

4.0 Environmental Impacts of Operation

Environmental issues associated with operation of a nuclear power plant during the renewal term are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).^(a) The GEIS includes a determination of whether the analysis of the environmental issues could be applied to all plants and whether additional mitigation would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

- (1) 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.
- (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).
- (3) 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 not likely to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required.

This chapter addresses the issues related to operation during the renewal term that are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, and are applicable to the Virgil C. Summer Nuclear Station (V.C. Summer). Section 4.1 addresses issues applicable to the V.C. Summer cooling system. Section 4.2 addresses issues related to transmission lines and onsite land use. Section 4.3 addresses the radiological impacts of normal operation, and Section 4.4 addresses issues related to the socioeconomic impacts of normal operation during the renewal term. Section 4.5 addresses issues related to groundwater use and quality, while Section 4.6 discusses the impacts of renewal-term operations on threatened and endangered species. Section 4.7 addresses new information that was raised during the scoping period.

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

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The results of the evaluation of environmental issues related to operation during the renewal term are summarized in Section 4.8. Finally, Section 4.9 lists the references for Chapter 4. Category 1 and Category 2 issues that are not applicable to V.C. Summer because they are related to plant design features or site characteristics not found at V.C. Summer are listed in Appendix F.

4.1 Cooling System

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to V.C. Summer cooling system operation during the renewal term are listed in Table 4-1. South Carolina Electric and Gas (SCE&G) stated in its Environmental Report (ER) (SCE&G 2002a) that it is not aware of any new and significant information associated with the renewal of the V.C. Summer operating license (OL). The staff has not identified any significant new information during its independent review of the SCE&G ER (SCE&G 2002a), the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of the issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation is not likely to be sufficiently beneficial to be warranted.

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows.

- Altered current patterns at intake and discharge structures. Based on information in the GEIS, the Commission found that

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.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts of altered current patterns at intake and discharge structures during the renewal term beyond those discussed in the GEIS.

Table 4-1. Category 1 Issues Applicable to the Operation of the V.C. Summer Cooling System During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)	
Altered current patterns at intake and discharge structures	4.2.1.2.1; 4.4.3
Altered thermal stratification of lakes	4.2.1.2.3; 4.4.3
Temperature effects on sediment transport capacity	4.2.1.2.3; 4.4.3
Scouring caused by discharged cooling water	4.2.1.2.3; 4.4.3
Eutrophication	4.2.1.2.3; 4.4.3
Discharge of chlorine or other biocides	4.2.1.2.4; 4.4.2.2; 4.4.3
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4; 4.4.2.2; 4.4.3
Discharge of other metals in wastewater	4.2.1.2.4; 4.4.2.2
Water use conflicts (plants with once-through cooling systems)	4.2.1.3
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Accumulation of contaminants in sediments or biota	4.2.2.2; 4.4.1.2; 4.4.3; 4.6.1.1
Entrainment of phytoplankton and zooplankton	4.2.2.1.1; 4.2.2.1.10; 4.2.2.2; 4.4.3
Cold shock	4.2.2.1.5; 4.2.2.1.10; 4.2.2.2; 4.4.3
Thermal plume barrier to migrating fish	4.2.2.1.6; 4.2.2.2; 4.4.3
Distribution of aquatic organisms	4.2.2.1.6; 4.2.2.2; 4.4.3
Premature emergence of aquatic insects	4.2.2.1.7; 4.2.2.2; 4.4.3
Gas supersaturation (gas bubble disease)	4.2.2.1.8; 4.2.2.2; 4.4.3
Low dissolved oxygen in the discharge	4.2.2.1.9; 4.2.2.2; 4.4.3
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.2.2.1.10; 4.2.2.2; 4.4.3
Stimulation of nuisance organisms (e.g., shipworms)	4.2.2.1.11; 4.2.2.2; 4.4.3
TERRESTRIAL RESOURCES	
Cooling pond impacts on terrestrial resources	4.4.4
HUMAN HEALTH	
Noise	4.3.7

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- 1 • Altered thermal stratification of lakes. Based on information in the GEIS, the
2 Commission found that

3
4 Generally, lake stratification has not been found to be a problem at operating
5 nuclear power plants and is not expected to be a problem during the license
6 renewal term.
7

8 The staff has not identified any significant new information during its independent review of
9 the SCE&G ER, the staff's site visit, the scoping process, and staff review of monitoring
10 programs and evaluation of other available information. Therefore, the staff concludes that
11 there are no impacts of altered thermal stratification of lakes during the renewal term
12 beyond those discussed in the GEIS.
13

- 14 • Temperature effects on sediment transport capacity. Based on information in the GEIS,
15 the Commission found that

16
17
18 These effects have not been found to be a problem at operating nuclear
19 power plants and are not expected to be a problem during the license renewal
20 term.
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22 The staff has not identified any significant new information during its independent review of
23 the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other
24 available information. Therefore, the staff concludes that there are no impacts of
25 temperature effects on sediment transport capacity during the renewal term beyond those
26 discussed in the GEIS.
27

- 28 • Scouring caused by discharged cooling water. Based on information in the GEIS, the
29 Commission found that

30
31
32 Scouring has not been found to be a problem at most operating nuclear power
33 plants and has caused only localized effects at a few plants. It is not expected
34 to be a problem during the license renewal term.
35

36 The staff has not identified any significant new information during its independent review of
37 the SCE&G ER, the staff's site visit, the scoping process, and staff review of monitoring
38 programs and evaluation of other available information. Therefore, the staff concludes that
39 there are no impacts of scouring caused by discharged cooling water during the renewal
40 term beyond those discussed in the GEIS.
41

- Eutrophication. Based on information in the GEIS, the Commission found that

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.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, and staff review of monitoring programs and evaluation of other available information including plant monitoring data and technical reports. Therefore, the staff concludes that there are no impacts of eutrophication during the renewal term beyond those discussed in the GEIS.

- Discharge of chlorine or other biocides. Based on information in the GEIS, the Commission found that

Effects are not a concern among regulatory and resource agencies, and are not expected to be a problem during the license renewal term.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other available information including the National Pollutant Discharge Elimination System (NPDES) permit for V.C. Summer (SCDHEC 2002), or discussion with the NPDES compliance office. Therefore, the staff concludes that there are no impacts of discharge of chlorine or other biocides during the renewal term beyond those discussed in the GEIS.

- Discharge of sanitary wastes and minor chemical spills. Based on information in the GEIS, the Commission found that

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.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other available information including the NPDES permit for V.C. Summer (SCDHEC 2002) or discussion with the NPDES compliance office. Therefore, the staff concludes that there are no impacts of discharges of sanitary wastes and minor chemical spills during the renewal term beyond those discussed in the GEIS.

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- 1 • Discharge of other metals in wastewater. Based on information in the GEIS, the
3 Commission found that

4 These discharges have not been found to be a problem at operating nuclear
5 power plants with cooling-tower-based heat dissipation systems and have
6 been satisfactorily mitigated at other plants. They are not expected to be a
7 problem during the license renewal term.

8
9 The staff has not identified any significant new information during its independent review of
10 the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other
11 available information, including the NPDES permit for V.C. Summer (SCDHEC 2002) or
12 discussion with the NPDES compliance office. Therefore, the staff concludes that there are
13 no impacts of discharges of other metals in wastewater during the renewal term beyond
14 those discussed in the GEIS.

- 15
16 • Water use conflicts (plants with once-through cooling systems). Based on information in
17 the GEIS, the Commission found that

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20 These conflicts have not been found to be a problem at operating nuclear
21 power plants with once-through heat dissipation systems.

22
23 The staff has not identified any significant new information during its independent review of
24 the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other
25 available information. Therefore, the staff concludes that there are no impacts of water use
26 conflicts for plants with once-through cooling systems during the renewal term beyond those
27 discussed in the GEIS.

- 28
29 • Accumulation of contaminants in sediments or biota. Based on information in the GEIS,
30 the Commission found that

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32
33 Accumulation of contaminants has been a concern at a few nuclear power
34 plants but has been satisfactorily mitigated by replacing copper alloy
35 condenser tubes with those of another metal. It is not expected to be a
36 problem during the license renewal term.

37
38 The staff has not identified any significant new information during its independent review of
39 the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of available
40 information. Therefore, the staff concludes that there are no impacts of accumulation of
41 contaminants in sediments or biota during the renewal term beyond those discussed in the
42 GEIS.

- Entrainment of phytoplankton and zooplankton. Based on information in the GEIS, the Commission found that

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.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, and staff review of monitoring programs and evaluation of other available information. Therefore, the staff concludes that there are no impacts of entrainment of phytoplankton and zooplankton during the renewal term beyond those discussed in the GEIS.

- Cold shock. Based on information in the GEIS, the Commission found that

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.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts of cold shock during the renewal term beyond those discussed in the GEIS.

- Thermal plume barrier to migrating fish. Based on information in the GEIS, the Commission found that

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.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts of thermal plume barriers to migrating fish during the renewal term beyond those discussed in the GEIS.

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- 1 • Distribution of aquatic organisms. Based on information in the GEIS, the Commission
2 found that

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4
5 Thermal discharge may have localized effects but is not expected to effect the
6 larger geographical distribution of aquatic organisms.
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8 The staff has not identified any significant new information during its independent review of
9 the SCE&G ER, the staff's site visit, the scoping process, and staff review of monitoring
10 programs and evaluation of other available information. Therefore, the staff concludes that
11 there are no impacts on distribution of aquatic organisms during the renewal term beyond
12 those discussed in the GEIS.
13

- 14 • Premature emergence of aquatic insects. Based on information in the GEIS, the
15 Commission found that

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17
18 Premature emergence has been found to be a localized effect at some
19 operating nuclear power plants but has not been a problem and is not
20 expected to be a problem during the license renewal term.
21

22 The staff has not identified any significant new information during its independent review of
23 the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other
24 available information. Therefore, the staff concludes that there are no impacts of premature
25 emergence of aquatic insects during the renewal term beyond those discussed in the GEIS.
26

- 27 • Gas supersaturation (gas bubble disease). Based on information in the GEIS, the
28 Commission found that

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31 Gas supersaturation was a concern at a small number of operating nuclear
32 power plants with once-through cooling systems but has been satisfactorily
33 mitigated. It has not been found to be a problem at operating nuclear power
34 plants with cooling towers or cooling ponds and is not expected to be a
35 problem during the license renewal term.
36

37 The staff has not identified any significant new information during its independent review of
38 the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other
39 available information. Therefore, the staff concludes that there are no impacts of gas
40 supersaturation during the renewal term beyond those discussed in the GEIS.
41

- Low dissolved oxygen in the discharge. Based on information in the GEIS, the Commission found that

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.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, and staff review of monitoring programs and evaluation of other available information. Therefore, the staff concludes that there are no impacts of low dissolved oxygen during the renewal term beyond those discussed in the GEIS.

- Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses. Based on information in the GEIS, the Commission found that

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.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts of losses from predation, parasitism, and disease among organisms exposed to sublethal stresses during the renewal term beyond those discussed in the GEIS.

- Stimulation of nuisance organisms. Based on information in the GEIS, the Commission found that

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.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts of

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stimulation of nuisance organisms during the renewal term beyond those discussed in the GEIS.

- Cooling pond impacts on terrestrial resources. Based on information in the GEIS, the Commission found that

Impacts of cooling ponds on terrestrial ecological resources are considered to be of small significance at all sites.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts of cooling ponds on terrestrial resources during the renewal term beyond those discussed in the GEIS.

- Noise. Based on information in the GEIS, the Commission found that

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.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts of noise during the renewal term beyond those discussed in the GEIS.

The Category 2 issues related to cooling system operation during the renewal term that are applicable to V.C. Summer are discussed in the section that follows and are listed in Table 4-2. Although the SCE&G ER identified only microbial organisms (public health) as an applicable Category 2 issue, the staff determined that all the Category 2 issues pertaining to plants with cooling ponds are applicable to V.C. Summer.

