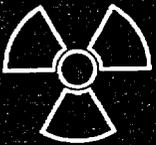
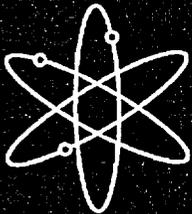




Generic Environmental Impact Statement for License Renewal of Nuclear Plants



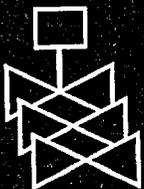
Supplement 13



Regarding
H.B. Robinson Steam Electric Plant, Unit No. 2



Draft Report for Comment



U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, DC 20555-0001



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**Generic Environmental
Impact Statement for
License Renewal of
Nuclear Plants**

Supplement 13

**Regarding
H.B. Robinson Steam Electric Plant, Unit No. 2**

Draft Report for Comment

Manuscript Completed: May 2003
Date Published: May 2003

**Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001**



COMMENTS ON DRAFT REPORT

Any interested party may submit comments on this report for consideration by the NRC staff. Comments may be accompanied by additional relevant information or supporting data. Please specify the report number NUREG-1437, Supplement 13, draft, in your comments, and send them by July 30, 2003 to the following address:

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For any questions about the material in this report, please contact:

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Abstract

1
2
3
4 The U.S. Nuclear Regulatory Commission (NRC) considered the environmental impacts of
5 renewing nuclear power plant operating licenses (OLs) for a 20-year period in its *Generic*
6 *Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437,
7 Volumes 1 and 2, and codified the results in 10 CFR Part 51. In the GEIS (and its
8 Addendum 1), the staff identifies 92 environmental issues and reaches generic conclusions
9 related to environmental impacts for 69 of these issues that apply to all plants or to plants with
10 specific design or site characteristics. Additional plant-specific review is required for the
11 remaining 23 issues. These plant-specific reviews are to be included in a supplement to the
12 GEIS.

13
14 This draft supplemental environmental impact statement (SEIS) has been prepared in response
15 to an application submitted to the NRC by the Carolina Power and Light Company (CP&L) to
16 renew the OL for H.B. Robinson Steam Electric Plant, Unit No. 2 (RNP), for an additional
17 20 years under 10 CFR Part 54. This draft SEIS includes the NRC staff's analysis that
18 considers and weighs the environmental impacts of the proposed action, the environmental
19 impacts of alternatives to the proposed action, and mitigation measures available for reducing
20 or avoiding adverse impacts. It also includes the staff's preliminary recommendation regarding
21 the proposed action.

22
23 Regarding the 69 issues for which the GEIS reached generic conclusions, neither CP&L nor the
24 staff has identified information that is both new and significant for any issue for which the GEIS
25 reached a generic conclusion that applies to RNP. In addition, the staff determined that
26 information provided during the scoping process did not call into question the conclusions in the
27 GEIS. Therefore, the staff concludes that the impacts of renewing the RNP OL will not be
28 greater than impacts identified for these issues in the GEIS. For each of these issues, the
29 staff's conclusion in the GEIS is that the impact is of SMALL^(a) significance (except for collective
30 offsite radiological impacts from the fuel cycle and high-level waste and spent fuel, which were
31 not assigned a single significance level).

32
33 Regarding the remaining 23 issues, those that apply to RNP are addressed in this draft SEIS.
34 For each applicable issue, the staff concludes that the significance of the potential
35 environmental impacts of renewal of the OL is SMALL. The staff also concludes that additional
36 mitigation measures are not likely to be sufficiently beneficial as to be warranted. The staff
37 determined that information provided during the scoping process did not identify any new issue
38 that has a significant environmental impact.

(a) Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

Abstract

1 The NRC staff's preliminary recommendation is that the Commission determine that the
2 adverse environmental impacts of license renewal for RNP are not so great that preserving the
3 option of license renewal for energy-planning decisionmakers would be unreasonable. This
4 recommendation is based on (1) the analysis and findings in the GEIS; (2) the Environmental
5 Report submitted by CP&L; (3) consultation with Federal, State, and local agencies; (4) the
6 staff's own independent review; and (5) the staff's consideration of public comments received
7 during the scoping process.

8
9

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Executive Summary

By letter dated June 14, 2002, the Carolina Power and Light Company (CP&L) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license (OL) for H.B. Robinson Steam Electric Plant, Unit 2 (RNP), for an additional 20-year period. If the OL is renewed, State regulatory agencies and CP&L will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners. If the OL is not renewed, then the plant must be shut down at or before the expiration date of the current OL, which is July 31, 2010.

Section 102 of the National Environmental Policy Act (NEPA) (42 USC 4321) directs that an environmental impact statement (EIS) is required for major Federal actions that significantly affect the quality of the human environment. The NRC has implemented Section 102 of NEPA in 10 CFR Part 51. Part 51 identifies licensing and regulatory actions that require an EIS. In 10 CFR 51.20(b)(2), the Commission requires preparation of an EIS or a supplement to an EIS for renewal of a reactor OL; 10 CFR 51.95(c) states that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2.^(a)

Upon acceptance of the CP&L application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing a notice of intent to prepare an EIS and conduct scoping. The staff visited the RNP site in September 2002 and held public scoping meetings on September 25, 2002, in Hartsville, South Carolina. In the preparation of this draft supplemental environmental impact statement (SEIS) for RNP, the staff reviewed the CP&L Environmental Report (ER) and compared it to the GEIS, consulted with other agencies, conducted an independent review of the issues following the guidance set forth in NUREG-1555, Supplement 1, the *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*, and considered the public comments received during the scoping process. The public comments received during the scoping process are provided in Appendix A, Part 1, of this SEIS.

The staff will hold two public meetings in Hartsville, South Carolina, in June 2003 to describe the preliminary results of the NRC environmental review and to answer questions to provide members of the public with information to assist them in formulating comments on this SEIS. When the comment period ends, the staff will consider and disposition all of the comments received. These comments will be addressed in Appendix A, Part 2, of the final SEIS.

This draft SEIS includes the NRC staff's preliminary analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the

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

Executive Summary

proposed action, and mitigation measures for reducing or avoiding adverse effects. It also includes the staff's preliminary recommendation regarding the proposed action.

The Commission has adopted the following statement of purpose and need for license renewal from the GEIS:

The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than NRC) decisionmakers.

The goal of the staff's environmental review, as defined in 10 CFR 51.95(c)(4) and the GEIS, is to determine

... whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

Both the statement of purpose and need and the evaluation criterion implicitly acknowledge that there are factors, in addition to license renewal, that will ultimately determine whether an existing nuclear power plant continues to operate beyond the period of the current OL.

NRC regulations [10 CFR 51.95(c)(2)] contain the following statement regarding the content of SEISs prepared at the license-renewal stage:

The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, the supplemental environmental impact statement prepared at the license renewal stage need not discuss other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the facility within the scope of the generic determination in § 51.23(a) ["Temporary storage of spent fuel after cessation of reactor operation—generic determination of no significant environmental impact"] and in accordance with § 51.23(b).

The GEIS contains the results of a systematic evaluation of the consequences of renewing an OL and operating a nuclear power plant for an additional 20 years. It evaluates 92 environmental issues using the NRC's three-level standard of significance – SMALL, MODERATE, or LARGE – developed using the Council on Environmental Quality guidelines.

The following definitions of the three significance levels are set forth in footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B:

SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

For 69 of the 92 issues considered in the GEIS, the analysis in the GEIS reached the following conclusions:

- (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 characteristics.
- (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.

These 69 issues were identified in the GEIS as Category 1 issues. In the absence of new and significant information, the staff relied on conclusions as amplified by supporting information in the GEIS for issues designated as Category 1 in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B.

Of the 23 issues that do not meet the criteria set forth above, 21 are classified as Category 2 issues requiring analysis in a plant-specific supplement to the GEIS. The remaining two issues, environmental justice and chronic effects of electromagnetic fields, were not categorized. Environmental justice was not evaluated on a generic basis and must be addressed in a plant-specific supplement to the GEIS. Information on the chronic effects of electromagnetic fields was not conclusive at the time the GEIS was prepared.

This draft SEIS documents the staff's evaluation of all 92 environmental issues considered in the GEIS. The staff considered the environmental impacts associated with alternatives to license renewal and compared the environmental impacts of license renewal and the alternatives. The alternatives to license renewal that were considered include the no-action

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alternative (not renewing the OL for RNP) and alternative methods of power generation. Based on projections made by the U.S. Department of Energy's Energy Information Administration (DOE/EIA), gas- and coal-fired generation appear to be the most likely power-generation alternatives if the power from RNP is replaced. These alternatives are evaluated assuming that the replacement power generation plant is located at either the Robinson site or some other unspecified alternate location in South Carolina.

CP&L and the staff have established independent processes for identifying and evaluating the significance of any new information on the environmental impacts of license renewal. Neither CP&L nor the staff has identified information that is both new and significant related to Category 1 issues that would call into question the conclusions in the GEIS. Similarly, neither the scoping process nor the staff review has identified any new issue applicable to RNP that has a significant environmental impact. Therefore, the staff relies upon the conclusions of the GEIS for all of the Category 1 issues that are applicable to RNP.

CP&L's license-renewal application presents an analysis of the Category 2 issues plus environmental justice and chronic effects from electromagnetic fields. The staff has reviewed the CP&L analysis for each issue and has conducted an independent review of each issue. One Category 2 issue is not applicable, because it is related to plant design features or site characteristics not found at RNP. Four Category 2 issues are not discussed in this draft SEIS, because they are specifically related to refurbishment. CP&L has stated that its evaluation of structures and components, as required by 10 CFR 54.21, did not identify any major plant refurbishment activities or modifications as necessary to support the continued operation of RNP, for the license-renewal period. In addition, any replacement of components or additional inspection activities that are within the bounds of normal plant operation are not expected to affect the environment outside of the bounds of the plant operations evaluated in the U.S. Nuclear Regulatory Commission's *Final Environmental Statement Related to Operation of Robinson Nuclear Steam-Electric Plant Unit 2*, which was published in 1975.

Sixteen Category 2 issues related to operational impacts and postulated accidents during the renewal term, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this draft SEIS. Four of the Category 2 issues and environmental justice apply to both refurbishment and to operation during the renewal term and are only discussed in this draft SEIS in relation to operation during the renewal term. For all 16 Category 2 issues and environmental justice, the staff concludes that the potential environmental effects are of SMALL significance in the context of the standards set forth in the GEIS. In addition, the staff determined that appropriate Federal health agencies have not reached a consensus on the existence of chronic adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required. For severe accident mitigation alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on its review of the SAMAs and the IPEEE report for RNP and the plant improvements already made, the staff has identified two new SAMAs not previously identified by CP&L that are cost-beneficial. However, these SAMAs do not relate to adequately

managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

Mitigation measures were considered for each Category 2 issue. Current measures to mitigate the environmental impacts of plant operation were found to be adequate, and no additional mitigation measures were deemed sufficiently beneficial to be warranted.

If the RNP operating license is not renewed and the unit ceases operation on or before the expiration of the current operating license, then the adverse impacts of likely alternatives will not be smaller than those associated with continued operation of RNP. The impacts may, in fact, be greater in some areas.

The preliminary recommendation of the NRC staff is that the Commission determine that the adverse environmental impacts of license renewal for RNP are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the ER submitted by CP&L; (3) consultation with other Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of public comments received during the scoping process.

