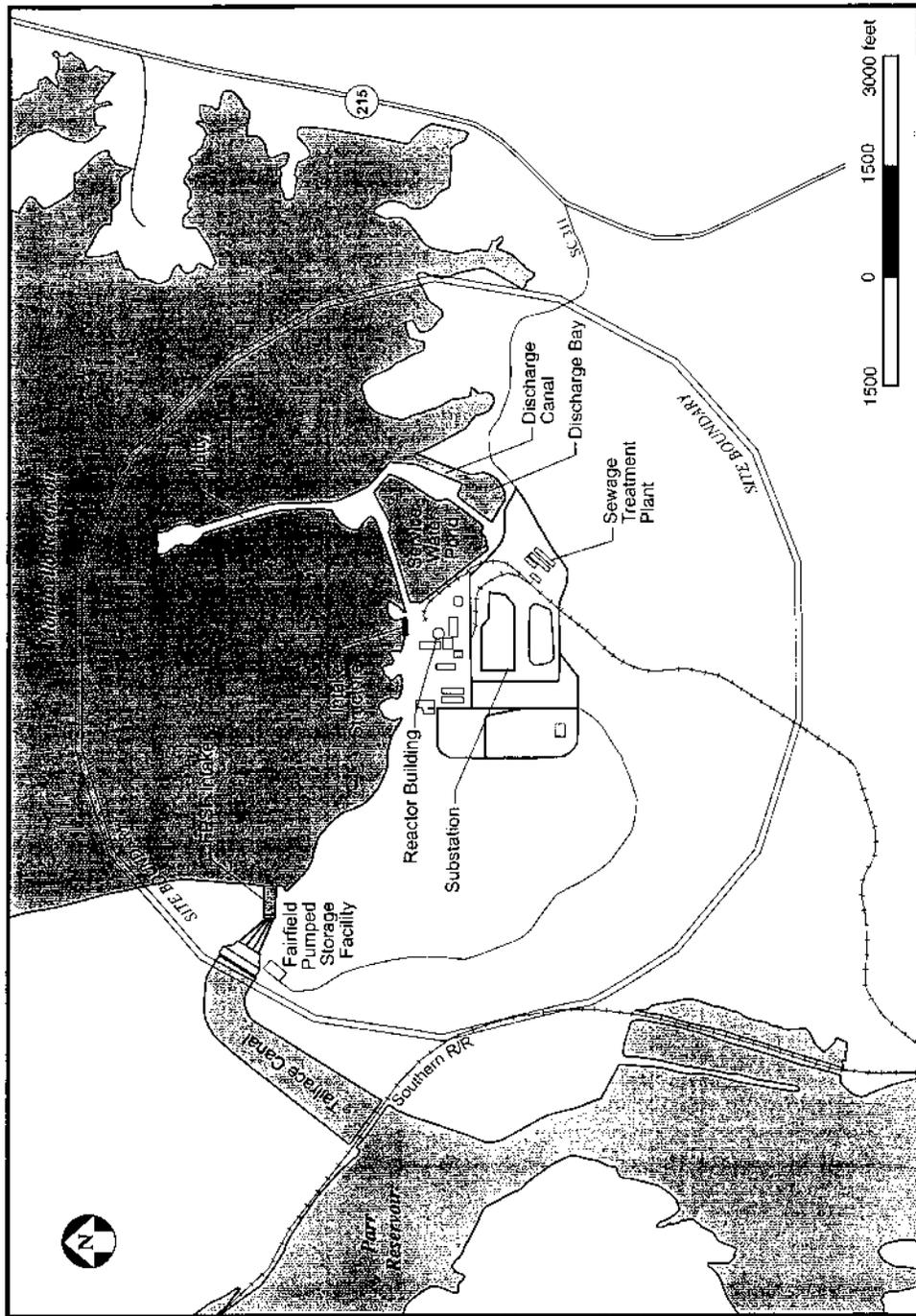