4.1.1 Water Use Conflicts (Make-up Water from a Small River)

Water use conflicts has been determined to be a Category 2 issue because consultations with regulatory agencies indicate that water use conflicts may be a problem at some plants because consumptive water loss associated with closed-cycle cooling systems may represent a substantial proportion of the flows in small rivers (NRC 1996).

V.C. Summer 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 make-up water from the Broad River, which has an annual mean flow of approximately

Table 4-2. Category 2 Issues Applicable to the Operation of the V.C. Summer Cooling System During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS ^a Section
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)			
Water use conflicts (plants with cooling ponds or cooling towers using make-up water from a small river with low flow)	4.2.1.3, 4.2.2.2, 4.4.2.1	A	4.1.1
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING POND HEAT-DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	4.2.2.1.2; 4.3.3	B	4.1.2
Impingement of fish and shellfish	4.2.2.1.3; 4.3.3	B	4.1.3
Heat shock	4.2.2.1.4; 4.3.3	B	4.1.4
HUMAN HEALTH			
Microbial organisms (public health)(plants using lakes or canals or cooling towers that discharge into a small river)	4.3.6	G	4.1.5
a = Supplemental Environmental Impact Statement			

6 x 10⁹ m³/yr (2.1 x 10¹¹ ft³/yr) (185 m³/s [6,535 cfs]) (Cooney et al. 2001). Monticello Reservoir was built to supply cooling water to the station 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 42 km (26 mi) upstream of the confluence of the Broad and Saluda Rivers.

The Federal Power Commission (Federal Energy Regulatory Commission's predecessor agency) licensed the Parr Hydroelectric Project in 1974, contingent upon a minimum instantaneous release at the Parr Powerhouse of 4.2 m³/s (150 cfs) during most months of the year and a minimum instantaneous release of 28 m³/s (1000 cfs) during the March-April-May striped bass (*Morone saxatilis*) spawning period (NRC 1981). 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 6.6 m³/s (235 cfs) (Cooney et al. 2001). The lowest recorded daily mean flow of 4.2 m³/s (149 cfs) was measured at the Richtex Station, approximately 11.3 km (7.0 mi) downstream of Parr Reservoir (NRC 1981).

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1 The 1981 *Final Environmental Statement* indicated that approximately 0.37 m³/s (13 cfs) of the
2 33 m³/s (1180 cfs) of water withdrawn from Monticello Reservoir for condenser cooling would
3 be lost to evaporation. This water loss was to be made up by pumping back from Parr
4 Reservoir. The projected evaporative loss of 0.37 m³/s (13 cfs) from condenser cooling
5 represented approximately 9 percent of the minimum allowable instantaneous flow of 4.2 m³/s
6 (150 cfs), 5.5 percent of the lowest daily mean flow (6.6 m³/s [235 cfs]), and approximately
7 0.2 percent of the annual mean flow (185 m³/s [6535 cfs]) of the Broad River at Alston, South
8 Carolina. The daily cycle of operation at the FSPF transfers up to 11,736 ha-ft (29,000 ac-ft) of
9 water (equivalent to 416 m³/s [14,700 cfs]) from Parr Reservoir to Monticello Reservoir and
10 back on a daily basis.

11
12 Based on a higher (theoretical maximum) cooling water withdrawal rate of 37 m³/s (1308 cfs),
13 V.C. Summer Quarterly Water Use Reports indicate that 0.62 m³/s (22 cfs) is lost to
14 evaporation (SCE&G 1998, 1999). This loss represents 14.7 percent of the minimum allowable
15 instantaneous flow of 4.2 m³/s (150 cfs), 9.4 percent of the lowest daily mean flow (6.6 m³/s
16 [235 cfs]), and approximately 0.3 percent of the annual mean flow (185 m³/s [6535 cfs]) of the
17 Broad River at Alston, South Carolina. Under normal circumstances, evaporative losses from
18 Monticello Reservoir represent less than one percent reduction in Broad River flows. Any
19 impacts to riparian ecological communities in Parr Reservoir would be small.

20
21 Severe drought conditions were experienced throughout the summer of 2002. However, no
22 situations were encountered where make-up water for the evaporative losses due to
23 V.C. Summer operations affected the flow conditions in the Broad River so as to impinge upon
24 any of the Federal Energy Regulatory Commission- (FERC-) mandated flow restrictions. A
25 discussion with the FERC oversight staff member of the Parr Hydropower facility confirmed that
26 the operation of V.C. Summer causes no discernable impacts to maintaining minimum flow
27 conditions in the Broad River. There is no concern on the part of the FERC concerning this
28 issue.^(a)

29
30 The staff has reviewed the available information, including the rate of evaporative water loss
31 associated with V.C. Summer operations, maintenance of minimum flow conditions on the
32 Broad River, and information concerning past operations. Based on this evaluation, any
33 impacts from V.C. Summer on the Broad River flow conditions or in stream and riparian
34 communities in Parr Reservoir or the Broad River over the license renewal term would be
35 SMALL and would not warrant mitigation.

(a) Statement provided via telephone conversation with Mr. John Lyon (FERC) 20 February 2003.

4.1.2 Entrainment of Fish and Shellfish in Early Life Stages

For plants with once-through cooling systems, entrainment of fish and shellfish in early life stages into cooling water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment before license renewal. Entrainment of fish and shellfish in early life stages at V.C. Summer has been investigated as part of the 316(b) demonstration for the SCDHEC NPDES permit (SCDHEC 2002). Entrainment sampling of V.C. Summer intake waters for ichthyoplankton (fish eggs and larvae) took place between October 1983 through September 1984 (Dames and Moore 1985a). No other specific entrainment studies have been conducted at the site. The current NPDES permit for V.C. Summer (No. SC003085) states that the V.C. Summer cooling water intake structure(s) reflect the best technology available for minimizing adverse environmental impact. Therefore, the South Carolina Department of Health and Environmental Control (SCDHEC) has not required further sampling. From 1987 through 1998, South Carolina Department of Natural Resources (SCDNR) conducted other general fisheries studies; these have been summarized in Section 2.2 of the draft supplemental environmental impact statement (SEIS).

Entrainment studies, including ichthyoplankton studies were conducted in 1983-1984 (Dames and Moore 1985a), prior to the introduction of white perch (*Morone americana*) to the reservoir. Gizzard shad (*Dorosoma cepedianum*) larvae were the most abundant organisms collected, representing 87 percent to 93 percent of the ichthyoplankton samples. Other larvae collected included white bass (*Morone chrysops*), yellow perch (*Perca flavescens*), crappie (*Pomoxis nigromaculatus*), and sunfish. Catfish juveniles were not collected. Larval fish densities were greatest at the surface at the sampling location nearest to the intakes to V.C. Summer. Total mean densities for this sampling location were 53.9/100 m³ at the surface. Mean densities at mid-depth were 11.8/100 m³ at this sampling location; and ranged up to 18.34 at the reference station at the upper end of the lake. At the sampling location closest to the intakes to V.C. Summer, white bass represented approximately 5 percent of the sample. Other species collected at this sampling location include minnows, suckers, perch, and sunfish. The composition of these samples reflects the overall composition of the fish stocks in Monticello Reservoir (Table 2-2) at the time of sampling (Dames and Moore 1985a).

Since the 1983-1984 study, the fish composition of the Monticello Reservoir has changed, with recently introduced blue catfish (*Ictalurus furcatus*) becoming the dominant fish, and white bass becoming abundant (Table 2-2). Currently, the fish most vulnerable to entrainment in early life stages, due to a combination of both life history and abundance in the lake, include gizzard shad, white perch, and yellow perch. In addition, very small and weak-swimming fry of benthic nesting fish, such as sunfish and crappie are also vulnerable to entrainment, although less so than the gizzard shad, white perch, and yellow perch. Based on the ratio of abundance in the plankton in 1983-1984 and standing stocks in 1984, ichthyoplankton abundances for 1996 fish

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stock levels would have been on the order of 126/100 m³ for gizzard shad, 1.7/100 m³ for yellow perch, 0.7/100 m³ for white bass, and 0.2/100 m³ for bluegill (*Lepomis macrochirus*). If the plankton/stock ratio of its close relative, the white bass were assumed, white perch abundance in the ichthyoplankton would have been on the order of 90/100 m³, second only to gizzard shad. These numbers represent a balance between the introduction of larval fish into the plankton (due in part to fish reproduction in Monticello and introduction of ichthyoplankton from Parr Reservoir by pumped storage) and fish mortality (due in part to entrainment). At a 32 m³/sec (1,143 cfs) cooling water withdrawal rate, V.C. Summer is capable of daily pumping 1.5 percent of Monticello Reservoir's surface waters per day (assuming an epilimnion of 7 m [23 ft]), waters where ichthyoplankton would be expected to be most abundant. Combined with pumped storage operations of 420 m³/sec (160,000 cfs) over a 12-hour discharge cycle, V.C. Summer plus FPSF pump the equivalent of 10 percent of Monticello Reservoir's surface waters per day. Even with the large volumes of surface water pumped by both facilities, and related potential fish entrainment, Monticello Reservoir maintains sustainable populations of a variety of fish, and a sustainable fishery, as described in Section 2.2. Changes in fish communities since 1985 have coincided with the introduction of new species, including the white perch and blue catfish, which are effective predators and competitors with other species. While entrainment of fish and shellfish in early life stages from V.C. Summer operations would continue during the renewal period, the potential impacts on fish populations in Monticello Reservoir would be small. Under natural conditions, only a very small percentage of juvenile fish survive predation, competition, and other mortality to become adult, reproducing fish.

Molluscan species such as freshwater clams, which incubate eggs internally but release larvae that continue their life as fish parasites, may briefly be vulnerable to entrainment in short time periods before they reach their hosts. The Asiatic clam (*Corbicula* sp.) releases free-living (free-floating) larvae which also may be vulnerable to entrainment. While euplanktonic crustaceans, such as copepods and cladocerans, are vulnerable to entrainment, benthic crustaceans such as amphipods and crayfish brood their eggs and young prior to release to independent living. However, individuals of these crustaceans may be entrained if they are swept into the intake canals. No mollusks or crustaceans of economic importance as fisheries resources are present in Monticello Reservoir.

Monticello Reservoir has maintained a diverse fish community and sustainable fishery throughout the period of operations of V.C. Summer and PFSF (Christie and Stroud 1996, 1997, 1998, 1999, Dames and Moore 1985b, Nash, et al. 1990). Information on ichthyoplankton from V.C. Summer's 316(b) demonstration (Dames and Moore 1985a) has been incorporated into the NPDES permit, and SCDHEC has determined that further mitigative efforts are not warranted at this time (SCDHEC 2002). NPDES permits are renewed every five years. The most recent NPDES permit (see Appendix E), which expires on April 30, 2007, does not require that SCE&G conduct entrainment studies of the aquatic organisms in the

station's cooling-water flow (SCDHEC 2002). No Federal- or State-listed threatened or endangered fish, mollusks, or crustaceans are present in the Monticello Reservoir; therefore, there will be no impacts on any listed species due to entrainment at V.C. Summer during the renewal period.

The staff has reviewed the available information, including that provided by the applicant, the staff's site visit, the SCDHEC, the scoping process, and other public sources. Using this information, the staff evaluated the potential impacts due to entrainment of early life stages of fish and shellfish by continued operation and maintenance of V.C. Summer. The staff considered the cumulative impacts of past, current, and foreseeable future actions at the site regardless of what agency (Federal or non-Federal) or person undertakes such other actions. It is the staff's conclusion that the potential impacts due to entrainment of fish and shellfish in early life stages during the renewal term are SMALL.