Abbreviations/Acronyms

1	μCi	microcurie(s)
2	$\mu\text{Ci/ml}$	microcuries per milliliter
3	μGy	microgray(s)
4	μm	micrometer(s)
5	μSv	microsieverts
6		
7	ac	acre(s)
8	ACC	averted cleanup and decontamination costs
9	ADAMS	Agencywide Document Access and Management System
10	AEA	Atomic Energy Act of 1954
11	AEC	U.S. Atomic Energy Commission
12	ALARA	as low as reasonably achievable
13	AOC	averted offsite property damage costs
14	AOE	averted occupational exposure
15	AOSC	averted onsite costs
16	APE	present value of averted public exposure
17	ATWS	anticipated transient without scram
18	AQCR	air quality control region
19		
20	Bq	becquerel(s)
21	BMT	basemat melt-through
22	Btu	British thermal unit(s)
23		
24	$^{\circ}\text{C}$	Degree Celsius
25	CCW	component cooling water
26	CDF	core damage frequency
27	CEQ	Council on Environmental Quality
28	CFR	Code of Federal Regulations
29	cfs	cubic feet per second
30	CHRS	containment heat removal system
31	Ci	curie(s)
32	cm	centimeter(s)
33	COE	cost of enhancement
34	COPC	chemicals of potential concern
35	CP&L	Carolina Power and Light Company
36	CVCS	chemical and volume control system
37	CWA	Clean Water Act
38		
39	DBA	design-basis accident(s)
40	DCH	direct containment heating

Abbreviations/Acronyms

1	DOE	U.S. Department of Energy
2	DPR	demonstration project reactor
3	DSM	demand-side management
4		
5	EIA	Energy Information Administration (of DOE)
6	EIS	environmental impact statement
7	ELF-EMF	extremely low frequency-electromagnetic field
8	EOP	Emergency Operating Procedure
9	EPA	U.S. Environmental Protection Agency
10	EPRI	Electric Power Research Institute
11	EQ	equipment qualification
12	ER	Environmental Report
13	ESA	Endangered Species Act
14	ESRP	Environmental Standard Review Plan, NUREG-1555, Supplement 1, Operating License Renewal
15		
16		
17	°F	Degree Fahrenheit
18	FAA	U.S. Federal Aviation Administration
19	FES	final environmental statement
20	FR	Federal Register
21	FSAR	Final Safety Analysis Report
22	ft	foot/feet
23	FWPCA	Federal Water Pollution Control Act (also known as the Clean Water Act of 1977)
24		
25	FWS	U.S. Fish and Wildlife Service
26		
27	g/d	gallons per day
28	gal	gallon
29	GDC	general design criteria
30	GEIS	Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437
31		
32	GIS	geographic information system
33	GL	Generic Letter
34	gpm	gallons per minute
35	GWPS	gaseous water processing system
36		
37	ha	hectare(s)
38	HCLPF	high confidence of low probability of failure
39	HHSI	high heady safety injection
40	HLW	high-level waste
41	hr	hour(s)

Abbreviations/Acronyms

1	Hz	hertz
2	HIC	high-integrity container
3		
4	in.	inch(es)
5	IPA	integrated plant assessment
6	IPE	individual plant examination
7	IPEEE	individual plant examination of external events
8	ISFSI	independent spent fuel storage installation
9	ISLOCA	interfacing systems loss-of-coolant accident
10		
11	J	joule(s)
12		
13	kg	kilogram(s)
14	km	kilometer(s)
15	kV	kilovolt(s)
16	kV/m	kilovolt per meter
17	kWh	kilowatt hour(s)
18		
19	L	liter(s)
20	L/s	liters per second
21	lb	pound
22	LERF	large early release frequency
23	LLW	low-level waste
24	LNG	liquefied natural gas
25	LOCA	loss-of-coolant accident
26	LOOP	loss of offsite power
27	LWDS	liquid waste disposal system
28	LWR	light-water reactor
29		
30	m	meter(s)
31	m/s	meter(s) per second
32	m ³ /d	cubic meters per day
33	m ³ /s	cubic meter(s) per second
34	mA	milliampere(s)
35	MAB	maximum attainable benefit
36	MACCS2	MELCOR Accident Consequence Code System 2
37	MCC	motor control center
38	MGD	million gallons per day
39	mGy	milligray(s)
40	mi	mile(s)
41	mL	milliliter(s)

Abbreviations/Acronyms

1	MOVs	motor-operated valves
2	mph	miles per hour
3	mrad	millirad(s)
4	mrem	millirem(s)
5	MSIV	main steam isolation valve
6	msl	mean sea level
7	mSv	millisievert(s)
8	MT	metric ton(s) (or tonne[s])
9	MTU	metric ton(s)-uranium
10	MW	megawatt(s)
11	MWd/MTU	megawatt-days per metric ton of uranium
12	MW(e)	megawatt(s) electric
13	MW(t)	megawatt(s) thermal
14	MWh	megawatt hour(s)
15		
16	NA	not applicable
17	NAS	National Academy of Sciences
18	NCI	National Cancer Institute
19	NEPA	National Environmental Policy Act of 1969
20	NESC	National Electric Safety Code
21	ng/J	nanogram per joule
22	NHPA	National Historic Preservation Act
23	NIEHS	National Institute of Environmental Health Sciences
24	NMFS	National Marine Fisheries Service, which has been renamed NOAA Fisheries
25	NOAA	National Oceanic and Atmospheric Administration
26	NO _x	nitrogen oxide(s)
27	NPDES	National Pollutant Discharge Elimination System
28	NRC	U.S. Nuclear Regulatory Commission
29	NWPPC	Northwest Power Planning Council
30		
31	ODCM	Offsite Dose Calculation Manual
32	OL	operating license
33		
34	PAME	primary amoebic meningoencephalitis
35	PAR	passive autocatalytic recombiners
36	PDS	plant damage state
37	PM ₁₀	particulate matter, 10 microns or less in diameter
38	PORV	power-operated relief valve
39	ppt	parts per thousand
40	PRA	Probabilistic Risk Assessment
41	PSA	Probabilistic Safety Assessment

Abbreviations/Acronyms

1	PSD	prevention of significant deterioration
2	PSW	plant service water
3	PWR	pressurized water reactor
4		
5	RAB	reactor auxiliary building
6	RAI	request for additional information
7	RCP	reactor coolant pump
8	RCS	reactor coolant system
9	REMP	radiological environmental monitoring program
10	RHR	residual heat removal
11	RLE	review level earthquake
12	rms	root mean square
13	RNP	H.B. Robinson Steam Electric Plant, Unit 2
14	RPC	replacement-power cost
15	RRW	risk-reduction worth
16	RWST	Refueling Water Storage Tank
17	ry	reactor year
18		
19	s	second(s)
20	SAG	Severe Accident Guideline
21	SAMA	Severe Accident Mitigation Alternative
22	SAMG	Severe Accident Management Guideline
23	SAR	Safety Analysis Report
24	SBO	station blackout
25	SBLOCA	small break loss-of-coolant accident
26	SCDHEC	South Carolina Department of Health and Environmental Control
27	SCDNR	South Carolina Department of National Resources
28	SCIAA	South Carolina Institute of Archaeology and Anthropology
29	SCR	selective catalytic reduction
30	SEIS	supplemental environmental impact statement
31	SER	Safety Evaluation Report
32	SGTR	steam generator tube rupture
33	SHPO	State Historic Preservation Officer
34	SMA	seismic margins analysis
35	SO ₂	sulfur dioxide
36	SO _x	sulfur oxide(s)
37	SRT	seismic review team
38	SSEL	safe shutdown equipment list
39	SWPS	solid waste processing system
40	Sv	sievert(s), special unit of dose equivalent
41		

Abbreviations/Acronyms

1	TBq	terabecquerel
2		
3	UDB	urban development boundary
4	UFSAR	Updated Final Safety Analysis Report
5	U.S.	United States
6	USC	United States Code
7	USCB	U.S. Census Bureau
8	USDA	U.S. Department of Agriculture
9	USGS	U.S. Geologic Survey
10	USI	Unresolved Safety Issue
11		
12	WCT	waste condensate tank
13	WGDT	waste gas decay tank
14	WHUT	waste holdup tank
15	WWDS	waste water demineralizer system
16		
17	yr	year
18		

1.0 Introduction

Under the Nuclear Regulatory Commission's (NRC's) environmental protection regulations in Title 10 of the Code of Federal Regulations (CFR) Part 51, which implement the National Environmental Policy Act (NEPA), renewal of a nuclear power plant operating license (OL) requires the preparation of an environmental impact statement (EIS). In preparing the EIS, the NRC staff is required first to issue the statement in draft form for public comment, and then issue a final statement after considering public comments on the draft. To support the preparation of the EIS, the staff has prepared a *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).^(a) The GEIS is intended to (1) provide an understanding of the types and severity of environmental impacts that may occur as a result of license renewal of nuclear power plants under 10 CFR Part 54, (2) identify and assess the impacts that are expected to be generic to license renewal, and (3) support 10 CFR Part 51 to define the number and scope of issues that need to be addressed by the applicants in plant-by-plant renewal proceedings. The GEIS guides the preparation of complete plant-specific information in support of the OL renewal process.

The Carolina Power and Light Company (CP&L), a subsidiary of Progress Energy, Inc., operates H.B. Robinson Steam Electric Plant, Unit No. 2 (RNP), in northeastern South Carolina under OL DPR-23, which was issued by the NRC. This OL will expire July 31, 2010. On June 17, 2002, CP&L submitted an application dated June 14, 2002, to the NRC to renew the RNP OL for an additional 20 years under 10 CFR Part 54. CP&L is a *licensee* for the purposes of its current OL and an *applicant* for the renewal of the OL. Pursuant to 10 CFR 54.23 and 51.53(c), CP&L submitted an Environmental Report (ER) (CP&L 2002) in which CP&L analyzed the environmental impacts associated with the proposed license renewal action, considered alternatives to the proposed action, and evaluated mitigation measures for reducing adverse environmental effects.

This report is the draft plant-specific supplement to the GEIS (the supplemental EIS [SEIS]) for the CP&L license-renewal application. This draft SEIS is a supplement to the GEIS because it relies, in part, on the findings of the GEIS. The staff will also prepare a separate safety evaluation report in accordance with 10 CFR Part 54.

(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.

1.1 Report Contents

The following sections of this introduction (1) describe the background for the preparation of this SEIS, including the development of the GEIS and the process used by the staff to assess the environmental impacts associated with license renewal; (2) describe the proposed Federal action to renew the RNP OL; (3) discuss the purpose and need for the proposed action; and (4) present the status of CP&L's compliance with environmental quality standards and requirements that have been imposed by Federal, State, regional, and local agencies that are responsible for environmental protection.

The ensuing chapters of this SEIS closely parallel the contents and organization of the GEIS. Chapter 2 describes the site, power plant, and interactions of the plant with the environment. Chapters 3 and 4, respectively, discuss the potential environmental impacts of plant refurbishment and plant operation during the renewal term. Chapter 5 contains a summary of the evaluation of potential environmental impacts of plant accidents including consideration of severe accident mitigation alternatives (SAMAs). Chapter 6 discusses the uranium fuel cycle and solid waste management. Chapter 7 discusses decommissioning, and Chapter 8 discusses alternatives to license renewal. Finally, Chapter 9 summarizes the findings of the preceding chapters and draws conclusions about the adverse impacts that cannot be avoided; the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity; and any irreversible or irretrievable commitment of resources. Chapter 9 also presents the staff's preliminary recommendation with respect to the proposed license renewal action.

Additional information is included in appendixes. Appendix A contains public comments received at the scoping meetings on the environmental review for license renewal and staff responses to the public comments. Appendixes B through G, respectively, list the following:

- the preparers of the supplement
- the chronology of the NRC staff's environmental review correspondence related to this SEIS
- the organizations contacted during the development of this SEIS
- CP&L's compliance status in Table E-1 (this appendix also contains copies of consultation correspondence prepared and sent during the evaluation process)

- 1 • GEIS environmental issues that are not applicable to RNP
- 2
- 3 • severe accident mitigation alternatives (SAMAs).
- 4

5 **1.2 Background**

6
7 Use of the GEIS, which examines the possible environmental impacts that could occur as a
8 result of renewing individual nuclear power plant OLS under 10 CFR Part 54, and the
9 established license renewal evaluation process supports the thorough evaluation of the impacts
10 of renewal of OLS.

11 **1.2.1 Generic Environmental Impact Statement**

12
13
14 The NRC initiated a generic assessment of the environmental impacts associated with the
15 license renewal term to improve the efficiency of the license renewal process by documenting
16 the assessment results and codifying the results in the Commission's regulations. This
17 assessment is provided in the GEIS, which serves as the principal reference for all nuclear
18 power plant license-renewal EISs.