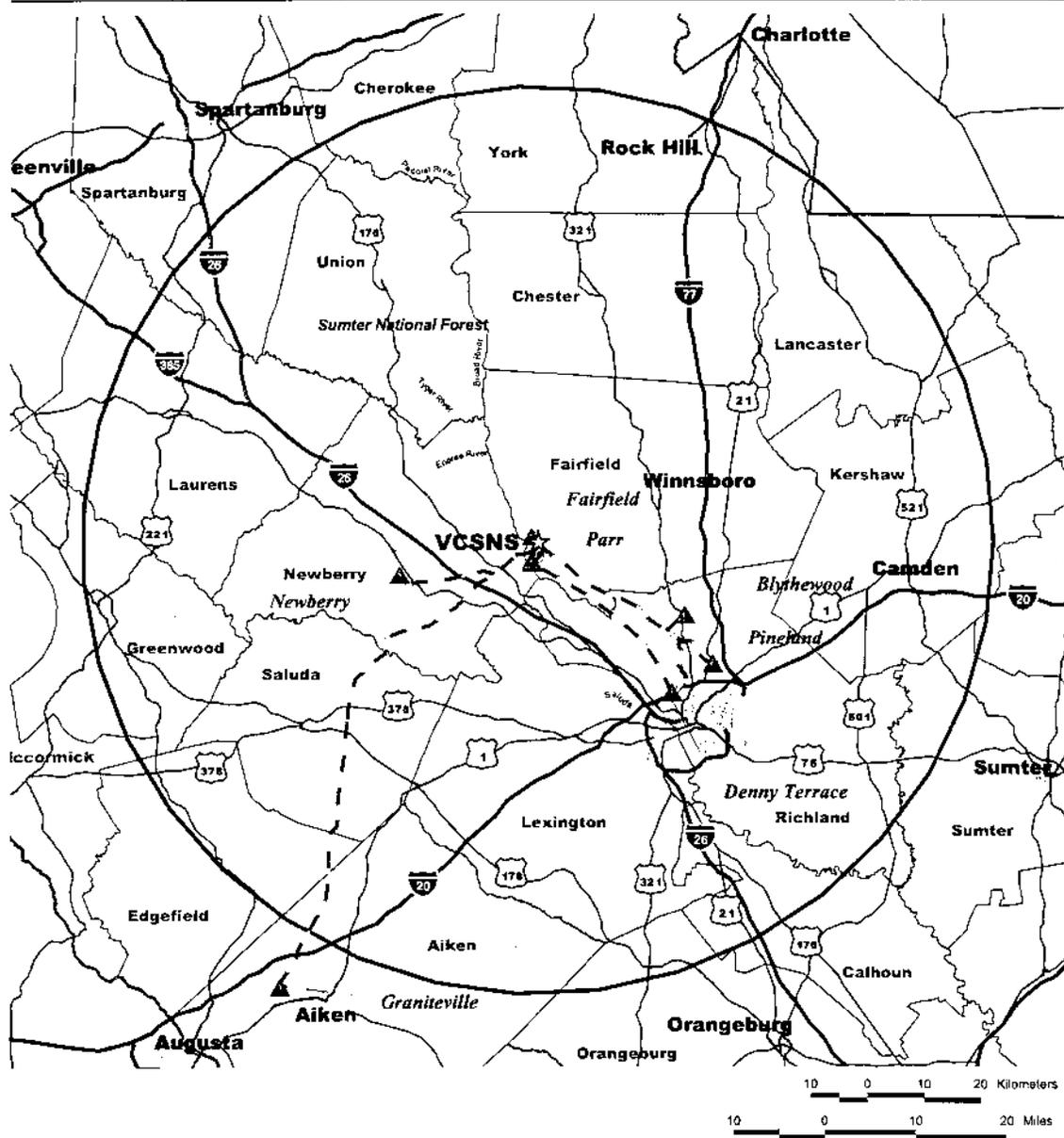