During the course of the SEIS preparation, the staff considered mitigation measures for the continued operation of V.C. Summer. When continued operation for an additional 20 years is considered as a whole, all of the specific effects on the environment (whether or not "significant") were considered. Based on the assessment to date, the staff expects that the measures in place at V.C. Summer (e.g., placement of the intake structure) provide mitigation for all impacts related to entrainment, and no new mitigation measures are warranted.

4.1.3 Impingement of Fish and Shellfish

For plants with once-through cooling systems, impingement of fish and shellfish on debris screens of cooling water systems associated with nuclear power plants is considered a Category 2 issue, requiring site-specific assessment before license renewal. Impingement was monitored and impingement impacts were evaluated at V.C. Summer from October 1983 through September 1984 as part of V.C. Summer's 316(b) demonstration (Dames and Moore 1985a). No other specific impingement studies have been conducted. The current NPDES permit for V.C. Summer (No. SC003085) states that the V.C. Summer cooling water intake structure(s) reflect the best technology available for minimizing adverse environmental impact. Therefore, the SCDHEC has not required further sampling. There have been other general fisheries studies conducted in the mid 1990s; these are summarized in Section 2.2.

Fish present in Monticello Reservoir that are potentially most vulnerable to impingement are those that inhabit the water column: threadfin shad, gizzard shad, white perch, and white bass. Benthic species may also be swept into the intake structures and become impinged on the screens. As part of the 316b demonstration, fish were collected from the traveling screens twice monthly. A total of 5140 fish were collected, and yearly impingement was estimated to be 85,000 fish weighing 515 kg. This represented about one half of one percent of the estimated

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standing stock at the time the studies were conducted. The highest number of fish were impinged during January, and cold shock was implicated in the high numbers, as shad are particularly affected by cold temperatures. The fish collected from the screens represented 17 species belonging to 6 families (Table 4-3). The most impinged fish were gizzard shad (83 percent) and members of the perch family (7.6 percent). Members of the sunfish family represented 4.8 percent of the fish sampled (Dames and Moore 1985a).

The study confirmed that any impact of operational water withdrawal by V.C. Summer will be primarily on gizzard shad (83 percent of impinged fish). During the one-year study, V.C. Summer was estimated to impinge about 16 kg of an estimated total standing crop of 37,700 kg in the reservoir (Dames and Moore 1985a). Gizzard shad was an abundant species in the reservoir and the species has high reproductive and growth rates. Thus, SCE&G (2002a) concluded in the ER that V.C. Summer operations will have a negligible impact on the identified species.

During the period from 1985 through 1999, fish populations in Monticello Reservoir have changed as the result of the introduction of the white perch and blue catfish, two species that are effective predators and competitors with other species already inhabiting the reservoir.

Table 4-3 Species Comprising More than One Percent of Impingement Samples: Results of 316(b) Impingement Studies, V.C. Summer (Dames and Moore 1985a)

Species	% Total Catch by Occurrence	% Total Catch by Weight
gizzard shad	82.6	54.8
yellow perch	7.6	8.1
white catfish	2.4	17.6
bluegill	1.5	2.1
channel catfish	1.3	4.7
black crappie	1.3	2.5
pumpkinseed	1.1	1.1
threadfin shad	0.8	0.6
warmouth	0.6	2.8
white bass	0.3	5.2
white crappie	0.3	3.3

Blue catfish and white perch have become dominant members of the fish community. These changes are expected to be reflected in the impingement mortality during the renewal period. During the period 1986 to 1999, fish standing stocks do not appear to have declined as a result of V.C. Summer operations, and introductions of blue catfish and white perch are coincident with higher standing stocks of these species (Christie and Stroud 1996, 1997, 1998, 1999, Nash, et al. 1990) (See Section 2.2). These data support a conclusion that Monticello Reservoir maintains a diverse fish community and a sustainable recreational fishery despite any losses of fish due to impingement mortality from V.C. Summer operations, including cumulative effects from the FPSF, and that standing stocks will continue to be influenced by introduction of new species and stabilization of fish populations subsequent to those introductions.

All species of mollusks and macro crustaceans in Monticello Reservoir are benthic as adults and are not normally vulnerable to impingement. However, individuals living in the areas of the intake, upon death or accident, may be swept into the intake screens.

The staff has reviewed the available information, including that provided by the applicant, the staff's site visit, the SCDHEC, the scoping process, and other public sources. Using this information, the staff evaluated the potential impacts due to impingement of fish and shellfish by continued operation and maintenance of V.C. Summer. The staff considered the cumulative impacts of past, current, and foreseeable future actions at the site. It is the staff's conclusion that the potential impacts due to impingement of fish and shellfish during the renewal term are SMALL.

During the course of the SEIS preparation, the staff considered mitigation measures for the continued operation of V.C. Summer. When continued operation for an additional 20 years is considered as a whole, all of the specific effects on the environment (whether or not "significant") were considered. Based on the assessment to date, the staff expects that the measures in place at V.C. Summer (e.g., the operational design of the intake screens) provide mitigation for all impacts related to impingement, and no new mitigation measures are warranted.

4.1.4 Heat Shock

For plants with cooling ponds or reservoirs, including V.C. Summer, heat shock is considered a Category 2 issue, requiring a site-specific assessment before license renewal. The staff independently reviewed the V.C. Summer ER (SCE&G 2002a), visited the site, and reviewed the applicant's NPDES permit (SC0030856, effective February 1, 2003, to April 30, 2007). The staff also independently reviewed monitoring reports for the circulating cooling water discharge, the cooling water bay, and the cooling water canal.

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Heat shock to fish from thermal discharges has been investigated by SCE&G. In the Monticello Reservoir, the major factor of plant operations affecting heat-related deaths of fish is the temperature of water in the cooling water bay and the cooling water canal (SCE&G 2002a). The current NPDES permit limits the daily maximum discharge temperature to 45 °C (113 °F) and monthly average plume temperature to 32 °C (90 °F). As discussed in Section 2.2.5, in the late 1980s, periodic fish kills were observed in the discharge bay during the summer. Thermal effects from combined operations of V.C. Summer and drawdown of the reservoir for pumped storage operations were the suspected cause of mortality of fish congregating in this area. These thermal effects were mitigated by dredging in the discharge canal in 1993. Subsequent monitoring demonstrated that the modifications were successful in reducing the temperature regimes and eliminating the conditions believed responsible for the fish kills. No further fish kills have been observed (SCE&G 1994, 1996).

The staff has reviewed the available information and, based on the conditions of the NPDES permit, the operating history of V.C. Summer, the staff's site visit, the scoping process, and other public sources, the staff concludes that the potential impacts of discharging heated water from V.C. Summer to Monticello Reservoir are SMALL. When preparing this SEIS, the staff considered the potential impacts to aquatic resources due to heat shock for an additional 20 years of operation and maintenance of V.C. Summer, mitigation measures, and the cumulative impacts of operations of the FPSF. Based on assessments to date, the staff expects that the measures in place at V.C. Summer will provide mitigation for all impacts related to heat shock, and no new mitigation measures are warranted.

4.1.5 Microbial Organisms (Public Health)

For plants discharging cooling water to cooling ponds, lakes, canals, or small rivers with annual average flow rates less than $9 \times 10^{10} \text{ m}^3/\text{yr}$ ($3.15 \times 10^{12} \text{ ft}^3/\text{yr}$), the effects of microbial organisms on human health are listed as a Category 2 issue and require plant-specific evaluation before license renewal. This issue is applicable to V.C. Summer because the station uses a cooling pond (Monticello Reservoir) that discharges to Parr Reservoir, which is part of the Broad River. The Broad River has an average annual flow of $6 \times 10^9 \text{ m}^3/\text{yr}$ ($2.1 \times 10^{11} \text{ ft}^3/\text{yr}$) and is categorized as a small river in the GEIS (NRC 1996).

The Category 2 designation is based on the potential for public health impacts associated with the enhancement of thermophilic organisms such as *Naegleria fowleri*, a pathogenic amoeba, that could not be determined generically. The Nuclear Regulatory Commission (NRC) noted that impacts of nuclear plant cooling towers and thermal discharges are considered to be of small significance if they do not enhance the presence of microorganisms that are detrimental to water quality and public health (NRC 1996). The assessment criteria relate to thermal discharge temperature, thermal characteristics, thermal conditions for the enhancement of

1 these microorganisms, and impact to public health. Thermophilic bacteria generally occur at
2 temperatures of 25 °C to 80 °C (77 °F to 176 °F), with maximum growth at 50 °C to 60 °C (122
3 °F to 140 °F) (SCE&G 2002a).

4
5 SCE&G monitors water temperature at an “uplake” location, near the water intake, and at a
6 location near the discharge canal. The maximum temperature observed by SCE&G during the
7 years 1995 to 2000 was 39.8 °C (103.7 °F), which occurred in July 1999 (SCE&G 2000).
8 Maximum temperatures for the other years ranged from 35.1 °C to 38.4 °C (95.2 °F to
9 101.2 °F). All of these maximum temperatures were observed in July and August at the
10 surface. Temperatures at 1 m (3 ft) or deeper in the vicinity of the discharge canal were
11 generally 2 °C to 5 °C (3.0 °F to 9.0 °F) lower during the summer months. Maximum
12 temperatures in Monticello Reservoir outside of the discharge canal are below the optimal
13 temperature range for growth and reproduction of thermophilic organisms.

14
15 In addition to reactor cooling water discharges, V.C. Summer releases turbine building closed-
16 cycle cooling water system discharges to Monticello Reservoir. V.C. Summer adds a bromine
17 compound to the open side of this cooling system during normal operations. The bromine
18 compound is used to eliminate microorganisms that would be a potential human health
19 problem. Another factor that affects the survival and growth of thermophilic organisms in
20 Monticello Reservoir is the disinfection of V.C. Summer sewage treatment plant effluents. This
21 treatment reduces the potential for introducing or enhancing existing populations of these
22 organisms in the discharge canal or the reservoir.

23
24 There is public access to Monticello Reservoir, including recreational fishing, boating, and
25 waterfowl hunting. Some subsistence fishing may also occur along the eastern shore, where all
26 the lakeshore residences are located. Public use of the reservoir creates the potential for
27 human exposure to thermophilic organisms. However, given the thermal characteristics of
28 Monticello Reservoir in the vicinity of the discharge outfall and the disinfection of nonreactor
29 cooling tower water and sewage effluents, these organisms would not be expected to pose a
30 threat to recreational or subsistence users of the reservoir or downstream users.

31
32 SCE&G wrote the SCDHEC requesting information on any studies the agency might have
33 conducted concerning thermophilic microorganisms in Monticello Reservoir and any concerns
34 the agency might have relative to these organisms (SCE&G 2002a). SCDHEC’s response
35 indicated that public health hazards from thermophilic organisms are largely theoretical and do
36 not represent a significant health threat to offsite users of Monticello Reservoir’s waters.

37
38 Based on its review of the above information, the staff concludes that the potential impacts to
39 public health from microbial organisms resulting from operation of V.C. Summer’s cooling water

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discharge system to the aquatic environment on or in the vicinity of the site area are SMALL, and additional mitigation is not warranted.

4.2 Transmission Lines

SCE&G built eight transmission lines for the specific purpose of connecting V.C. Summer to the transmission system. Two additional transmission lines were built by Santee Cooper, co-owner of V.C. Summer, to connect the station to the regional grid.

In total, for the specific purpose of connecting V.C. Summer to the transmission system, SCE&G and Santee Cooper have constructed approximately 250 km (160 mi) of transmission lines (over 190 km [120 mi] of corridor) that occupy approximately 800 ha (2000 ac) 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 Interstate 26 and Interstate 20.