19
20 The GEIS documents the results of the systematic approach that was taken to evaluate the
21 environmental consequences of renewing the licenses of individual nuclear power plants and
22 operating them for an additional 20 years. For each potential environmental issue, the GEIS
23 (1) describes the activity that affects the environment, (2) identifies the population or resource
24 that is affected, (3) assesses the nature and magnitude of the impact on the affected population
25 or resource, (4) characterizes the significance of the effect for both beneficial and adverse
26 effects, (5) determines whether the results of the analysis apply to all plants, and (6) considers
27 whether additional mitigation measures would be warranted for impacts that would have the
28 same significance level for all plants.

29
30 The NRC's standard of significance of impacts was established using the Council on
31 Environmental Quality (CEQ) terminology for "significantly" (40 CFR 1508.27, which requires
32 consideration of both "context" and "intensity"). Using the CEQ terminology, the NRC
33 established three significance levels – SMALL, MODERATE, or LARGE. The definitions of the
34 three significance levels are set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart
35 A, Appendix B, as follows:

36
37 **SMALL** – Environmental effects are not detectable or are so minor that they will neither
38 destabilize nor noticeably alter any important attribute of the resource.
39

Introduction

1 MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize,
2 important attributes of the resource.

3
4 LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize
5 important attributes of the resource.

6
7 The GEIS assigns a significance level to each environmental issue, assuming that ongoing
8 mitigation measures would continue.

9
10 The GEIS includes a determination of whether the analysis of the environmental issue could be
11 applied to all plants and whether additional mitigation measures would be warranted. Issues
12 are assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, **Category 1**
13 issues are those that meet all of the following criteria:

- 14
15 (1) The environmental impacts associated with the issue have been determined to apply either
16 to all plants or, for some issues, to plants having a specific type of cooling system or other
17 specified plant or site characteristic.
18
19 (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the
20 impacts (except for collective offsite radiological impacts from the fuel cycle and from high-
21 level waste [HLW] and spent fuel disposal).
22
23 (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis,
24 and it has been determined that additional plant-specific mitigation measures are likely not
25 to be sufficiently beneficial to warrant implementation.

26
27 For issues that meet the three Category 1 criteria, no additional plant-specific analysis is
28 required in this SEIS unless new and significant information is identified.

29
30 **Category 2** issues are those that do not meet one or more of the criteria of Category 1, and
31 therefore, additional plant-specific review for these issues is required.

32
33 In the GEIS, the staff assessed 92 environmental issues and determined that 69 qualified as
34 Category 1 issues, 21 qualified as Category 2 issues, and 2 issues were not categorized. The
35 latter two issues, environmental justice and chronic effects of electromagnetic fields, are to be
36 addressed in a plant-specific analysis. Of the 92 issues, 11 are related only to refurbishment,
37 6 are related only to decommissioning, 67 apply only to operation during the renewal term, and
38 8 apply to both refurbishment and operation during the renewal term. A summary of the
39 findings for all 92 issues in the GEIS is codified in Table B-1 of 10 CFR Part 51, Subpart A,
40 Appendix B.
41

1.2.2 License-Renewal Evaluation Process

An applicant seeking to renew its OL(s) is required to submit an ER as part of its application. The license-renewal evaluation process involves careful review of the applicant's ER and assurance that all new and potentially significant information not already addressed in or available during the GEIS evaluation is identified, reviewed, and assessed to verify the environmental impacts of the proposed license renewal.

In accordance with 10 CFR 51.53(c)(2) and (3), the ER submitted by the applicant must

- provide an analysis of the Category 2 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, in accordance with 10 CFR 51.53(c)(3)(ii)
- discuss actions to mitigate any adverse impacts associated with the proposed action and environmental impacts of alternatives to the proposed action.

In accordance with 10 CFR 51.53(c)(2), the ER does not need to

- consider the economic benefits and costs of the proposed action and alternatives to the proposed action except insofar as such benefits and costs are either (1) essential for making a determination regarding the inclusion of an alternative in the range of alternatives considered, or (2) relevant to mitigation
- consider the need for power and other issues not related to the environmental effects of the proposed action and the alternatives
- discuss any aspect of the storage of spent fuel within the scope of the generic determination in 10 CFR 51.23(a) in accordance with 10 CFR 51.23(b)
- contain an analysis of any Category 1 issue unless there is significant new information on a specific issue — this is pursuant to 10 CFR 51.23(c)(3)(iii) and (iv).

New and significant information is (1) information that identifies a significant environmental issue not covered in the GEIS and codified in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, or (2) information that was not considered in the analyses summarized in the GEIS and that leads to an impact finding that is different from the finding presented in the GEIS and codified in 10 CFR Part 51.

In preparing to submit its application to renew the RNP OL, CP&L developed a process to ensure that information not addressed in or available during the GEIS evaluation regarding the environmental impacts of license renewal for RNP would be properly reviewed before

Introduction

1 submitting the ER, and to ensure that such new and potentially significant information related to
2 renewal of the license for Unit 2 would be identified, reviewed, and assessed during the period
3 of NRC review. CP&L reviewed the Category 1 issues that appear in Table B-1 of 10 CFR Part
4 51, Subpart A, Appendix B, to verify that the conclusions of the GEIS remained valid with
5 respect to RNP. This review was performed by personnel from CP&L and its support
6 organization who were familiar with NEPA issues and the scientific disciplines involved in the
7 preparation of a license renewal ER.
8

9 The NRC staff also has a process for identifying new and significant information. That process
10 is described in detail in *Standard Review Plans for Environmental Reviews for Nuclear Power*
11 *Plants, Supplement 1: Operating License Renewal (ESRP)*, NUREG-1555, Supplement 1
12 (NRC 2000). The search for new information includes (1) review of an applicant's ER and the
13 process for discovering and evaluating the significance of new information; (2) review of
14 records of public comments; (3) review of environmental quality standards and regulations;
15 (4) coordination with Federal, State, and local environmental protection and resource agencies;
16 and (5) review of the technical literature. New information discovered by the staff is evaluated
17 for significance using the criteria set forth in the GEIS. For Category 1 issues where new and
18 significant information is identified, reconsideration of the conclusions for those issues is limited
19 in scope to the assessment of the relevant new and significant information; the scope of the
20 assessment does not include other facets of the issue that are not affected by the new
21 information.
22

23 Chapters 3 through 7 discuss the environmental issues considered in the GEIS that are
24 applicable to RNP. At the beginning of the discussion of each set of issues, there is a table that
25 identifies the issues to be addressed and lists the sections in the GEIS where the issue is
26 discussed. Category 1 and Category 2 issues are listed in separate tables. For Category 1
27 issues for which there is no new and significant information, the table is followed by a set of
28 short paragraphs that state the GEIS conclusion codified in Table B-1 of 10 CFR Part 51,
29 Subpart A, Appendix B, followed by the staff's analysis and conclusion. For Category 2 issues,
30 in addition to the list of GEIS sections where the issue is discussed, the tables list the
31 subparagraph of 10 CFR 51.53(c)(3)(ii) that describes the analysis required and the draft SEIS
32 sections where the analysis is presented. The draft SEIS sections that discuss the Category 2
33 issues are presented immediately following the table.
34

35 The NRC prepares an independent analysis of the environmental impacts of license renewal
36 and compares these impacts with the environmental impacts of alternatives. The evaluation of
37 the CP&L license renewal application began with publication of a notice of acceptance for
38 docketing and opportunity for a hearing in the *Federal Register* (FR 67 FR 53626 [NRC 2002a])
39 on August 16, 2002. The staff published a notice of intent to prepare an EIS and conduct
40 scoping (67 FR 54499 [NRC 2002b]) on August 22, 2002. Two public scoping meetings were
41 held on September 25, 2002, in Hartsville, South Carolina. Comments received during the

1 scoping period were summarized in the *Environmental Impact Statement Scoping Process: Summary Report – H.B. Robinson Steam Electric Plant, Unit No. 2, Darlington County, South Carolina* (NRC 2003). These comments are also presented in Part 1 of Appendix A.

2
3
4
5 The staff followed the review guidance contained in NUREG-1555, Supplement 1, in the
6 *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (NRC 2000). The staff and contractors retained to assist the staff
7 visited the RNP site on September 24 and 25, 2002, to gather information and to become
8 familiar with the site and its environs. The staff also reviewed the comments received during
9 scoping, and consulted with Federal, State, regional, and local agencies. A list of the
10 organizations consulted is provided in Appendix D. Other documents related to RNP were
11 reviewed and are referenced.
12

13
14 This draft SEIS presents the staff's analysis that considers and weighs the environmental
15 effects of the proposed renewal of the OL for RNP, the environmental impacts of alternatives to
16 license renewal, and mitigation measures available for avoiding adverse environmental effects.
17 Chapter 9, "Summary and Conclusions," provides the NRC staff's preliminary recommendation
18 to the Commission on whether or not the adverse environmental impacts of license renewal are
19 so great that preserving the option of license renewal for energy-planning decisionmakers
20 would be unreasonable.
21

22 A 75-day comment period will begin on the date of publication of the U.S. Environmental
23 Protection Agency Notice of Filing of the draft SEIS to allow members of the public to comment
24 on the preliminary results of the NRC staff's review. During this comment period, two public
25 meetings will be held in Hartsville, South Carolina, in June 2003. During these meetings, the
26 staff will describe the preliminary results of the NRC environmental review and answer
27 questions related to it to provide members of the public with information to assist them in
28 formulating their comments.
29

30 **1.3 The Proposed Federal Action**

31
32 The proposed Federal action is renewal of the OL for RNP Unit 2 (as a coal-powered power
33 plant, Robinson Unit 1 is outside the scope of this SEIS). RNP is located in northeastern South
34 Carolina, approximately 8 km (5 mi) west-northwest of Hartsville, 88 km (55 mi) east-northeast
35 of Columbia, and 144 km (90 mi) west of the Atlantic Ocean. RNP is a single nuclear unit
36 equipped with a pressurized water reactor. The nuclear steam supply system is a three-loop
37 Westinghouse design and is rated at 2300 megawatts-thermal (MW[t]). It has a nominal net
38 electric generation rating of 700 megawatts-electric (MW[e]) (CP&L 2002). Plant cooling is

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1 provided by Lake Robinson, a 910-ha (2250-ac) impoundment that CP&L created by damming
2 Black Creek. The current OL for RNP expires on July 31, 2010. By letter dated June 14, 2002,
3 CP&L submitted an application to the NRC (CP&L 2002) to renew this OL for an additional
4 20 years of operation (i.e., until July 31, 2030).
5

6 **1.4 The Purpose and Need for the Proposed Action**

7
8 Although a licensee must have a renewed license to operate a reactor beyond the term of the
9 existing OL, the possession of that license is just one of a number of conditions that must be
10 met for the licensee to continue plant operation during the term of the renewed license. Once
11 an OL is renewed, State regulatory agencies and the owners of the plant will ultimately decide
12 whether the plant will continue to operate based on factors such as the need for power or other
13 matters within the State's jurisdiction or the purview of the owners.
14

15 Thus, for license renewal reviews, the NRC has adopted the following definition of purpose and
16 need (GEIS Section 1.3):
17

18 The purpose and need for the proposed action (renewal of an operating license) is to
19 provide an option that allows for power generation capability beyond the term of a
20 current nuclear power plant operating license to meet future system generating needs,
21 as such needs may be determined by State, utility, and where authorized, Federal (other
22 than NRC) decisionmakers.
23

24 This definition of purpose and need reflects the Commission's recognition that, unless there are
25 findings in the safety review required by the Atomic Energy Act of 1954 or findings in the NEPA
26 environmental analysis that would lead the NRC to reject a license-renewal application, the
27 NRC does not have a role in the energy-planning decisions of State regulators and utility
28 officials as to whether a particular nuclear power plant should continue to operate. From the
29 perspective of the licensee and the State regulatory authority, the purpose of renewing an OL is
30 to maintain the availability of the nuclear plant to meet system energy requirements beyond the
31 current term of the plant's license.
32

33 **1.5 Compliance and Consultations**

34
35 CP&L is required to hold certain Federal, State, and local environmental permits, as well as
36 meet relevant Federal and State statutory requirements. In its ER, CP&L provided a list of the
37 authorizations from Federal, State, and local authorities for current operations as well as
38 environmental approvals and consultations associated with RNP license renewal.
39 Authorizations and consultations relevant to the proposed OL renewal action are included in
40 Appendix E.