Figure 2-3. South Carolina Electric & Gas Company, Virgil C. Summer Nuclear Station Site Area Map.

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**

DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION

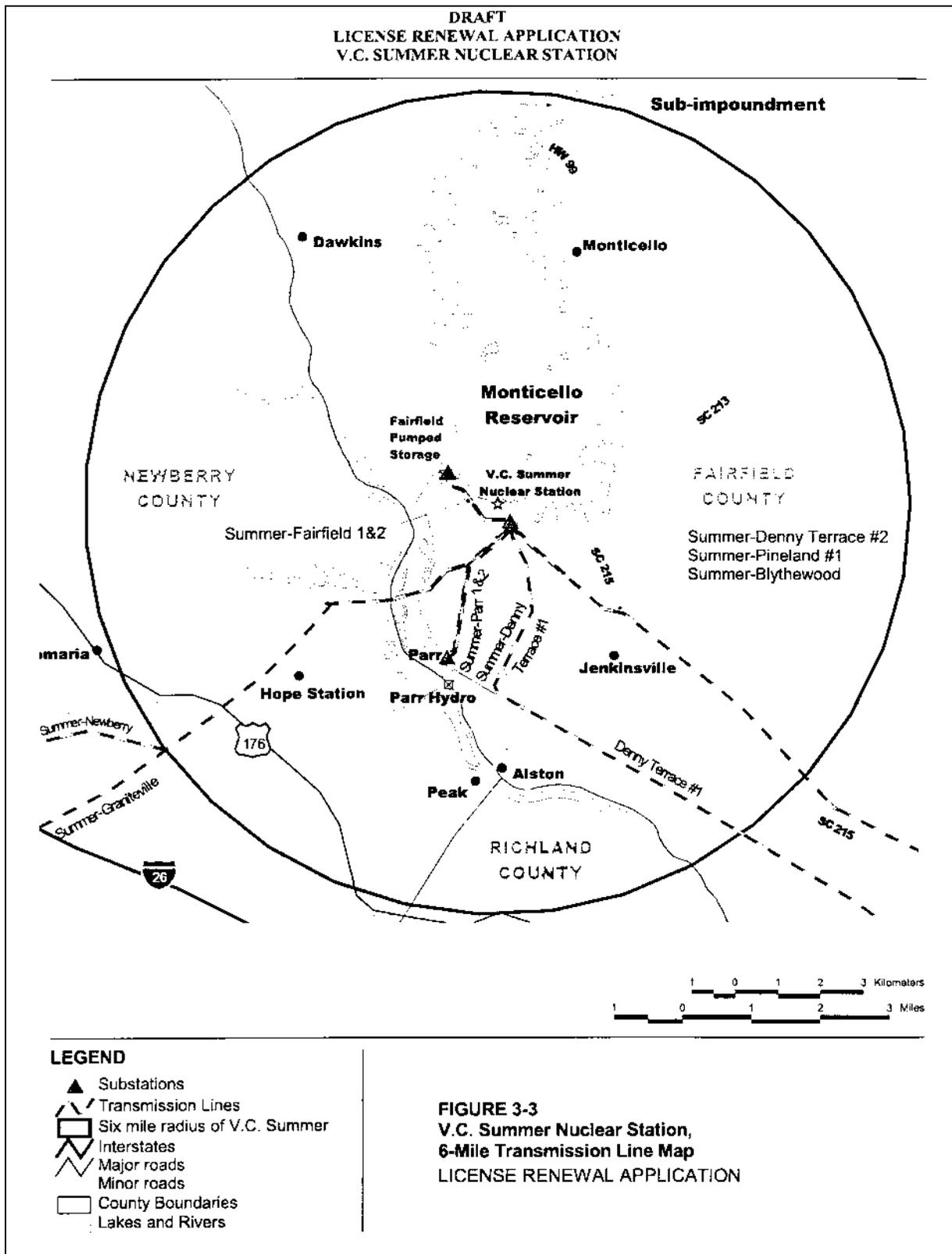


LEGEND

- ☆ V.C. Summer Nuclear Station
- ▲ Substations
- Transmission Lines
- 50 mile radius of V.C. Summer
- ▬ Interstates
- ▬ Major roads
- ▬ County Boundaries
- ▬ State Boundary
- ▬ Lakes and Rivers
- ▬ National Forests

FIGURE 3-2
V.C. Summer Nuclear Station,
50-Mile Transmission Line Map
LICENSE RENEWAL APPLICATION

**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**



**VIRGIL C. SUMMER NUCLEAR STATION
APPLICATION FOR RENEWED OPERATING LICENSE
APPENDIX E - ENVIRONMENTAL REPORT**



Historic Sites, Buildings,
and Landmarks
For All Governments

January 29, 2001

Mr. Stephen A. Byrne
Vice President, Nuclear Operations
SC Electric & Gas Company
Virgil C. Summer Nuclear Station
PO Box 88
Jenkinsville, SC 29065

Re: Virgil C. Summer Nuclear Station License Renew

Dear Mr. Byrne:

Thank you for your letter of January 19, which we received on January 24, regarding the proposed license renewal for the Virgil C. Summer Nuclear Station in Fairfield County.

It has been our experience that the license renewal for the continuing operation of plants such as this one has no effect on historic properties. These operations are usually not associated with new construction or expansion of plant boundaries.

Your letter states that you have used the NRIS to compile a list of National Register properties within a six-mile radius of the Summer Station. We encourage a search of our GIS database as a source of more accurate, up-to-date information. I've enclosed a copy of the *Consultant's Guide to Survey & National Register Files, State Historic Preservation Office*.

Please call me at 896-6169 if you have questions or if I can be of further assistance.

Sincerely,

A handwritten signature in cursive script, appearing to read "Nancy Brock".

Nancy Brock, Coordinator
Review and Compliance Programs
State Historic Preservation Office