The transmission corridors are maintained by mowing, trimming of undesirable vegetation from the sides of the corridors, and by use of nonrestricted-use herbicides. Under normal circumstances, the mowing and herbicide schedule follows a three-year cycle. Trees are side-trimmed every 10 years by helicopters carrying hydraulically operated saws. Aerial patrols of transmission corridors are conducted four times a year by SCE&G and twice a year by Santee Cooper. Dead and diseased trees at the edges of corridors are removed if they could fall and strike the transmission lines or support structures.

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to transmission lines from V.C. Summer are listed in Table 4-4. SCE&G stated in its ER that it is not aware of any new and significant information associated with the renewal of the V.C. Summer OL. The staff has not identified any significant new information during its independent review of the SCE&G ER (SCE&G 2002a), the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation is not likely to be sufficiently beneficial to be warranted.

A brief description of the staff's review and GEIS conclusions, as codified in Table B-1, for each of these issues follows.

Table 4-4. Category 1 Issues Applicable to the V.C. Summer Transmission Lines During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
TERRESTRIAL RESOURCES	
Power line right-of-way management (cutting and herbicide application)	4.5.6.1
Bird collisions with power lines	4.5.6.2
Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	4.5.6.3
Flood plains and wetlands on power line right-of-way	4.5.7
AIR QUALITY	
Air quality effects of transmission lines	4.5.2
LAND USE	
Onsite land use	4.5.3
Power line right-of-way	4.5.3

- Power line right-of-way management (cutting and herbicide application). Based on information in the GEIS, the Commission found that

The impacts of right-of-way maintenance on wildlife are expected to be of small significance at all sites.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, consultation with the U.S. Fish and Wildlife Service and the SCDNR, or staff evaluation of other information. Therefore, the staff concludes that there are no impacts of power line right-of-way maintenance during the renewal term beyond those discussed in the GEIS.

- Bird collisions with power lines. Based on information in the GEIS, the Commission found that

Impacts are expected to be of small significance at all sites.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, consultation with the U.S. Fish and Wildlife Service and SCDNR, or staff evaluation of other information. Therefore, the

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1 staff concludes that there are no impacts of bird collisions with power lines during the
2 renewal term beyond those discussed in the GEIS.

- 3
4 • Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops,
5 honeybees, wildlife, livestock). Based on information in the GEIS, the Commission
6 found that

7
8 No significant impacts of electromagnetic fields on terrestrial flora and fauna
9 have been identified. Such effects are not expected to be a problem during the
10 license renewal term.

11
12 The staff has not identified any significant new information during its independent review of
13 the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other
14 information. Therefore, the staff concludes that there are no impacts of electromagnetic
15 fields on flora and fauna during the renewal term beyond those discussed in the GEIS.

- 16
17 • Flood plains and wetlands on power line right-of-way. Based on information in the
18 GEIS, the Commission found that

19
20 Periodic vegetation control is necessary in forested wetlands underneath power
21 lines and can be achieved with minimal damage to the wetland. No significant
22 impact is expected at any nuclear power plant during the license renewal term.

23
24 The staff has not identified any significant new information during its independent review of
25 the SCE&G ER, the staff's site visit, the scoping process, consultation with the U.S. Fish
26 and Wildlife Service and SCDNR, or staff evaluation of other information. Therefore, the
27 staff concludes that there are no impacts of power line rights-of-way on flood plains and
28 wetlands during the renewal term beyond those discussed in the GEIS.

- 29
30 • Air quality effects of transmission lines. Based on information in the GEIS, the
31 Commission found that

32
33 Production of ozone and oxides of nitrogen is insignificant and does not
34 contribute measurably to ambient levels of these gases.

35
36 The staff has not identified any significant new information during its independent review
37 of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other
38 information. Therefore, the staff concludes that there are no air quality impacts of
39 transmission lines during the renewal term beyond those discussed in the GEIS.

- Onsite land use. Based on the information in the GEIS, the Commission found that

Onsite land use changes required during ... the renewal period would be a small fraction of any nuclear power plant site and would involve land that is controlled by the applicant.

The staff has not identified any significant new information during its independent review of the SCE&G ER (SCE&G 2002a), the staff's site visit, the scoping process, or staff evaluation of other information. Therefore, the staff concludes that there are no onsite land-use impacts during the renewal term beyond those discussed in the GEIS.

- Power line right-of-way (land use). Based on information in the GEIS, the Commission found that

Ongoing use of power line right of ways would continue with no change in restrictions. The effects of these restrictions are of small significance.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other information. Therefore, the staff concludes that there are no impacts of power line rights-of-way on land use during the renewal term beyond those discussed in the GEIS.

There is one Category 2 issue related to transmission lines, and another issue related to transmission lines is being treated as a Category 2 issue. These issues are listed in Table 4-5 and are discussed in Sections 4.2.1 and 4.2.2.

Table 4-5. Category 2 and Uncategorized Issues Applicable to the V.C. Summer Transmission Lines During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
HUMAN HEALTH			
Electromagnetic fields, acute effects (electric shock)	4.5.4.1	H	4.2.1
Electromagnetic fields, chronic effects	4.5.4.2	NA	4.2.2

4.2.1 Electromagnetic Fields—Acute Effects

In the GEIS (NRC 1996), the staff found that, without a review of the conformance of each nuclear plant transmission line with National Electrical Safety Code (NESC) criteria (IEEE 1997), it was not possible to determine the significance of the electric shock potential. Evaluation of individual plant transmission lines is necessary because the issue of electric shock safety was not addressed in the licensing process for some plants. For other plants, land use in the vicinity of transmission lines may have changed, or power distribution companies may have chosen to upgrade line voltage. To comply with 10 CFR 51.53(c)(3)(ii)(H), the applicant must provide an assessment of the potential shock hazard if the transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents.

SCE&G built eight transmission lines for the specific purpose of connecting V.C. Summer to the transmission system (NRC 1981, Section 3.2.7). Two additional transmission lines were built by Santee Cooper, co-owner of V.C. Summer, to connect the station to the regional grid. A total of 10 transmission lines connect V.C. Summer to the transmission system. SCE&G and Santee Cooper have constructed approximately 257 km (160 mi) of transmission lines (193 km [120 mi] of corridor) that occupy approximately 800 ha (2000 ac) of corridor. SCE&G and Santee Cooper designed and constructed all V.C. Summer transmission lines in accordance with the NESC and industry guidance that was in effect when the lines were built (SCE&G 2002a).

To support its conclusion that the transmission lines at V.C. Summer are in compliance with the NESC 5-mA, electric-field-induced current limit, SCE&G conducted a computer-model-based analysis evaluating the conformance of the transmission lines at V.C. Summer with the NESC requirement that transmission lines be designed to limit the steady-state current due to electrostatic effects to 5 mA in a tractor-trailer parked under the lines (SCE&G 2002a). SCE&G calculated electric field strength and induced current for both Santee Cooper- 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 limiting case configuration for each line, that line sag be determined at 48.9 °C (120 °F) conductor temperature, and the maximum vehicle size under the lines is a tractor-trailer.

The analysis determined that none of the transmission lines has the capacity to induce as much as 5 mA in a tractor-trailer parked beneath the lines. Therefore, V.C. Summer transmission line designs conform to the NESC provisions for preventing electric shock from induced or steady-state current.

The staff has reviewed the available information, including that provided by the applicant, the staff's site visit, the scoping process, and other public sources. Using this information, the staff evaluated the potential impacts for electric shock resulting from operation of V.C. Summer and associated transmission lines. The staff considered the cumulative impacts of past, current, and foreseeable future actions at the site regardless of what agency (Federal or non-Federal) or person undertakes such other actions. It is the staff's preliminary conclusion that the potential impacts for electric shock during the renewal term are SMALL.

During the course of the SEIS preparation, the staff considered mitigation measures for the continued operation of V.C. Summer. When continued operation for an additional 20 years is considered as a whole, all of the specific effects on the environment (whether or not "significant") were considered. Based on the assessment to date, the staff expects that the measures in place at V.C. Summer (e.g., transmission lines are in compliance with the NESC) provide mitigation for all impacts related to acute effects of electromagnetic fields, and no new mitigation measures are warranted.

4.2.2 Electromagnetic Fields—Chronic Effects

In the GEIS, the chronic effects of 60-Hz electromagnetic fields from power lines were not designated as either Category 1 or Category 2, and will not be until a scientific consensus is reached on the health implications of these fields.

The potential for chronic effects from these fields continues to be studied and is not known at this time. The National Institute of Environmental Health Sciences (NIEHS) directs related research through the U.S. Department of Energy. A recent report (NIEHS 1999) contains the following conclusion:

The NIEHS concludes that ELF-EMF [extremely low frequency-electromagnetic field] exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern.

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This statement is not sufficient to cause the staff to change its position with respect to the chronic effects of electromagnetic fields. The staff considers the GEIS finding of “not applicable” still appropriate and will continue to follow developments on this issue.

4.3 Radiological Impacts of Normal Operations

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to V.C. Summer in regard to radiological impacts are listed in Table 4-6. SCE&G stated in its ER (SCE&G 2002a) that it is not aware of any new and significant information associated with the renewal of the V.C. Summer OL. No new and significant information on these issues has been identified by the staff during its independent review of the V.C. Summer ER, the staff’s site visit, the scoping process, discussions with other agencies, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For these issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation is not likely to be sufficiently beneficial to be warranted.

A brief description of the staff’s review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Radiation exposures to public (license renewal term). Based on information in the GEIS, the Commission found that

Radiation doses to the public will continue at current levels associated with normal operations.

The staff has not identified any new and significant information. Therefore, the staff concludes that there are no impacts of radiation exposures to the public during the renewal term beyond those discussed in the GEIS.

Table 4-6. Category 1 Issues Applicable to Radiological Impacts of Normal Operations During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
HUMAN HEALTH	
Radiation exposures to public (license renewal term)	4.6.2
Occupational radiation exposures (license renewal term)	4.6.3

- Occupational radiation exposures (license renewal term). Based on information in the GEIS, the Commission found that

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.

The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts of occupational radiation exposures during the renewal term beyond those discussed in the GEIS.

There are no Category 2 issues related to radiological impacts of routine operations.

4.4 Socioeconomic Impacts of Plant Operations During the License Renewal Term

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to socioeconomic impacts during the renewal term are listed in Table 4-7. SCE&G stated in its ER (SCE&G 2002a) that it was not aware of any new and significant information associated with the renewal of the V.C. Summer OL. The staff has not identified any significant new information during its independent review of the SCE&G ER (SCE&G 2002a), the staff's site visit, the scoping process, or staff evaluation of other information. Therefore, the staff

Table 4-7. Category 1 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
SOCIOECONOMICS	
Public services: public safety, social services, and tourism and recreation	4.7.3; 4.7.3.3; 4.7.3.4; 4.7.3.6
Public services: education (license renewal term)	4.7.3.1
Aesthetic impacts (license renewal term)	4.7.6
Aesthetic impacts of transmission lines (license renewal term)	4.5.8

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concludes that there are no impacts related to these issues beyond those discussed in the GEIS (NRC 1996). For these issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation is not likely to be sufficiently beneficial to be warranted.

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Public services: public safety, social services, and tourism and recreation. Based on information in the GEIS, the Commission found that

Impacts to public safety, social services, and tourism and recreation are expected to be of small significance at all sites.

The staff has not identified any significant new information during its independent review of the SCE&G ER (SCE&G 2002a), the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts on public safety, social services, and tourism and recreation during the renewal term beyond those discussed in the GEIS.

- Public services: education (license renewal term). Based on information in the GEIS, the Commission found that

Only impacts of small significance are expected.

The staff has not identified any significant new information during its independent review of the SCE&G ER (SCE&G 2002a), the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts on education during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts (license renewal term). Based on information in the GEIS, the Commission found that

No significant impacts are expected during the license renewal term.

The staff has not identified any significant new information during its independent review of the SCE&G ER (SCE&G 2002a), the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no aesthetic impacts during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts of transmission lines (license renewal term). Based on information in the GEIS, the Commission found that

No significant impacts are expected during the license renewal term.