1 The staff has reviewed the list and consulted with the appropriate Federal, State, and local
2 agencies to identify any compliance or permit issues or significant environmental issues of
3 concern to the reviewing agencies. These agencies did not identify any new and significant
4 environmental issues. The ER states that CP&L is in compliance with applicable environmental
5 standards and requirements for RNP. The staff has not identified any environmental issues
6 that are both new and significant.
7

8 **1.6 References**

9
10 10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental
11 Protection Regulations for Domestic Licensing and Related Regulatory Functions."

12
13 10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for
14 Renewal of Operating Licenses for Nuclear Power Plants."

15
16 40 CFR Part 1508. Code of Federal Regulations, Title 40, *Protection of Environment*, Part
17 1508, "Terminology and Index."

18
19 Atomic Energy Act of 1954 (AEA). 42 USC 2011, et seq.
20

21 Carolina Power and Light Company (CP&L). 2002. *Applicant's Environmental Report –*
22 *Operating License Renewal Stage, H.B. Robinson Steam Electric Plant, Unit No. 2.* Docket No.
23 50-261, License No. DPR-23, Hartsville, South Carolina.
24

25 National Environmental Policy Act of 1969 (NEPA). 42 USC 4321, et seq.
26

27 U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement*
28 *for License Renewal of Nuclear Plants.* NUREG-1437, Volumes 1 and 2, Washington, D.C.
29

30 U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement*
31 *for License Renewal of Nuclear Plants Main Report.* "Section 6.3 – Transportation, Table 9.1
32 Summary of findings on NEPA issues for license renewal of nuclear power plants, Final
33 Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C.
34

35 U.S. Nuclear Regulatory Commission (NRC). 2000. *Standard Review Plans for Environmental*
36 *Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal.* NUREG-1555,
37 Supplement 1, Washington, D.C.
38

Introduction

1 U.S. Nuclear Regulatory Commission (NRC). 2002a. "Notice of Acceptance for Docketing of
2 the Application and Notice of Opportunity for a Hearing Regarding Renewal of License
3 No. DPR-23 for an Additional Twenty-Year Period." Federal Register: Vol. 67, No. 159, pp.
4 53,626-53,627. August 16, 2002.

5
6 U.S. Nuclear Regulatory Commission (NRC). 2002b. "Notice of Intent to Prepare an
7 Environmental Impact Statement and Conduct Scoping Process." Federal Register: Vol. 67,
8 No. 163, pp. 54,499-54,501. August 22, 2002.

9
10 U.S. Nuclear Regulatory Commission (NRC). 2003. *Environmental Impact Statement Scoping*
11 *Process: Summary Report – H.B. Robinson Steam Electric Plant, Unit No. 2, Hartsville, South*
12 *Carolina*. Washington, D.C.

13
14

2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment

The H.B. Robinson Steam Electric Plant, owned by Carolina Power and Light (CP&L), is located in northeastern South Carolina, approximately 8 km (5 mi) west-northwest of Hartsville, South Carolina. It is located on the shore of Lake Robinson in Darlington County.

Two generating units are located on the Robinson site: Unit 1 is a coal plant that has been operating since 1960, and Unit 2, referred to as Robinson Nuclear Plant (RNP), is a single-unit nuclear plant. The nuclear steam supply system for RNP is a pressurized water reactor (PWR) with three steam generators. RNP obtains cooling water from Lake Robinson, an impoundment of Black Creek. The U.S. Nuclear Regulatory Commission (NRC) has categorized Lake Robinson as a cooling pond (NRC 1996). The station and its environs are described in Section 2.1, and its interaction with the environment is presented in Section 2.2.

2.1 Plant and Site Description and Proposed Plant Operation During the Renewal Term

RNP is located on approximately 2435 ha (6020 ac) of CP&L property in northwestern Darlington and southwestern Chesterfield Counties, including the 911-ha (2250-ac) Lake Robinson. Figures 2-1 and 2-2 show the site location and features within 80 and 10 km (50 and 6 mi), respectively. The Darlington County Internal Combustion Turbine Electric Plant is also located on the CP&L property, slightly more than 1.6 km (1 mi) north of RNP.

The upper 1890 km² (173 mi²) of the Black Creek drainage was impounded in 1958 to create Lake Robinson. The 11-km (7-mi) long lake was designed to accommodate a total plant capacity of approximately 1200 megawatts-electric (MW[e]) (NRC 1975). RNP shares the 6.4 km (4 mi) cooling water discharge canal with Unit 1. In addition to functioning as a cooling pond, the lake supports recreational use and modest fishing.

CP&L owns property around the impoundment but leases it to adjacent property owners for access to the impoundment. As a result, the eastern side of Lake Robinson is developed with homes, recreational areas, a marina, and public access points. CP&L leases the northern portion of its property to the State of South Carolina, which manages it in conjunction with its adjacent Sandhills State Forest. CP&L manages the balance of the undeveloped property for timber production.

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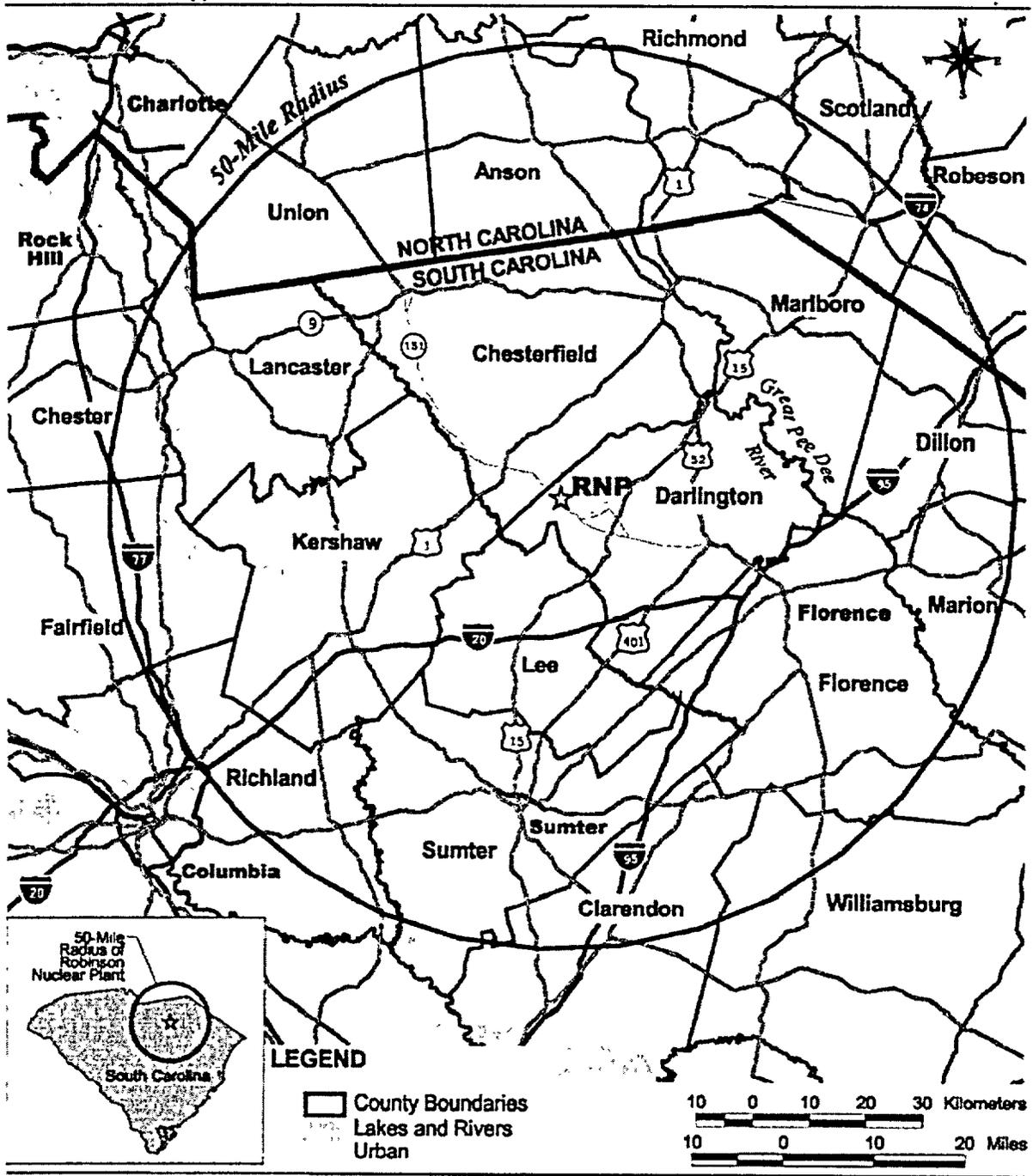
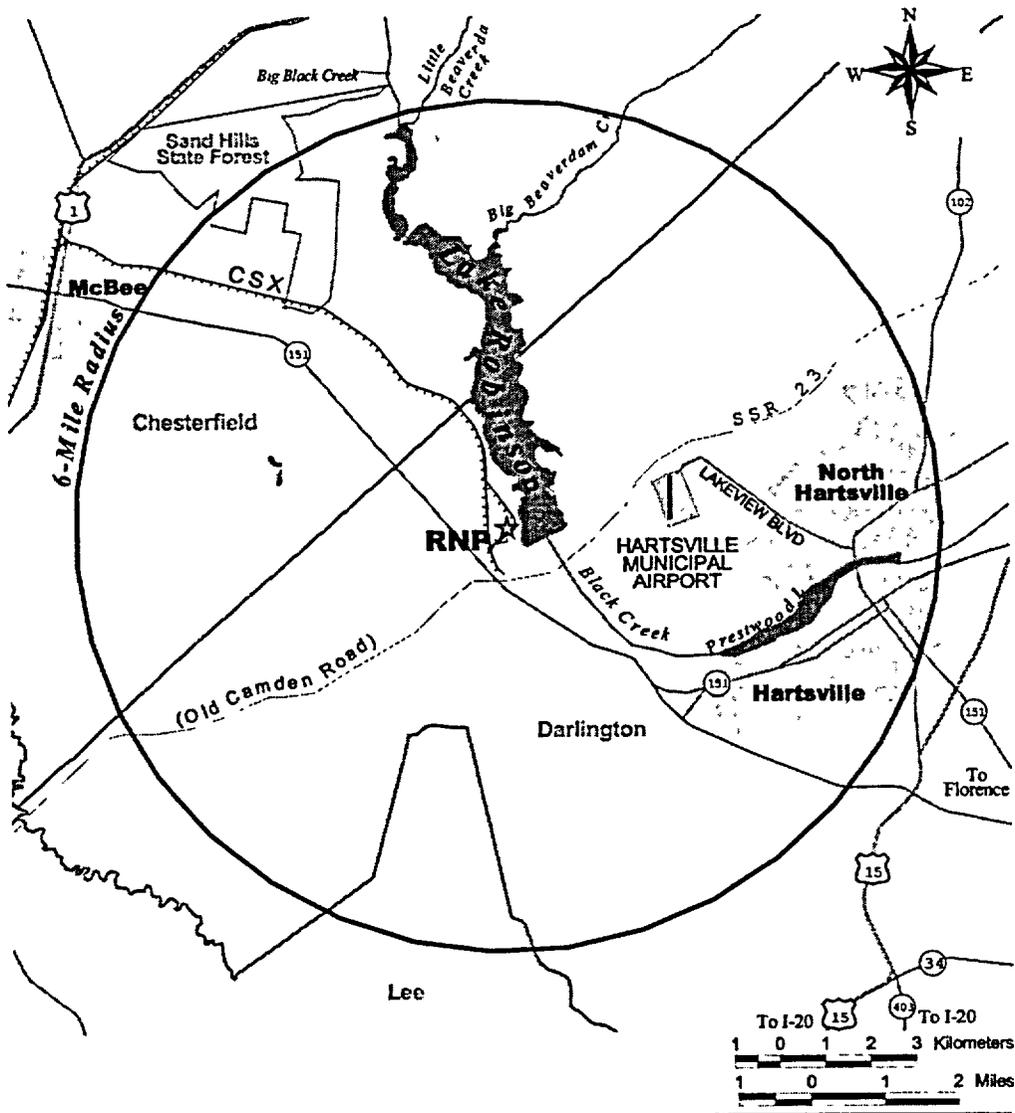


Figure 2-1. Location of RNP, 80-km (50-mi) Region



LEGEND

-  Railroad
-  County Boundaries
-  Lakes and Rivers
-  Cities
- SSR = Secondary State Route

1
2
3

Figure 2-2. Location of RNP, 10-km (6-mi) Region

1 CP&L refuels RNP on an 18-month schedule. During these refueling periods, site employment
2 increases by as many as 950 to 1050 temporary workers over the 30- to 40-day period. At
3 RNP, CP&L employs a nuclear-related permanent work force of approximately 435 employees,
4 plus 120 contract and matrixed employees. The plant is located approximately 8 km (5 mi)
5 west-northwest of Hartsville, 50 km (30 mi) south of the North Carolina border, and 150 km (90
6 mi) from the Atlantic Ocean. The nearest large city is Columbia, South Carolina, approximately
7 90 km (55 mi) west-southwest.
8

9 The topography of the region consists of rolling sand hills interspersed with watercourses. The
10 area surrounding RNP is predominantly rural, consisting of farmlands and woodlands
11 intermittently spotted with industrial sites. Surface soil at the site is sandy, and surface water
12 drains to Lake Robinson (CP&L 2002a).
13

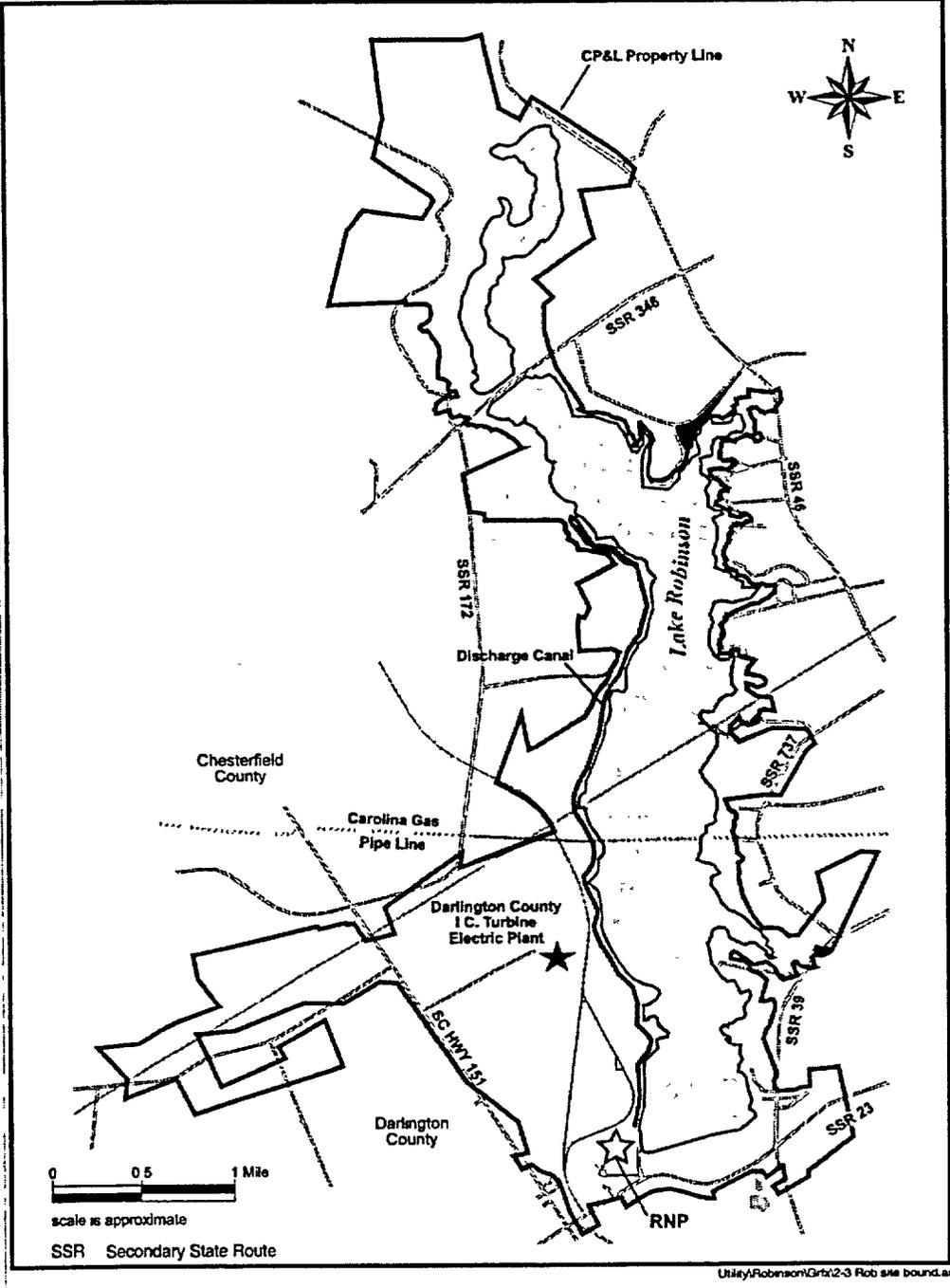
14 **2.1.1 External Appearance and Setting**

15
16 RNP consists of a reactor containment building, auxiliary buildings, the intake structure, liquid
17 storage tanks, the turbine structure, the independent spent fuel storage installation (ISFSI), the
18 rad waste facility, the fuel-handling building, waste retention basins, the switchyard, and
19 associated transmission lines (see Figure 2-3). Units 1 and 2 (RNP) each have their own intake
20 structures; however, they share the discharge canal. There are a number of additional features
21 in the area, such as the coal pile and handling facilities and the railway spur and switchyard,
22 both of which are directly related to the coal-fired facility (Unit 1).
23

24 The Robinson site is located within the upper Coastal Plain Physiographic Province of South
25 Carolina, approximately 24 km (15 mi) southeast of the Piedmont Province in an area known as
26 the Sand Hills. The site is on the southern edge of the Sand Hills region and is typified by
27 rolling hills interspersed with watercourses and covered with wooded areas. To the south and
28 east of the site the terrain becomes flatter and marshy in the coastal plain. The Coastal Plain
29 sediments in the area of the site were formed at the same time as the Tuscaloosa Formation,
30 but locally are known as the Middendorf Formation. Overlying the Middendorf is the Black
31 Creek Formation, which consists primarily of phosphatic and glauconitic sands interbedded with
32 hard gray and black clay locally indurated to shale. The surficial materials at the site are recent
33 sands or soils developed from the Middendorf Formation. In general, the upper alluvial sands
34 and gravels are moderately compact.
35

36 **2.1.2 Reactor Systems**

37
38 The single-unit nuclear plant designed by Westinghouse Electric Corporation is a PWR with a
39 three-loop Westinghouse steam supply system. Ebasco was the engineering and construction



1
2 **Figure 2-3.** Lake Robinson, the Cooling Canal, the Intake Structure, the Dam, and Black
3 Creek (CP&L 2002a)

1 contractor. The plant is rated at 2300 megawatts-thermal (MW[t]) with a corresponding nominal
2 net electrical output of approximately 700 MW(e). The reactor is housed within a dry,
3 reinforced concrete, steel-lined containment structure. The unit was placed in service in 1970.
4 RNP is licensed for a fuel that is slightly enriched uranium dioxide, up to 5.0 percent by weight
5 of uranium-235. The plant operates with an average fuel assembly burnup of 60,000 megawatt
6 days per metric ton uranium. RNP is currently pursuing approval of a maximum of 1.7 percent
7 increase in licensed core thermal power (CP&L 2002a).

8 9 **2.1.3 Cooling and Auxiliary Water Systems**

10
11 RNP uses a three-loop cooling system for heat dissipation. The primary loop is a sealed
12 system that carries heat from the reactor to the steam generators. The secondary loop, which
13 is also sealed, carries heat from the steam generators through the turbines to the condensers.
14 The tertiary system carries heat from the condensers to a cooling canal that discharges to the
15 recirculating cooling pond system, Lake Robinson. The cooling canal and Lake Robinson
16 release heat to the environment.

17
18 Cooling water for RNP is obtained from and then discharged back to Lake Robinson, which is a
19 910-ha (2250-ac) impoundment created by CP&L on Black Creek. Because Black Creek was
20 not navigable at this location, Lake Robinson was categorized by the NRC as a cooling pond.
21 However, for purposes of this evaluation, it is more useful to characterize it as a cooling
22 impoundment or a lake. The intake structures for Robinson Units 1 (the coal-fired unit) and 2
23 (the nuclear unit) are both located on the shore of Lake Robinson, near the generator facilities
24 (Figure 2-4). Heated effluent is discharged back to the impoundment through a cooling canal at
25 a discharge point located approximately 6.4 km (4 mi) upstream from the dam and cooling
26 water intake structures (Figure 2-3). The intake structure uses traveling screens with a mesh
27 size of 1 cm (3/8 in.). The circulating water flows for these two units average 2.476×10^6
28 m³/day (654 million gallons per day [MGD]).

29
30 RNP has five groundwater production wells that are completed in the Middendorf Formation at
31 depths up to 70 m (230 ft). Two of these wells (Wells 1 and 2) provide makeup water for Unit 1
32 (the coal-fired unit) and sanitary water for both Units 1 and 2. The other three wells (Wells A,
33 B, and C on Figure 2-4) provide makeup water for Unit 2. The water is demineralized and used
34 for the primary, secondary, and auxiliary cooling systems. The five groundwater wells yield an
35 average of 52 L/s (825 gallons per minute [gpm]).

36
37 In addition, RNP uses approximately 0.32 L/s (5 gpm) of water from the Darlington Water and
38 Sewer Authority, which, in turn, receives most of its water from the City of Florence.
39 Approximately 0.25 L/s (4 gpm) of this water is for potable needs.
40