The staff has not identified any significant new information during its independent review of the SCE&G ER (SCE&G 2002a), the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no aesthetic impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

Table 4-8 lists the Category 2 socioeconomic issues, which require plant-specific analysis, and environmental justice, which was not addressed in the GEIS. These issues are discussed in Sections 4.4.1 through 4.4.6.

Table 4-8. Environmental Justice and GEIS Category 2 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
SOCIOECONOMICS			
Housing impacts	4.7.1	I	4.4.1
Public services: public utilities	4.7.3.5	I	4.4.2
Offsite land use (license renewal term)	4.7.4	I	4.4.3
Public services, transportation	4.7.3.2	J	4.4.4
Historic and archaeological resources	4.7.7	K	4.4.5
Environmental justice	Not addressed ^(a)	Not addressed ^(a)	4.4.6
(a) Guidance related to environmental justice was not in place at the time the GEIS and the associated revision to 10 CFR Part 51 were prepared. Therefore, environmental justice is to be addressed in the licensee's ER and the staff's environmental impact statement.			

4.4.1 Housing Impacts During Operations

Housing impacts is a Category 2 issue (10 CFR 51, Subpart A, Appendix B, Table B-1). In determining housing impacts, the applicant chose to follow Appendix C of the GEIS (NRC 1996), which presents a population characterization method that is based on two factors, “sparseness” and “proximity” (GEIS Section C.1.4 [NRC 1996]). Sparseness measures population density within 32 km (20 mi) of the site, and proximity measures population density and city size within 80 km (50 mi). Each factor has categories of density and size (GEIS Table C.1), and a matrix is used to rank the population category as low, medium, or high (GEIS Figure C.1).

SCE&G used 2000 census data from the U.S. Census Bureau website (USCB 2000) and geographic information system software (ArcView®) to determine demographic characteristics in the V.C. Summer vicinity. As derived from Census Bureau information, an estimated 136,842 people live within 32 km (20 mi) of V.C. Summer. Applying the GEIS sparseness measures, V.C. Summer has a population density of 109 persons per square mile within 32 km (20 mi) and falls into a less sparse category, Category 3 (having 60 to 120 persons per square mile).

As derived from Census Bureau information, an estimated 1.02 million people live within 80 km (50 mi) of V.C. Summer. This equates to a population density of 131 persons per square mile within 50 miles. Applying the GEIS proximity measures, V.C. Summer is classified as Category 3 (having one or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 mi). According to the GEIS sparseness and proximity matrix, the V.C. Summer ranks of sparseness Category 3 and proximity Category 3 result in the conclusion that V.C. Summer is located in a medium-population area.

Refurbishment activities and continued operations could result in housing impacts due to increased staffing. However, SCE&G does not plan to perform refurbishment and concluded that there would be no refurbishment-related impacts to area housing. Accordingly, the following discussion focuses on impacts of continued operations on local housing availability. 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 of the SCE&G ER (SCE&G 2002a), approximately 90 percent of V.C. Summer employees reside in Fairfield, Lexington, Newberry, and Richland Counties. Therefore, the focus of the housing impact analysis is on these areas.

10 CFR Part 51, Subpart A, Appendix B, Table B-1 states that impacts on housing availability are expected to be of small significance at plants located in a medium-population area where growth-control measures are not in effect. This conclusion is supported by the following site-specific housing analysis. The GEIS assumes that an additional staff of 60 permanent workers per unit might be needed during the license renewal period to perform routine maintenance and other activities, and Section 3.4 of the SCE&G ER (SCE&G 2002a) conservatively estimates that 60 additional employees during the license renewal period could generate 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, then approximately 213 housing units would be required in Fairfield, Lexington, Newberry, and Richland Counties. The V.C. Summer site is located in a medium-population area and neither Fairfield nor the adjacent Central Midlands Counties are subject to growth-control measures that would limit housing development. There are ample housing options to absorb this increase in all four counties as detailed in Table 2-5 with nearly 248,000 units and almost 22,000 vacant units in 2000.

Based on the NRC criteria, the SCE&G ER (SCE&G 2002a) expects housing impacts to be SMALL during continued operations at V.C. Summer. SMALL 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 is required to meet new demand (NRC 1996).

The staff reviewed the available information relative to housing impacts and SCE&G's conclusions. Based on this review and because the bounding number of new housing units needed is a very small percentage of the available units, the staff concludes that the impact on housing during the license renewal period would be SMALL, and additional mitigation is not warranted.

4.4.2 Public Services: Public Utility Impacts During Operations

Impacts on public utility services are considered SMALL if there is little or no change in the ability of the system to respond to the level of demand, and thus there is no need to add capital facilities. Impacts are considered MODERATE if overtaxing service capabilities occurs during periods of peak demand. Impacts are considered LARGE if existing levels of service (e.g., water or sewer services) are substantially degraded and additional capacity is needed to meet ongoing demands for services. The GEIS indicates that, in the absence of new and significant information to the contrary, the only impacts on public utilities that could be significant are impacts on public water supplies (NRC 1996).

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1 Analysis of impacts on the public water supply system considered plant demand and plant-
2 related population growth. Section 2.2.2 describes the V.C. Summer permitted withdrawal rate
3 and actual use of water. V.C. Summer does not use water from a municipal system and is
4 planning no major refurbishment, so plant demand would not change beyond current demands
5 (SCE&G 2002a).
6

7 The NRC considers both plant demand and plant-related population growth demands on local
8 water resources. The impact to the local water supply systems from plant-related population
9 growth can be determined by calculating the amount of water that would be required by these
10 individuals. The average American uses between 190 and 300 L (50 and 80 gal) per day for
11 personal use (Fetter 1980).
12

13 In Section 3.4 of the SCE&G ER (SCE&G 2002a), the applicant uses a conservative estimate of
14 60 additional employees during the license renewal period who could generate a total of
15 237 new jobs, which could result in a population increase of 640 in the area [237 jobs multiplied
16 by 2.7, which is the average number of persons per household in the area (CMCOG 1999)].
17 Using this consumption rate, the plant-related population increase could require an additional
18 192,000 L/d (51,200 gal/d) (640 people multiplied by 300 L/d [80 gal/d]) in an area where the
19 public water supply capacity is more than 570 million L/d (150 million gal/d). If it is assumed
20 that this increase is distributed across the four potentially affected counties, consistent with
21 current employee trends, the increase in water demand would not create shortages in capacity
22 of the water supply systems in these communities.
23

24 The staff has reviewed the available information and the SCE&G analysis discussed above.
25 Because the increase in water use is such a small percentage of the available capacity in the
26 region, the staff concludes that the impact of the increase in water use is SMALL, requiring no
27 additional mitigation.
28

29 **4.4.3 Offsite Land Use During Operations**

30

31 Offsite land use during the license renewal term is a Category 2 issue (10 CFR 51, Subpart A,
32 Appendix B, Table B-1). Table B-1 of 10 CFR 51 Subpart A, Appendix B notes that "significant
33 changes in land use may be associated with population and tax revenue changes resulting from
34 license renewal."
35

Section 4.7.4 of the GEIS defines the magnitude of land-use changes as a result of plant operation during the license renewal term as follows:

SMALL - Little new development and minimal changes to an area's land-use pattern.

MODERATE - Considerable new development and some changes to the land-use pattern.

LARGE - Large-scale new development and major changes in the land-use pattern.

SCE&G has identified a maximum of 60 additional employees during the license renewal term plus an additional 177 indirect jobs (total 237) in the region (SCE&G 2002a). In Section 3.7.5 of the GEIS (NRC 1996), the staff found that if plant-related population growth is less than 5 percent of the study area's total population, then offsite land use changes would be small. This is especially pertinent if the study area has established patterns of residential and commercial development, a population density of at least 23 persons/km² (60 persons/mi²), and at least one urban area with a population of 100,000 or more within 80 km (50 mi). In the case of V.C. Summer, population growth will be less than 5 percent of the four-county area's total population, each county in the area has established patterns of residential and commercial development guided by comprehensive plans, there is a population density of 131 persons per square mile within a 50-mi radius, and there is one urban area (Columbia) with a population of 116,278 in the city and a metropolitan area population of 536,691 (USCB 2000). Consequently, the staff concludes that population changes resulting from license renewal are likely to result in SMALL offsite land use impacts.

Tax revenue can affect land use because it enables local jurisdictions to be able to provide the public services (e.g., transportation and utilities) necessary to support development. In Section 4.7.4.1 of the GEIS, the staff states that the assessment of tax-driven land-use impacts during the license renewal term should consider (1) the size of the plant's payments relative to the community's total revenues, (2) the nature of the community's existing land-use pattern, and (3) the extent to which the community already has public services in place to support and guide development. If the plant's tax payments are projected to be small relative to the community's total revenue, tax-driven land-use changes during the plant's license renewal term would be small, especially where the community has pre-established patterns of development and has provided adequate public services to support and guide development. In Section 4.7.2.1 of the GEIS, the staff states that if tax payments by the plant owner are less than 10 percent of the taxing jurisdiction's revenue, the significance level would be SMALL. If the plant's tax payments are projected to be medium to large relative to the community's total revenue, new tax-driven land-use changes would be MODERATE. If the tax payments are projected to be a dominant

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1 source of the community's total revenue, new tax-driven land uses would be LARGE
2 (NRC 1996a).

3
4 Fairfield County is the only local jurisdiction that taxes V.C. Summer directly. V.C. Summer tax
5 payments to Fairfield County represented approximately 47 percent of total annual property tax
6 revenues and 47 percent of the County's annual operating budget between 1995 and 2000.
7 Continued operation of V.C. Summer over the license renewal term would be important to
8 maintaining the current level of development and public services, but would not result in
9 changes to local land-use and development patterns or result in additional costs for public
10 services. V.C. Summer has been, and would probably continue to be, the dominant source of
11 tax revenue for Fairfield County. However, despite having this income source since the early
12 1980s, Fairfield County has not experienced large land-use changes, especially on the west
13 side near V.C. Summer. The V.C. Summer environs have remained largely rural, county
14 population growth rates after V.C. Summer construction have been minimal, and county
15 planners are not projecting large changes (Stowers 2000).

16
17 SCE&G does not anticipate major refurbishment or construction during the license renewal
18 period and therefore does not anticipate any increase in the assessed value of V.C. Summer
19 due to refurbishment-related improvements nor any related tax-increase-driven changes to
20 offsite land-use and development patterns. If the OL for V.C. Summer was not renewed and
21 the station was decommissioned, then impacts to the tax base of the surrounding communities
22 and their economic structures could be significant, as discussed in Section 8.4.7 of the GEIS
23 (NRC 1996). However, based on the information presented above, the staff concludes that tax-
24 related land-use impacts related to renewing the OL for V.C. Summer are likely to be SMALL.

25 26 **4.4.4 Public Services: Transportation Impacts During Operations**

27
28 On October 4, 1999, 10 CFR 51.53(c)(3)(ii)(J) and 10 CFR Part 51, Subpart A, Appendix B,
29 Table B-1 were revised to clearly state that "Public Services: Transportation Impacts During
30 Operations" is a Category 2 issue (see NRC 1999 for more discussion of this clarification). The
31 issue is treated as such in this SEIS for V.C. Summer.

32
33 As described previously, no major refurbishment is planned and no refurbishment impacts to
34 local transportation are therefore anticipated. The V.C. Summer workforce includes
35 approximately 600 SCE&G and between 130 and 140 contract employees. On an 18-month
36 cycle, 600 to 800 additional workers join the permanent workforce during refueling outages.
37 The SCE&G projection of 60 additional employees associated with license renewal for
38 V.C. Summer represents a conservative estimate that would result in no more than a
39 10 percent increase in the current number of permanent employees and an even smaller

percentage of employees present onsite during a typical refueling outage. This increase in employees and consequent trips generated by renewing the OL would not impact the roadway system that serves V.C. Summer. The area surrounding the station is essentially rural, low-density residential and there is adequate roadway network capacity even though these are rural roads. Roadway improvements are proposed in the vicinity of V.C. Summer to SC 213 and the Peak Bypass and are shown on the Long-Range Rural System Upgrades Map maintained by the Central Midlands Council of Governments.

The staff has reviewed the SCE&G ER (SCE&G 2002a) and other information made available during interviews with local officials and observation of the transportation conditions around V.C. Summer and concludes that impacts of V.C. Summer license renewal on transportation would be SMALL and mitigation would not be warranted.

4.4.5 Historic and Archaeological Resources

The National Historic Preservation Act of 1966 (NHPA), as amended, requires Federal agencies to take into account the effects of their undertakings on historic properties. The historic preservation review process mandated by Section 106 of the NHPA is outlined in regulations issued by the Advisory Council on Historic Preservation at 36 CFR Part 800. Renewal of an OL could potentially affect historic properties that may be located at the site. Therefore, in accordance with the NHPA, the NRC must make a reasonable effort to identify historic properties in the areas of potential effects. If no historic properties are present or affected, the NRC is required to notify the State Historic Preservation Officer (SHPO) before proceeding. If it is determined that historic properties are present, the NRC is required to assess and resolve possible adverse effects of the undertaking.

In January 2001, SCE&G wrote to the South Carolina SHPO requesting comments on the V.C. Summer license renewal process. In this letter, SCE&G determined that the continued operation of V.C. Summer will have no impact on historic properties (SCE&G 2001). In a response dated January 29, 2001, the South Carolina SHPO stated that license renewal for the continuing operation of plants such as this one typically has no effect on historic properties (SHPO 2001). NRC has initiated consultation with the South Carolina SHPO pursuant to Section 10 of the NHPA.

Major refurbishment of V.C. Summer is not required during the license renewal period, so there will be no need to use currently undeveloped portions of the site for operations during the renewal period. Operation of V.C. Summer, as planned under the application for license renewal, would protect undiscovered historic or archaeological resources on the site because

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the undeveloped natural landscape and vegetation would remain undisturbed, and access to the site would remain restricted.

SCE&G established a land use and shoreline management plan. The purpose of this plan is to help maintain and conserve the area's natural and human-made resources as well as assist in providing a balance between recreational use and development and environmental preservation and control. This management plan addresses environmental policies including the exclusion zone, public access, public fishing, and boating and hunting, as well as shoreline activities. Erosion control measures are identified as well as restrictions on the removal of under brushing (SCE&G 2002b).

SCE&G operating procedures take into account the inadvertent discovery of historic and archaeological remains at V.C. Summer. However, care should be taken during normal operational and maintenance conditions to ensure that historic properties are not inadvertently impacted. These activities may include not only operation of V.C. Summer itself, but also land management-related actions such as recreation, wildlife habitat enhancement, or maintaining/upgrading V.C. Summer access roads through the site and on transmission line rights-of-way.

Based on the staff's cultural resources analysis and consultation, on SCE&G conclusions that major refurbishment activities will not be undertaken related to the license renewal of V.C. Summer, and on the fact that operation will continue within the bounds of station operations as evaluated in the *Final Environmental Statement* (AEC 1973), the staff concludes that the potential impacts on historic and archaeological resources are SMALL, and no additional mitigation is warranted.

4.4.6 Environmental Justice

Environmental justice refers to a Federal policy that requires that Federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its actions on minority^(a) or low-income populations. The memorandum accompanying Executive Order 12898 (59 *Federal Register* 7629) directs Federal executive agencies to consider environmental justice under the National Environmental Policy Act of 1969. The Council on Environmental Quality has provided guidance for addressing environmental justice (CEQ 1997). Although the Executive Order is not mandatory for independent agencies, the

(a) The NRC Guidance for performing environmental justice reviews defines "minority" as American Indian or Alaskan Native, Asian or Pacific Islander, Black not of Hispanic Origin, or Hispanic (NRC 2001).

NRC has voluntarily committed to undertake environmental justice reviews. Specific guidance is provided in NRC Office of Nuclear Reactor Regulation Office Instruction LIC-203, *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues* (NRC 2001).

The staff examined the geographic distribution of minority and low-income populations within 80 km (50 mi) of V.C. Summer, using the 2000 Census (USCB 2000) for low-income and minority populations. The radius within 80 km (50 mi) of V.C. Summer encompassed 21 South Carolina counties and a small portion of one county in North Carolina. The analysis was supplemented with interviews with local governments and social service agencies in Fairfield County and the Central Midlands Region.

For the purpose of the staff's review, a minority population is defined to exist if the percentage of each minority and aggregated minority category within the census block groups potentially affected by the license renewal of V.C. Summer exceeds the corresponding percentage of minorities in the entire State of South Carolina by 20 percent; or if the corresponding percentage of minorities within the census block group is at least 50 percent. A low-income population is defined to exist if the percentage of low-income population within a census block group^(a) exceeds the corresponding percentage of low-income population in the entire State of South Carolina by 20 percent, or if the corresponding percentage of low-income population within a census block group is at least 50 percent.

The Census Bureau data characterize South Carolina as 0.3 percent American Indian or Alaskan Native; 0.9 percent Asian; 0.0 percent Native Hawaiian or other Pacific Islander; 29.5 percent Black races; 1.0 percent all other single minorities; 1.0 percent multi-racial; 32.8 percent aggregate of minority races; and 2.4 percent Hispanic ethnicity (USCB 2000). Census Bureau data characterize North Carolina as 1.2 percent American Indian or Alaskan Native; 1.4 percent Asian; 0.0 percent Native Hawaiian or other Pacific Islander; 21.6 percent Black races; 2.3 percent all other single minorities; 1.3 percent multi-racial; 27.9 percent aggregate of minority races; and 4.7 percent Hispanic ethnicity (USCB 2000).

(a) A census block group is a combination of census blocks, which are statistical subdivisions of a census tract. A census block is the smallest geographic entity for which the Census Bureau collects and tabulates decennial census information. A census tract is a small, relatively permanent statistical subdivision of counties delineated by local committees of census data users in accordance with Census Bureau guidelines for the purpose of collecting and presenting decennial census data. Census block groups are subsets of census tracts (USCB 2001).

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1 The SCE&G ER (SCE&G 2002a) reported that aggregate minority populations exist in
2 230 block groups based on the more than 20 percent criterion. Figure 4-1 displays the location
3 of these minority block groups distributed among the counties in the geographic area. The
4 African American minority population exists in 209 block groups based on the more than
5 20 percent criterion. Based on the more than 20 percent criterion, American Indian or Alaskan
6 Native minority populations exist in a single block group in York County. The Catawba Indian
7 Nation has tribal lands (approximately 283 ha [700 ac]) in the Rock Hill, South Carolina, area
8 (EDA 2000). Total tribal membership is believed to be around 3000, with approximately half of
9 this number living in York County and Lancaster County (EDA 2000; EPA 2001). Based on the
10 more than 20 percent criterion, Hispanic ethnicity minority populations exist in two block groups
11 that are in Saluda County and Greenwood County. Based on the more than 20 percent
12 criterion, the Asian minority population exists in a single block group in Richland County. No
13 Native Hawaiian or other Pacific Islander, other single minorities, or multi-racial minorities exist
14 in the geographic area based on the more-than-20-percent or the exceeds-50-percent criteria.

15
16 The Census Bureau had not yet released 2000 census data for low-income households when
17 the SCE&G ER (SCE&G 2002a) was prepared. Therefore, SCE&G used 1990 census data
18 from the Census Bureau website (USCB 1991) in reporting the percentage of the total
19 households within the States of North Carolina and South Carolina that are deemed low-income
20 households and in identifying low-income households within 80 km (50 mi) of V.C. Summer.
21 The 2000 census data for low-income households has since been made available by the
22 Census Bureau, and subsequently, the staff assessed this matter using the more recent data.

23
24 NRC guidance defines low-income using Census Bureau statistical poverty thresholds (NRC
25 2001, Appendix D). The low-income household numbers for each census tract were divided by
26 the total households for that census tract to obtain the percentage of low-income households
27 per census tract. Census Bureau data (USCB 1991) characterize 15.8 percent of South
28 Carolina and 14.0 percent of North Carolina households as low income. Based on the more-
29 than-20-percent criterion, 15 1990-census tracts contained a low-income population. Eleven of
30 these tracts were found in Richland County, two in York County, and one each in Lexington and
31 Sumter Counties. Figure 4-2 displays the locations of low-income household tracts among the
32 counties in the geographic area.

33
34 With the locations of minority and low-income populations identified, the staff proceeded to
35 evaluate whether any of the environmental impacts of the proposed action could affect these
36

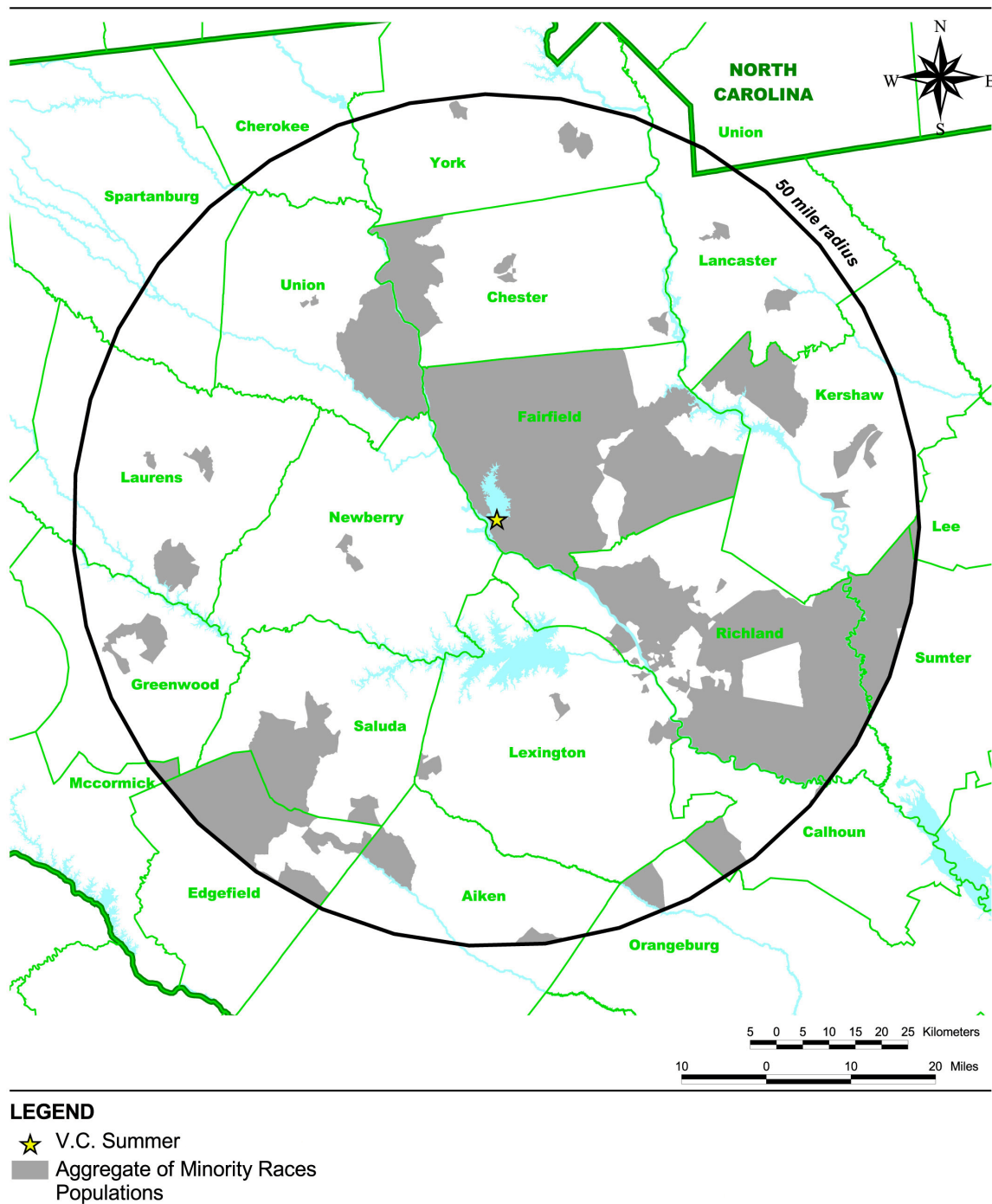


Figure 4-1. Geographic Distribution of Minority Populations within 80 km (50 mi) of V.C. Summer