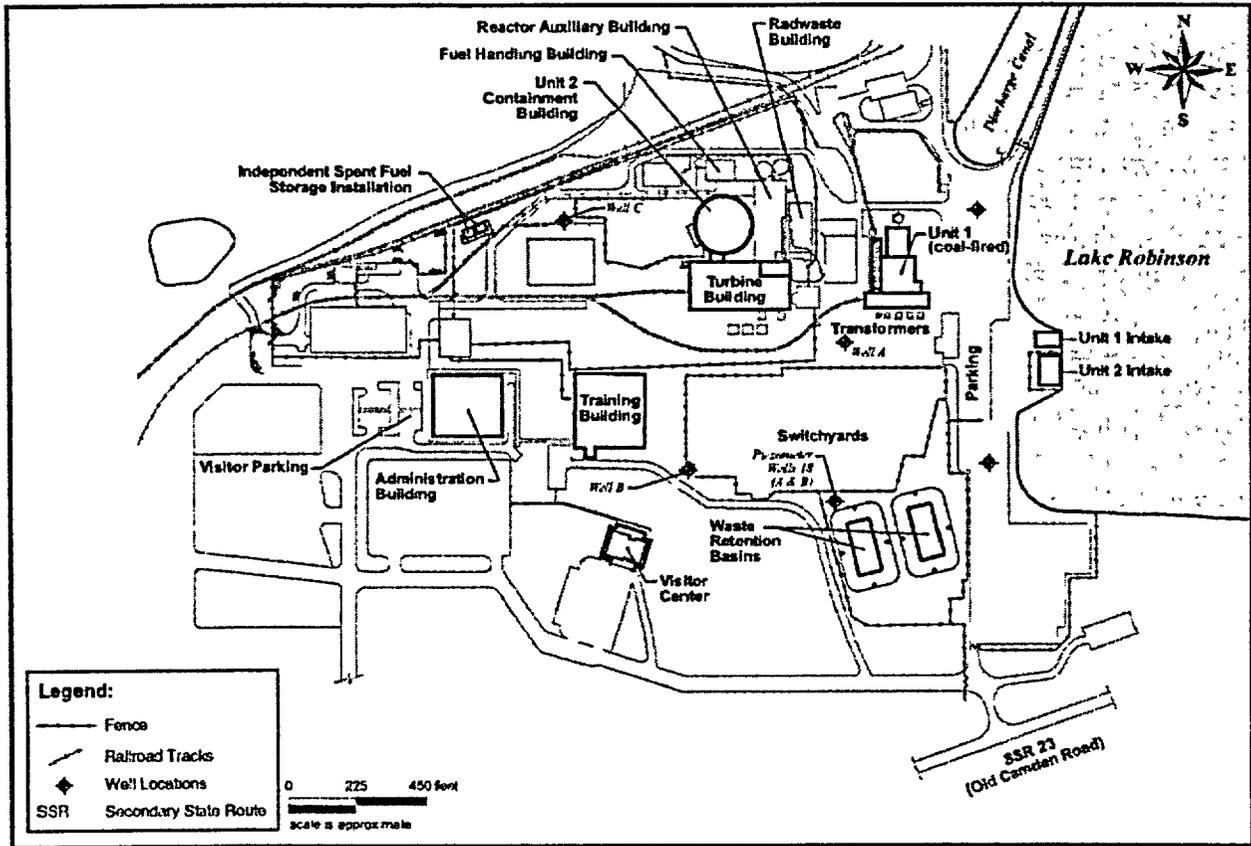


Figure 2.4. Intake Structures and Well Locations on the Robinson Site

2.1.4 Radioactive Waste Management Systems and Effluent Control Systems

RNP uses liquid, gaseous, and solid radioactive waste management systems to collect and process the wastes that are the by-products of operations before they are released to the environment. The waste disposal systems for RNP meet the design objectives of 10 CFR Part 50, Appendix I (*Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low As Reasonably Achievable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents*). Radioactive material in the reactor coolant is the source of gaseous, liquid, and solid radioactive wastes in light-water reactors (LWRs). Radioactive fission products build up within the fuel as a consequence of the fission process. These fission products mostly are contained in the sealed fuel rods, but small quantities escape and contaminate the reactor coolant. Neutron activation of the primary coolant system also is responsible for coolant contamination.

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1 Nonfuel solid wastes result from treating and separating radionuclides from gases and liquids
2 and from removing contaminated material from various reactor areas. Solid wastes also consist
3 of reactor components, equipment, and tools removed from service, as well as contaminated
4 protective clothing, paper, rags, and other trash generated from plant design modifications,
5 operations, and routine maintenance activities. Solid wastes are shipped to a waste processor
6 for volume reduction before disposal at a licensed burial site. Spent resins and filters are
7 stored or packaged for shipment to a licensed offsite processing or disposal facility.

8
9 Fuel rods that have exhausted a certain percentage of their fuel and have been removed from
10 the reactor core for disposal are called spent fuel. The reactor core is refueled approximately
11 every 18 months. Spent fuel is stored onsite in a spent fuel pool and in an ISFSI that operates
12 under a separate NRC license. Spent fuel is periodically shipped to the Shearon Harris Nuclear
13 Power Plant for storage. Three shipments totaling 42 fuel bundles were made in 1997 and four
14 shipments totaling 56 fuel bundles were made in 2000 (CP&L 1998a, 2001).

15
16 The Offsite Dose Calculation Manual (ODCM) for RNP (CP&L 2002b), which is subject to NRC
17 inspection, describes the methods and parameters used for calculating offsite doses resulting
18 from radioactive liquid and gaseous effluents. It is also used for calculating gaseous and liquid
19 monitoring alarm/trip setpoints for release of effluents from RNP (CP&L 2002c). Operational
20 limits for releasing liquid and gaseous effluents are specified to ensure compliance with NRC
21 regulations (NRC 1991).

22
23 The systems used at RNP for processing liquid waste, gaseous waste, and solid waste are
24 described in the following sections.

25 26 **2.1.4.1 Liquid Waste Processing Systems and Effluent Controls**

27
28 Radioactive liquids entering the waste disposal system are collected in sumps and tanks until
29 the need for subsequent treatment can be determined. The waste is sampled and analyzed to
30 determine the quantity and type of radioactivity. Before discharge, radioactive liquids are
31 processed as necessary and then released under controlled conditions. The system design
32 and operation is characteristically directed toward minimizing releases to unrestricted areas.
33 Discharge streams are monitored, and safety features are incorporated to preclude releases in
34 excess of the limits of 10 CFR Part 20. The bulk of radioactive liquids discharged from the
35 reactor coolant system are processed and retained inside the plant by the chemical and volume
36 control system (CVCS) and waste water demineralization system. Processed wastes are
37 stored until they can be shipped for offsite disposal.

38
39 The liquid waste processing system is capable of processing all wastes generated during
40 routine continuous operation of the primary system. During normal plant operation, the waste

1 disposal system processes liquids from the equipment drains and leakoffs, radioactive chemical
2 laboratory drains, radioactive shower drains, decontamination area drains, and demineralizer
3 regeneration (normally not used). The system also collects and transfers liquids from the
4 following sources to the waste holdup tank (WHUT) or the CVCS for processing: reactor
5 coolant loop drains, pressurizer relief tank, reactor coolant pump secondary seals, excess
6 letdown during startup, accumulators, and reactor vessel flange leakoffs.

7
8 These liquids flow to the reactor coolant drain tank and are discharged to the WHUT or the
9 CVCS holdup tanks by the reactor coolant drain pumps, which are operated automatically by a
10 level controller in the tank. These pumps also return water from the refueling canal to the
11 refueling water storage tank. Where possible, waste liquids drain to the waste holdup tank by
12 gravity flow. Other waste liquids drain to the sump tank and are discharged to the WHUT by
13 pumps operated automatically by a level controller in the tank.

14
15 Liquids from the WHUT and CVCS holdup tanks are processed using the waste water
16 demineralization system and the boron recycle system, which consist of filters and
17 demineralizers with various capabilities selected depending on process conditions. Processed
18 liquids are routed to one of the waste condensate tanks or monitor tanks. When the tank is
19 filled, it is isolated and sampled for analysis while an alternate tank is in service. If analysis
20 confirms the activity level is suitable for discharge, the processed liquid is pumped through a
21 flow meter and a radiation monitor to the condenser-circulating-water discharge. Otherwise, it
22 is returned to the WHUT for reprocessing. The radiochemical analysis forms the basis for
23 recording activity releases, and the radiation monitor automatically closes the discharge valve if
24 the liquid activity level exceeds a preset value.

25
26 Liquids in the Radwaste Building sump are discharged into the storm sewer if analysis confirms
27 the activity level is suitable for discharge. Otherwise, these liquids are pumped to a radwaste
28 drain.

29
30 Liquid effluents from RNP can be discharged both continuously and on a batch basis. Steam
31 generator blowdown and condensate polisher wastes are continuously released during normal
32 operation. A daily grab sample is taken of the steam generator blowdown. This sample is
33 composited and analyzed weekly for iodine-131 and various other fission and activation
34 products. Condensate polisher waste is composited automatically, and samples are collected
35 weekly and analyzed for radioactive fission and activation products. There are radiation
36 monitors on these waste streams that will terminate the release if alarm setpoints are
37 exceeded.

38
39 Batch releases occur during normal operation when the radioactivity content of each batch is
40 verified to be in compliance with 10 CFR Part 20 requirements prior to release. During 2001,
41 there were 98 batch releases plus continuous releases of liquid effluents with a total volume of

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1 6.15 x 10⁷ L (1.62 x 10⁷ gal) prior to dilution. In this liquid waste, there was a total fission and
2 activation product activity of 0.0026 TBq (0.070 Ci) and a total tritium activity of 12.4 TBq
3 (336 Ci). These volumes and activities are typical of past years. The composition of the liquid
4 waste generated is reported in the *Annual Radioactive Effluent Release Report for 2001* (CP&L
5 2002c). See Section 2.2.7 for a discussion of the theoretical doses to the maximally exposed
6 individual as a result of these releases.

7
8 CP&L does not anticipate any increase in liquid waste releases during the renewal period.

9 10 **2.1.4.2 Gaseous Waste Processing Systems and Effluent Controls**

11
12 The gaseous waste processing system (GWPS) is designed to remove fission gases from
13 radioactive contaminated fluids and to contain these gases. Fission gases are removed from
14 other systems to the maximum extent possible and are contained in the GWPS. During plant
15 operations, gaseous wastes will originate from degassing reactor coolant discharged to the
16 CVCS, displacement of cover gases as liquids accumulate in various tanks, miscellaneous
17 equipment vents and relief valves, and sampling operations and automatic gas analysis for
18 hydrogen and oxygen in cover gases.

19
20 Radioactive gases are collected at a slight positive pressure in a vent header. From there, the
21 gases are pumped by compressors through a manifold to one of the waste gas decay tanks
22 where they are held a suitable period of time for decay. Cover gases in the nitrogen blanketing
23 system are reused to minimize gaseous wastes. During normal operation, gases are
24 discharged intermittently at a controlled rate from these tanks through the radiation monitors in
25 the plant. The system is provided with holdup capacity and discharge controls for gaseous
26 wastes. Gas held in the decay tanks can either be returned to the CVCS holdup tanks or
27 discharged to the atmosphere if it has decayed sufficiently for release.

28
29 Before the contents of a tank are released, they are analyzed to determine the level of activity.
30 If the level of activity is below release limits, the contents of the tank are discharged to the plant
31 vent at a controlled rate. The effluent is continuously sampled by a radiation monitor to ensure
32 compliance with gaseous effluent discharge requirements. The release is automatically
33 terminated if the radioactivity level exceeds a predetermined level.

34
35 During 2001, there were 117 batch releases of gaseous effluents. The total gaseous release of
36 fission and activation product activity was 0.014 TBq (0.38 Ci), and the total tritium activity was
37 0.42 TBq (11.4 Ci). The total activity of iodine-131 was 32 kBq (0.87 µCi), and the total activity
38 of particulates with half-lives greater than 8 days was 300 kBq (8.2 µCi). The details of these

1 radioactive gaseous releases are reported in the *Annual Radioactive Effluent Release Report*
2 *for 2001* (CP&L 2002c). See Section 2.2.7 for a discussion of the theoretical doses to the
3 maximally exposed individual as a result of these releases.
4

5 CP&L does not anticipate any increase in gaseous waste release during the renewal period.
6

7 **2.1.4.3 Solid Waste Processing**

8
9 Solid radioactive waste from RNP consists of spent resin, filter cartridges, bags, and
10 miscellaneous materials such as paper and glassware (CP&L 2000). Solid wastes are
11 packaged in approved containers such as 0.21-m³ (55-gal) drums, liners, high-integrity
12 containers (HIC), and boxes, for removal to a processing or burial facility. The solid waste
13 processing system (SWPS) is designed so that all radioactive solid waste is processed,
14 packaged, and stored to control the discharge of effluents and offsite shipments in accordance
15 with appropriate Federal and State standards and in compliance with 49 CFR Parts 170-179,
16 10 CFR Part 20, 10 CFR Part 50, and 10 CFR Part 61.
17

18 Radioactive solid wastes are converted by the SWPS into packaged forms approved for offsite
19 processing or disposal. The SWPS collects, controls, processes, packages, handles, and
20 temporarily stores radioactive solid waste generated as a result of the normal operations of the
21 plant, without limiting the operation or availability of the plant. In addition to the items listed
22 above, the SWPS receives solid radioactive waste such as contaminated cloth, construction
23 materials, laboratory supplies, and other non-retrievable items.
24

25 Because of their low radioactivity content, dry radioactive wastes are stored until enough waste
26 has accumulated to permit economical transportation to an offsite burial facility for final
27 disposal. The SWPS is also used in accordance with a process control program to process wet
28 radioactive waste to meet shipping and disposal requirements.
29

30 Spent radioactive resins are sluiced from their respective ion exchange vessels into the spent
31 resin storage tank or the spent media storage tank for temporary storage. To dispose of the
32 resins, the system is connected from the temporary storage tank to the spent resin fill
33 connection in the radwaste facility. A flexible hose is connected to this fill connection at one
34 end and the other is placed into a HIC or liner. The temporary storage tank is then pressurized
35 with low-pressure nitrogen, and the resins are transferred to the radwaste facility and placed in
36 a HIC or a metal liner. During sluicing, a dewatering process takes place to reduce the free-
37 standing liquid in the HIC or liner to contain less than 1 percent. Once full, a HIC or liner can be
38 transported in a shipping cask overland to a radwaste processing or burial facility for ultimate
39 disposal.
40

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1 An average of 16 shipments of dry compressible waste and contaminated equipment are
2 shipped for disposal from RNP each year as reported in the *Annual Radioactive Effluent*
3 *Release Report for 2001* (CP&L 2002c). In addition, an average of three shipments of spent
4 resins, filter sludges, and evaporator bottom residues are shipped for disposal each year. In
5 2001, there were four shipments to dispose of 15.4 m³ (544 ft³) containing a total activity of 2.32
6 TBq (62.7 Ci). The average annual volume of solid radioactive waste is about 175 m³ (6180
7 ft³). These quantities vary somewhat from year to year. CP&L has been reducing the volume
8 of solid waste for several years and does not anticipate any increase during the renewal period.
9

10 **2.1.5 Nonradioactive Waste Systems**

11
12 Nonradioactive solid wastes from RNP are collected and disposed of or recycled based on
13 waste type. Hazardous waste is collected in 0.21-m³ (55-gal) drums, transferred to a central
14 storage facility, and shipped as small quantity waste to a disposal vendor. Storm water runoff is
15 collected in the waste settling ponds where oil skimmers remove oil, and the water is monitored
16 for pH and oil before being discharged to the canal. Additionally, permitted direct outfalls to
17 Black Creek discharge storm water runoff from parking lots and exterior plant drains.
18

19 Recycling is conducted with such items as general paper, aluminum cans, batteries, and
20 fluorescent bulbs. Used oil is collected at designated locations, and after analysis to ensure it is
21 not hazardous, it is burned in Unit 1 as fuel.
22

23 Construction rubble is disposed of onsite at the permitted Unit 1 landfill, located north of the
24 plant. General trash is shipped to a lined disposal facility in Bishopville, South Carolina. The
25 Bishopville facility is permitted by the South Carolina Department of Health and Environmental
26 Control (SCDHEC) for disposal of residential and business trash.
27

28 Sanitary wastes are treated in two onsite wastewater treatment plants using extended aeration,
29 and the treated effluents are discharged to the cooling-water discharge canal in accordance
30 with NPDES outfall limits.
31

32 **2.1.6 Plant Operation and Maintenance**

33
34 Routine maintenance performed on plant systems and components is necessary for safe and
35 reliable operation. Maintenance activities conducted at RNP include inspection, testing, and
36 surveillance to maintain the current licensing basis of the plant and to ensure compliance with
37 environmental and safety requirements. Certain activities can be performed while the reactor is
38 operating, but others require that the plant be shut down. Long-term outages are scheduled for
39 refueling and for certain types of repairs or maintenance, such as replacement of major
40 components. CP&L refuels RNP about every 18 months. Each outage is typically scheduled to

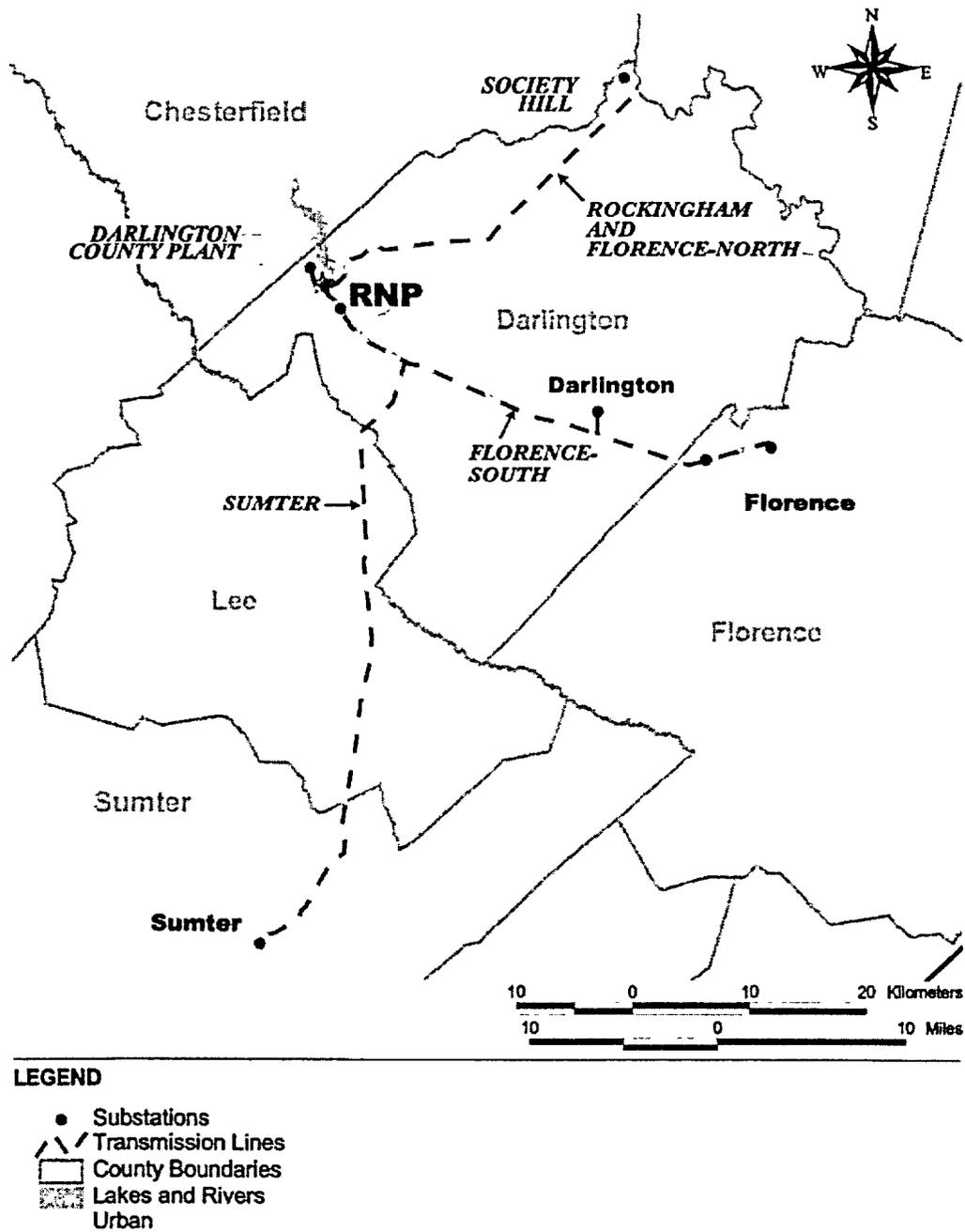
1 last approximately 30 to 40 days, and about one-third of the core is replaced at each refueling.
2 Approximately 950 to 1050 additional workers are onsite during a typical reactor outage.
3

4 CP&L performed an aging management review and developed an integrated plant assessment
5 (IPA) for managing the effects of aging on systems, structures, and components in accordance
6 with 10 CFR Part 54. The aging management program is described in Chapter 3 and
7 Appendix B of the CP&L's application for renewal of the RNP operating license (OL)
8 (CP&L 2002a). The IPA identified the programs and inspections that are managing the effects
9 of aging at RNP. CP&L expects to conduct activities related to the management of aging
10 effects during plant operation or during normal refueling and other outages, but no outages
11 specifically for refurbishment activities are planned. Previously, CP&L has performed some
12 major construction activities at RNP including the replacement of the lower steam generator
13 assemblies. CP&L has no plans to add additional full-time staff (non-outage workers) at the
14 plant during the license renewal period.
15

16 **2.1.7 Power Transmission System**

17
18 Four transmission lines were constructed for the specific purpose of connecting RNP to the
19 transmission system. The final environmental statement (FES) for RNP operation (NRC 1975)
20 and the CP&L ER (CP&L 2002a) describe these four lines. Prior to construction of RNP, a
21 transmission line existed between Rockingham, North Carolina, and Florence, South Carolina.
22 In 1970, CP&L constructed two lines from RNP to the Rockingham-Florence line near Society
23 Hill, South Carolina. At that point, CP&L tapped into the Rockingham-Florence line and
24 connected one RNP line to each segment, creating the RNP-Society Hill portions of the RNP-
25 Rockingham and RNP-Florence-North lines. The rights-of-way for the Rockingham, Florence-
26 North, Sumter, and Florence-South lines range in width from 30 to 103 m (100 to 340 ft) and in
27 length from 29 to 62 km (18 to 39 mi) and cover a total of approximately 613 ha (1517 ac). The
28 transmission line rights-of-way are depicted in Figure 2.5. The dimensions of the rights-of-way
29 for the lines are presented in Table 2-1 and are described below.
30

- 31 • Rockingham – The RNP-Society Hill portion of the RNP-Rockingham line is a
32 230-kilovolt (kV) line that shares the entire 29-km (18-mi) right-of-way with the
33 RNP-Society Hill portion of the RNP-Florence-North line. The right-of-way width is
34 103 m (340 ft).
35
- 36 • Florence-North – The RNP-Society Hill portion of the RNP-Florence line is a 230-kV line.
37 It shares the entire 29-km (18-mi) right-of-way with the RNP-Society Hill portion of the
38 RNP-Rockingham line. The right-of-way width is 103 m (340 ft).
39
40
41



LEGEND

- Substations
- - - Transmission Lines
- ▭ County Boundaries
- ▨ Lakes and Rivers
- ▩ Urban

1

Figure 2-5. RNP Transmission Line Rights-of-Way

Table 2-1. Dimensions of RNP Transmission Line Rights-of-Way

Substation	kV	Length		Width		Area	
		km	(mi)	m	(ft)	ha	(ac)
Rockingham ^(a)	230	29	(18)	103	(340)	150	(371)
Florence-North ^(a)	230	29	(18)	103	(340)	150	(371)
Sumter ^(b)	230	62	(39)	30, 55	(100, 180)	186	(460)
Florence-South ^(b)	230	43	(27)	30, 55	(100, 180)	127	(315)
Total		163	(102)			613	1517

(a) The Rockingham and Florence-North lines share a 103-m (340-ft) right-of-way.
(b) The Sumter and Florence-South lines share a common 55-m (180-ft) right-of-way for the first 16 km (10 mi).

- Sumter – The RNP-Sumter line is a 230-kV line that is 62-km (39-mi) long. It shares the first 16 km (10 mi) of the 55-m (180-ft) wide right-of-way with the Florence-South line. The remainder of the right-of-way is 30 m (100 ft) wide.
- Florence-South – The Florence-South line is a 230-kV line that runs for 43 km (27 mi). It shares the first 16 km (10 mi) of the 55-m (180-ft) wide right-of-way with the Sumter line. The rest of the right-of-way is 30 km (100 ft) wide.

CP&L constructed two additional RNP transmission lines, one in 1973 and the other in 1999. These lines connect only to the Darlington County Internal Combustion Turbine Electric Plant, but not to the transmission system, and are located entirely on CP&L land. CP&L designed and constructed RNP transmission lines in accordance with the National Electric Safety Code criteria (Institute of Electric and Electronic Engineers [IEEE] 1997) and industry guidance that was current when the lines were built. Ongoing right-of-way surveillance and maintenance of RNP transmission facilities ensure continued conformance to design standards.