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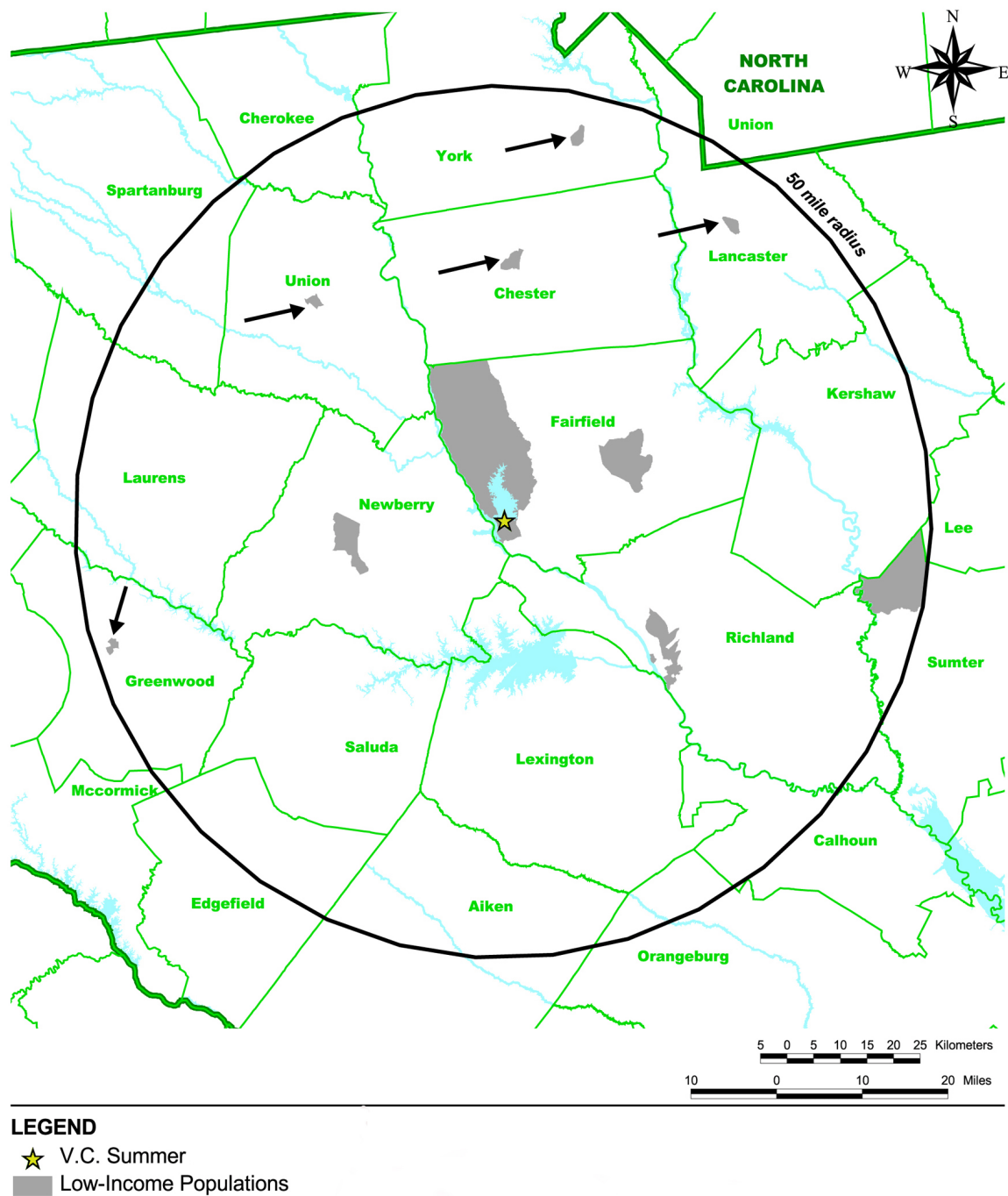


Figure 4-2. Locations of Low-income Populations within 80 km (50 mi) of V.C. Summer

populations in a disproportionately high and adverse manner. Based on staff guidance (NRC 2001), air, land, and water resources within about 80 km (50 mi) of V.C. Summer were examined. Within that area, a few potential environmental impacts could affect human populations; all of these were considered SMALL for the general population.

The pathways through which the environmental impacts associated with V.C. Summer license renewal can affect human populations are discussed throughout this SEIS. The staff evaluated whether minority and low-income populations could be disproportionately affected by these impacts. The staff found no unusual resource dependencies or practices, such as subsistence agriculture, hunting, or fishing through which the populations could be disproportionately high and adversely affected. In addition, the staff did not identify any location-dependent disproportionately high and adverse impacts affecting these minority and low-income populations. The staff concludes that offsite impacts from V.C. Summer to minority and low-income populations would be SMALL, and no special mitigation is warranted.

It is evident from staff consultations with local officials and research that Fairfield and Newberry Counties demonstrate many of the hallmarks of communities likely to be impacted by environmental justice issues. There are many indicators that this is a valid observation that can be supported by the reports of local social service agencies (United Way of the Central Midlands 2002). It can also be concluded that the presence of V.C. Summer may counteract and mitigate some of these socioeconomic issues and concerns.

4.5 Groundwater Use and Quality

The single Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that is applicable to V.C. Summer groundwater use and quality is listed in Table 4-9. SCE&G stated in its ER that it is not aware of any new and significant information associated with the renewal of the V.C. Summer OL (SCE&G 2002a). The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no impacts related to this issue beyond those discussed in the GEIS. For this issue, the GEIS concluded that the impacts are SMALL, and additional plant-specific mitigation is not likely to be sufficiently beneficial to be warranted.

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, 10 CFR 51, follows.

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Table 4-9. Category 1 Issue Applicable to Groundwater Use and Quality During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
GROUNDWATER USE AND QUALITY	
Groundwater-use conflicts (potable and service water; plants that use <100 gpm).	4.8.1.1

- Groundwater-use conflicts (potable and service water; plants that use <100 gpm).

Based on information in the GEIS, the Commission found that

Plants using less than 100 gpm are not expected to cause any groundwater-use conflicts.

The V.C. Summer groundwater use is less than 100 gpm. The staff has not identified any significant new information during its independent review of the SCE&G ER, the staff's site visit, the scoping process, or staff evaluation of other available information. Therefore, the staff concludes that there are no groundwater-use conflicts during the renewal term beyond those discussed in the GEIS.

Category 2 issues related to groundwater use and quality during the renewal term that are applicable to V.C. Summer are discussed in the sections that follow. These issues, which require plant-specific analysis, are listed in Table 4-10.

4.5.1 Groundwater Use Conflicts (Plants Using Cooling Towers or Cooling Ponds that Withdraw Make-up Water from a Small River)

The issue of groundwater use conflicts applies to V.C. Summer 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 $5.9 \times 10^9 \text{ m}^3/\text{yr}$ ($2.1 \times 10^{11} \text{ ft}^3/\text{yr}$).

Daily mean flow in the Broad River in the vicinity of V.C. Summer (at Alston, South Carolina, 1.9 km [1.2 mi] downstream of the Parr Shoals dam) ranged from $6.65 \text{ m}^3/\text{s}$ (235 to 130,000 cfs) over the period of record, with an annual average of $185.05 \text{ m}^3/\text{s}$ (6535 cfs). According to

Table 4-10. Category 2 Issues Applicable to Groundwater Use and Quality During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
GROUND-WATER USE AND QUALITY			
Groundwater-use conflicts (plants using cooling towers or cooling ponds that withdraw make-up water from a small river)	4.8.1.3 4.4.2.1	A	4.5.1
Groundwater quality degradation (cooling ponds at inland sites)	4.8.3	D	4.5.2

the *Final Environmental Statements* for construction (AEC 1973) and operation (NRC 1981) of Summer Station, the lowest recorded daily mean flow at a gauging station in the vicinity of V.C. Summer was 4.22 m³/s (149 cfs) at Richtex, South Carolina, 11.26 km (7 mi) downstream of the Parr Shoals dam. This U.S. Geological Survey 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 V.C. Summer water use reports for 1998 and 1999 indicate that evaporative losses as high as 0.62 m³/s (22 cfs) are associated with V.C. Summer operations (SCE&G 1998, 1999). This loss represents approximately 1.7 percent of the cooling water removed from the reservoir (37.04 m³/s [1308 cfs]) and approximately 0.3 percent of the average annual natural stream flow of 185.05 m³/s (6535 cfs). The potential evaporative loss represents 14.8 percent of the lowest recorded daily mean stream flow of 4.22 m³/s (149 cfs) reported in the *Final Environmental Statement* (NRC 1981).

Water 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 flow is regulated to maintain a minimum downstream release of 4.25 m³/s (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 flood plain was inundated. The surrounding area is characterized by a surficial water table aquifer in saprolitic soils and shallow fractures in rocks (SCE&G 2002a). 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

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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 V.C. Summer operation on the alluvial aquifer over the license renewal term would likewise be SMALL and would not warrant mitigation.

The staff has reviewed the available information including the discharge history of the Broad River, maintenance of minimum flow conditions on the Broad River, the physiographic and hydrogeologic setting, and the demands placed on the Broad River during low-flow conditions to compensate for evaporative losses. Based on this evaluation, any impacts from V.C. Summer on the Broad River flow conditions or associated, sparsely-distributed alluvial groundwater that would affect instream and riparian communities in Parr Reservoir or the Broad River over the license renewal term would be SMALL and would not warrant mitigation.

4.5.2 Groundwater Quality Degradation (Cooling Ponds at Inland Sites)

The issue of groundwater degradation applies to V.C. Summer because the station uses a cooling pond. V.C. Summer 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 V.C. Summer 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. Make-up 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).

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 and Moore 1985). 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 and Moore 1985, Table 2.2.2; SCE&G 2002a). There is no indication that evaporative losses associated with operation of V.C. Summer 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 V.C. Summer. Impacts of continued operation would be SMALL and would not warrant mitigation.

The staff has reviewed the available information including the physiographic and hydrogeologic setting and the water quality of Monticello Reservoir and the regional groundwater. Based on this evaluation, overall groundwater quality is likely to be improved by the presence of Monticello Reservoir and any negative impacts from V.C. Summer on the groundwater in the vicinity of the Station over the license renewal term would be SMALL and would not warrant mitigation.

4.6 Threatened or Endangered Species

Threatened or endangered species are listed as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue is listed in Table 4-11.

This issue requires consultation with appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected by continued operation of the nuclear plant during the license renewal term. The presence of threatened or endangered species in the vicinity of V.C. Summer is discussed in Sections 2.2.5 and 2.2.6.

4.6.1 Aquatic Species

No Federal-listed threatened or endangered aquatic species or their habitats are known to occur at the V.C. Summer site, including Monticello/Parr Reservoir system or in streams that are crossed by a V.C. Summer transmission line corridor (SCE&G 2002a).

Aquatic species that may have historically inhabited the Broad River include the shortnose sturgeon (*Acipenser brevirostrum*), a Federal-listed endangered species of fish, and a mussel, the Carolina heelsplitter (*Lasmigona decorata*). The shortnose sturgeon is currently not known from the Broad River; the nearest documented populations are in Lakes Marion and Moultrie in the Santee Cooper system. The upstream migration of this species is prevented by dams. Although the Carolina heelsplitter is known from several creeks in the western portion of Edgewood County, this mussel is not known from the watersheds of creeks in the north-eastern portion of the county that is crossed by a V.C. Summer transmission line corridor.

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Table 4-11. Category 2 Issue Applicable to Threatened or Endangered Species During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)			
Threatened or endangered species	4.1	E	4.6

The staff has prepared an assessment evaluating the potential impacts on aquatic threatened or endangered species resulting from the operation of V.C. Summer for an additional 20 years during the renewal period. The staff concluded that V.C. Summer license renewal will have no effect on the shortnose sturgeon or the Carolina heelsplitter. In a letter dated June 26, 2003, the staff transmitted its biological assessment to the USFWS and requested concurrence on its determination. The letter to USFWS and the staff's biological assessment are included in Appendix E to this SEIS.

The staff has reviewed the V.C. Summer ER (SCE&G 2002a), visited the site, reviewed the current NPDES permit (SC003856, issued 9/29/97) and related operational and biological information, and consulted with the USFWS. The staff concludes that license renewal will not impact Federal-listed aquatic threatened or endangered species or their critical habitat. During the course of its evaluation, the staff considered whether further mitigation for continued operation of V.C. Summer was warranted. Based on this evaluation, the staff determined that mitigation in place at V.C. Summer is appropriate and no additional mitigation is warranted.

4.6.2 Terrestrial Species

There are 10 Federal-listed or candidate terrestrial species that are known to occur in the vicinity of V.C. Summer or in counties crossed by the transmission lines (see Section 2.2.6). However, of these species, the bald eagle (*Haliaeetus leucocephalus*) is the only terrestrial species known to occur at V.C. Summer or along its transmission line corridors. There have been no reports of collisions or electrocutions of bald eagles along the transmission lines. SCE&G and Santee Cooper participate with the U.S. Department of Agriculture-Natural Resources Conservation Service, SCDNR, and other organizations in a wildlife management program for transmission line corridors. The "Power for Wildlife" program is designed to help landowners whose property is crossed by transmission lines convert transmission corridors into productive habitat for wildlife. In addition, SCE&G's procedures require that it follow the

USFWS habitat management guidelines for the bald eagle in the Southeast Region (USFWS 1987) and submit a raptor incident report in the event that an electrocuted eagle is found.

The staff has prepared an assessment evaluating the potential impacts on terrestrial threatened, endangered, or candidate species resulting from the operation of V.C. Summer for an additional 20 years during the renewal period. The staff concluded that V.C. Summer license renewal will have no effect on the wood stork, red-cockaded woodpecker, pool sprite, Georgia aster, smooth coneflower, rough-leaved loosestrife, Canby's dropwort, harperella, or relict trillium. The license renewal may affect, but is not likely to adversely affect, the bald eagle. In a letter dated June 26, 2003, the staff transmitted its biological assessment to the USFWS and requested concurrence on its determination. The letter to USFWS and the staff's biological assessment are included in Appendix E to this SEIS.

The staff has reviewed the information provided by the applicant, met with the SCDNR, and has consulted with the U.S. Fish and Wildlife Service. Based on the site visit, review of the ER, other reports, and consultation with the U.S. Fish and Wildlife Service and the SCDNR, it is the staff's preliminary conclusion that the impacts on terrestrial endangered, threatened, or candidate species of an additional 20 years of operation and maintenance of V.C. Summer and its associated transmission lines would be SMALL, and further mitigation is not warranted.

4.7 Evaluation of Potential New and Significant Information on Impacts of Operations During the Renewal Term

The staff has not identified significant new information on environmental issues listed in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, related to operation during the renewal term. The staff reviewed the discussion of environmental impacts associated with operation during the renewal term in the GEIS and has conducted its own independent review, including public scoping meetings, to identify issues with significant new information. Processes for identification and evaluation of new information are described in Section 1.2.2, License Renewal Evaluation Process.

4.8 Evaluation of Cumulative Impacts of Operations During the Renewal Term

The staff considered potential cumulative impacts during the evaluation of information applicable to each of the potential impacts identified within the GEIS. The impacts of the

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proposed license renewal are combined with other past, present, and reasonably foreseeable actions to determine whether cumulative impacts exist. For the purposes of this analysis, past actions were those related to the resources at the time of the plant licensing and construction. Current actions are the operation of the power plant and future actions are considered to be those that are reasonably foreseeable through the end of plant operation. Therefore, the analysis considers potential impacts through the end of the current license term, as well as the 20-year renewal license term. The geographical area over which past, present, and future actions that could contribute to cumulative impacts depends on the type of action considered, and is described below for each impact area.

4.8.1 Cumulative Impacts Resulting from Operation of the Plant Cooling System

For the purposes of this analysis, the geographic area considered is the Broad River. As described in Section 4.1, the staff found no new and significant information indicating that the conclusions regarding any of the cooling system-related Category 1 issues as related to V.C. Summer are inconsistent with the conclusions in the GEIS. Additionally, the staff has determined that none of the cooling system-related Category 2 issues were likely to have greater than a SMALL impact on local water quality or aquatic resources.

Cumulative impacts to the Broad River involve water use conflicts. As described in Section 2.1.3, V.C. Summer utilizes the Monticello Reservoir as a source of cooling water for its condenser. Monticello Reservoir is connected hydrologically to the Broad River by the Parr Reservoir and the Fairfield Pumping Station. Even through severe drought conditions, operations at V.C. Summer did not exceed any Federal Energy Regulatory Commission-mandated flow restrictions. There are no known or planned activities on the Broad River that could potentially produce additional water conflicts. Therefore, the cumulative impact is SMALL and no mitigation measures are warranted.

4.8.2 Cumulative Impacts Resulting from Continued Operation of the Transmission Lines

The continued operation of the V.C. Summer electrical transmission facilities was evaluated to determine if there is the potential for interactions with other past, present, and future actions that could result in adverse cumulative impacts to terrestrial resources such as wildlife populations, and the size and distribution of habitat areas; aquatic resources such as wetlands and floodplains; and both the acute and chronic effects of electromagnetic fields. For the purposes of this analysis, the geographic area that encompasses the past, present and

foreseeable future actions that could contribute to adverse cumulative effects is the area within 50 miles of the V.C. Summer site, as depicted in Figure 2-1.

As described in Section 4.2, the staff found no new and significant information indicating that the conclusions regarding any of the transmission line-related Category 1 issues related to V.C. Summer are inconsistent with the conclusions in the GEIS. For the category 2 issue related to electromagnetic fields-acute effects (electric shock), the impact is small and the uncategorized issue of chronic effects is still considered "not applicable." There are no known or planned activities within the 80-km (50-mi) radius area of consideration that could potentially produce additional impacts associated with transmission lines. Therefore, the cumulative impact is SMALL and no mitigation measures are warranted.

4.8.3 Cumulative Radiological Impacts

The radiological exposure limits for protection of the public and for occupational exposures have been developed assuming long-term exposures, and therefore incorporate cumulative impacts. As described in Section 2.2.7, the public and occupational doses resulting from V.C. Summer are well below regulatory limits, and as described in Section 4.3, the impacts of these exposures are SMALL. For the purposes of this analysis, the geographical area is the area included within a 80-km (50-mi) radius of the V.C. Summer site (Figure 2-1). The NRC would regulate any reasonably foreseeable future actions in the vicinity of V.C. Summer that could contribute to cumulative radiological impacts.

Therefore, the staff has determined that the cumulative radiological impacts of continued operation of V.C. Summer will be SMALL, and that additional mitigation is not warranted.

4.8.4 Cumulative Socioeconomic Impacts

Much of the analyses of socioeconomic impacts presented in Section 4.4 of this SEIS already incorporate cumulative impact analysis because the metrics used for quantification only make sense when placed in the total or cumulative context. For instance, the impact of the total number of additional housing units that may be needed can only be evaluated with respect to the total number that will be available in the impacted area. Therefore, the geographical area of the cumulative analysis varies depending on the particular impact considered, and may depend on specific boundaries, such as taxation jurisdictions or may be distance related, as in the case of Environmental Justice.

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The continued operation of V.C. Summer is not likely to add to any cumulative socioeconomic impacts beyond those already evaluated in Sections 4.4. In other words, the impacts of issues such as transportation or offsite land-use are likely to be non-detectable beyond the regions previously evaluated and will quickly decrease with increasing distance from the site. The staff has determined that the impacts on housing, public utilities, public services, and environmental justice would all be SMALL. The staff has determined that the impact on off-site land-use is SMALL because, even though V.C. Summer provides greater than 10% of the property tax revenue for the Fairfield County School District, there are no refurbishment actions planned at V.C. Summer. There are no reasonably foreseeable scenarios that would alter these conclusions in regard to cumulative impacts.

Related to historic resources, there are no structures eligible for the inclusion in the National Register of Historic Places on the V.C. Summer site or along the transmission lines. The staff has concluded that the impacts of license renewal would be SMALL. There is no reason to believe that the continued operation and maintenance of the V.C. Summer site and transmission line rights-of-way would impact any properties beyond the site or right-of-way boundaries, and therefore the contribution to a cumulative impact on historic resources would be negligible.

Based on these considerations, the staff concludes that continued operation of V.C. Summer is not likely to make a detectable contribution to the cumulative effects associated with any of the socioeconomic issues discussed in Section 4.4, and therefore, the cumulative impacts will be SMALL and no additional mitigation measures are warranted.

4.8.5 Cumulative Impacts on Groundwater Use and Quality

There are no known or planned projects that would require withdrawal of groundwater that, if implemented in addition to license renewal, would potentially cause an adverse impact on groundwater. The V.C. Summer groundwater use is less than 100 gpm. The current impact on the alluvial aquifer due to plant operations and current groundwater withdrawals are small as discussed in Section 4.5. Therefore the cumulative impact is SMALL and no mitigation measures are warranted.

4.8.6 Cumulative Impacts on Threatened or Endangered Species

The geographic area considered in the analysis of cumulative impacts to threatened or endangered species includes V.C. Summer project area and the associated transmission line right-of-way. As discussed in Sections 2.2.5 and 2.2.6, there are several threatened or

endangered species that occur within this area. However, the staff determined in Section 4.6 that continued operation of V.C. Summer would have no effect or is not likely to adversely effect any of these species. Therefore, the continued operation of V.C. Summer will not contribute to a regional cumulative impact to these species, regardless of whether or not other actions occur that could have adverse impacts.

Therefore, the staff has determined that the cumulative impacts to threatened or endangered species due to continued operation at the V.C. Summer site and associated transmission line will be SMALL, and that additional mitigation measures would not be warranted.

4.9 Summary of Impacts of Operations During the Renewal Term

Neither SCE&G nor the staff is aware of information that is both new and significant related to any of the applicable Category 1 issues associated with the V.C. Summer operation during the renewal term. Consequently, the staff concludes that the environmental impacts associated with these issues are bounded by the impacts described in the GEIS. For each of these issues, the GEIS concluded that the impacts would be SMALL and that additional plant-specific mitigation is not likely to be sufficiently beneficial to warrant implementation.

Plant-specific environmental evaluations were conducted for 14 Category 2 issues applicable to V.C. Summer operation during the renewal term and for chronic effects of electromagnetic fields and environmental justice. For all issues, the staff concluded that the potential environmental impact of renewal term operations of V.C. Summer would be of SMALL significance in the context of the standards set forth in the GEIS and that additional mitigation would not be warranted.

4.10 References

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10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 20, "Domestic Licensing of Production and Utilization Facilities."

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