The rights-of-way are maintained by mowing and trimming undesirable vegetation from the sides and by use of “non-restricted use” herbicides. Under normal circumstances, the mowing and herbicide schedule follows a 3-year cycle. Aerial patrols of transmission line rights-of-way are conducted three times per year and after major storms. Dead and diseased trees at the edges of rights-of-way are removed if it appears that they could fall and strike the transmission lines or support structures. CP&L participates with the U.S. Department of Agriculture-Natural Resources Conservation Service, South Carolina Department of Natural Resources (SCDNR), and other organizations in a wildlife management program for transmission line rights-of-way. The SCDNR “Power for Wildlife” program is designed to help landowners whose property is

1 crossed by transmission lines to convert transmission line rights-of-way into productive habitat
2 for wildlife. The program offers grant money and wildlife management expertise to landowners
3 who commit to participating in the program for 5 years.
4

5 **2.2 Plant Interaction with the Environment**

6
7 Sections 2.2.1 through 2.2.8 provide general descriptions of the environment near RNP as
8 background information. They also provide detailed descriptions where needed to support the
9 analysis of potential environmental impacts of refurbishment and operation during the renewal
10 term, as discussed in Sections 3 and 4. Section 2.2.9 describes the historic and archaeological
11 resources in the area, and Section 2.2.10 describes possible impacts associated with other
12 Federal project activities.
13

14 **2.2.1 Land Use**

15
16 RNP is located at the southern end of Lake Robinson in an unincorporated portion of Darlington
17 County, South Carolina. Darlington County does not have land-use zoning applicable to
18 unincorporated portions of the county. The nearest municipalities to the plant are McBee,
19 located approximately 11 km (7 mi) northwest of the plant, and Hartsville, located approximately
20 8 km (5 mi) southeast of the plant.
21

22 The total Robinson site occupies approximately 2438 ha (6020 ac), which includes 910 ha
23 (2250 ac) Lake Robinson. In addition to Unit 2 (RNP), the Robinson plant site includes Unit 1, a
24 coal-fired plant with a nameplate generator capacity of 206 MW, and the natural-gas and oil-
25 fired Darlington County Internal Combustion Turbine Electric Plant, which has a generator
26 nameplate capacity of 1046 MW (DOE/EIA 2002).
27

28 Section 307(c)(3)(A) of the Coastal Zone Management Act [16 USC 1456(c)(3)(A)] requires that
29 applicants for Federal licenses conducting an activity in a coastal zone are to provide to the
30 licensing agency a certification that the proposed activity complies with the enforceable policies
31 of the State's coastal zone program. This notification is to occur within 6 months of the State's
32 receipt of the certification. The Robinson site is not within South Carolina's coastal zone for
33 purposes of the Coastal Zone Management Act (SCDHEC 2002a).
34

35 **2.2.2 Water Use**

36
37 The water-use requirements of Units 1 and 2 of the H.B. Robinson Steam Electric Plant are
38 provided by surface water from Lake Robinson and groundwater from local wells. Lake
39 Robinson is a 910 ha (2250 ac) impoundment with a storage capacity of $38 \times 10^6 \text{ m}^3$
40 (31,000 ac-ft). Evaporation losses of water from Lake Robinson and groundwater pumping are

1 both consumptive uses of water that reduce the water supply available regionally. The water
2 supply infrastructure components (cooling-water system and groundwater wells) are shared by
3 both Units 1 and 2, and therefore, the water-use impacts are also shared.
4

5 The source of cooling water for Units 1 and 2 is Lake Robinson, an impoundment on Black
6 Creek. The flow of water entering Lake Robinson from Black Creek, several other minor
7 tributaries, and groundwater aquifers exceeds the evaporative losses occurring at the lake.
8 Therefore, Lake Robinson is able to sustain a discharge downstream.
9

10 Inflow into Lake Robinson varies seasonally and interannually. Data from the U.S. Geological
11 Survey streamflow station 02130900 on Black Creek above Lake Robinson shows only
12 23 percent of the annual flow occurring in the 4-month period of June through September.
13 Maximum, average, and minimum annual average flows reported at the same station are
14 $7.31 \text{ m}^3/\text{s}$ (258 cfs), $4.45 \text{ m}^3/\text{s}$ (157 cfs), and $2.44 \text{ m}^3/\text{s}$ (86 cfs), respectively.
15

16 Evaporative losses can be divided into three components: natural evaporation, induced
17 evaporation from Unit 1, and induced evaporation from Unit 2. Natural evaporation is the
18 component of the total lake evaporation that would occur if there were no cooling water
19 discharges to the lake. Van der Leeden et al. (1990) report an annual reservoir evaporation for
20 Columbia, South Carolina, of 130 cm (51 in.) with 48 percent of this annual evaporation
21 occurring in the 4-month period of June through September. Induced evaporative losses are a
22 result of the increased evaporation resulting from the elevated water-surface temperature
23 caused by the cooling water discharges to the lake. The discharge temperature to the lake is
24 regulated by permit (see Section 2.2.3) with the maximum allowable discharge temperatures of
25 44.0°C (111.2°F) occurring in the four-month period of June through September. Therefore,
26 the period of greatest natural evaporation, greatest induced evaporation, and lowest inflow all
27 occur in the 4-month period of June through September making this the critical period for water
28 use.
29

30 Five groundwater production wells supply Units 1 and 2 with an average combined yield of 52
31 L/s (825 gpm). These wells provide makeup water and sanitary water. The wells are
32 completed into the Middendorf Formation underlying the site.
33

34 2.2.3 Water Quality

35

36 The surface waters of the Black Creek drainage are naturally darkened by the presence of
37 tannins giving it the label of a "blackwater" system. Typical of other dystrophic "blackwater"
38 systems in the southeastern United States, the waters in the Black Creek drainage are very low
39 in dissolved minerals, have low hardness, and are naturally acidic. The chemistries of such
40 "blackwater" systems result in generally low productivity of aquatic biota.
41

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1 Downstream of Lake Robinson, Black Creek is currently listed on the State of South Carolina
2 303(d) list for 2002 as impaired for aquatic life as a result of elevated levels of zinc and copper.
3 Both Black Creek and Lake Robinson itself are listed as impaired for fish consumption as a
4 result of elevated mercury levels. The 2000 303(d) listing of impairment for Black Creek below
5 Lake Robinson for recreational uses as a result of elevated fecal coliform bacteria was removed
6 on the 2002 listing as a result of the standard being attained.
7

8 Pursuant to the Federal Water Pollution Control Act (FWPCA) of 1977, also known as the
9 Clean Water Act, the water quality of the plant effluents is regulated through the National
10 Pollutant Discharge Elimination System (NPDES). The South Carolina Department of Health
11 and Environmental Control (SCDHEC) is the agency delegated to issue NPDES permits. The
12 current permit (SC0002925) was issued January 16, 2003 and is due to expire June 2006. Any
13 new regulations promulgated by EPA or the SCDHEC would be included in future permits.
14

15 The temperature of the discharge to Lake Robinson is one aspect of the effluent discharges
16 regulated by the NPDES permit. The maximum allowable discharge temperature is specified
17 by month. Daily maximum temperatures range for 32.2°C (90.0°F) in December to 44.0°C
18 (111.2°F) for June through September. Additionally, the NPDES permit restricts the
19 temperature of water released downstream from the dam impounding Lake Robinson to less
20 than 33.0°C (91.4°F) throughout the year.
21

22 Additionally, the NPDES permit limits the concentration of chlorine, total suspended solids,
23 biochemical oxygen demand, fecal coliform, oil and grease, iron, and copper in the discharge.
24 While not specifying limits, the NPDES permit required monitoring and reporting of mercury and
25 other heavy metals concentration. Whole-effluent toxicity testing is required by the NPDES
26 permit to assess the impacts of the discharge on aquatic biota. Semiannual sampling and
27 reporting of groundwater quality of four groundwater monitoring wells is also required by the
28 NPDES permit for a variety of parameters.
29

30 **2.2.4 Air Quality**

31
32 The Robinson site is located in the transition zone delineating the Piedmont and Coastal Plain
33 of South Carolina and, therefore, has a temperate climatic regime. There are relatively few
34 breaks in the heat during the summer, which typically has about 6 days with temperatures that
35 exceed 38°C (100°F). A majority of the annual rainfall occurs during the summer, creating
36 some periods of high humid conditions. The Robinson site experiences an occasional entry of
37 very cold arctic air masses during the winter. During these periods, temperatures can fall well
38 below freezing for up to several days. Temperatures in the region of the site rarely exceed

1 35°C (95°F) or fall below -12°C (10°F). The best available long-term extreme temperature
2 data for the region indicates the highest recorded temperature of 42°C (108°F) at Columbia,
3 South Carolina, in August 1983, with the lowest reported temperature of -23°C (-9°F) at
4 Raleigh-Durham airport in North Carolina in January 1985.

5
6 Thunderstorms occur occasionally in the site region, with a normal occurrence of about 52 per
7 year (NOAA 2001). A vast majority of these storms occur during the months of May through
8 September (41 of the 52). The most recent severe weather events to affect the site area in
9 terms of strong winds and rain were associated with Hurricanes Hugo (September 1998) and
10 Hazel (October 1954). Based on statistics for the 30 years from 1954 through 1983 (Ramsdell
11 and Andrews 1986), on the average, only nine tornadoes are expected to occur in South
12 Carolina during the course of a year. The probability of a tornado striking the site is expected to
13 be about 1×10^{-4} per year.

14
15 The wind energy resource in the vicinity of the site is limited, with the annual average wind
16 power rated as 1 on a scale of 1 to 7 (Elliott et al. 1987). Wind turbines are economical for wind
17 power classes 4 through 7 that have average wind speeds of 5.6 to 9.4 m/s (12.5 to 21.1 mph)
18 (DOE 2001). Areas suitable for wind turbine application (rated class 3 or higher) in South
19 Carolina are limited to the ridges along the Blue Ridge Mountains in the extreme northwest
20 corner of the state.

21
22 The Robinson site is located within the Florence Intrastate Air Quality Control Region (AQCR)
23 (40 CFR 81.109). Currently, all counties in this AQCR are designated as being in attainment for
24 all criteria pollutants (40 CFR 81.341). The site will also be subjected to a more stringent 8-
25 hour ozone standard that was promulgated by EPA in 1997 (62 FR 38856). In 1997, EPA
26 issued new ambient air standards for $PM_{2.5}$ (40 CFR 50.7) and an 8-hour standard for ozone
27 (40 CFR 50.10). $PM_{2.5}$ is an acronym for fine particulates with an aerodynamic diameter less
28 than or equal to 2.5 micrometers. The 8-hour ozone standard is based on the 3-year average
29 of the annual fourth highest daily maximum 8-hour ozone concentrations. After several years of
30 litigation, the $PM_{2.5}$ and 8-hour ozone standards have recently been upheld. EPA is currently in
31 the process of implementing the standards, but it has not yet designated any areas as non-
32 attainment for either the $PM_{2.5}$ or 8-hr ozone standard. A portion of the AQCR, which includes
33 the Robinson site, could be at risk of being classified as non-attainment regarding ozone in the
34 future pending implementation of a new 8-hour standard in late 2004. The State only has one
35 area, the Cape Romain Wildlife Refuge, designated in 40 CFR 81.426 as a mandatory Class 1
36 Federal area in which visibility is an important value. There are more Class 1 areas located in
37 North Carolina (40 CFR 81.422), but a vast majority are located in the region of the North
38 Carolina-Tennessee border in the Smoky Mountains. None of these areas are located within
39 80 km (50 mi) of the Robinson site.

1 Diesel generators, boilers, and other activities and facilities associated with RNP operations
2 emit various pollutants. Emissions from these sources are regulated under air quality permit
3 number TV-0820-002 issued by SCDHEC and also covers the Darlington County Internal
4 Combustion Turbine Electric Plant, which is slightly more than 1.6 km (1 mi) north of the
5 Robinson site. This permit expires on March 31, 2004.
6

7 **2.2.5 Aquatic Resources**

8

9 Aquatic resources in the vicinity of RNP are associated with Lake Robinson, a water body
10 created in 1958 by the impoundment of Black Creek to serve as a source of cooling water for
11 Unit 1. The lake is not used as a source of drinking water for the local community, but it does
12 provide recreational opportunities for boating, fishing, and swimming. No commercial fishing
13 activities are associated with the lake.
14

15 Lake Robinson and Black Creek are considered dystrophic and part of a "blackwater" system.
16 Like typical dystrophic blackwater systems in the southeastern United States, water in the lake
17 and creek are very low in dissolved minerals, have low water hardness, and are tannic and
18 naturally acidic (pH ranged from 4.5 to 6.1 in 1998) (CP&L 1999a). The waters contain large
19 amounts of undecomposed organic matter derived from terrestrial plants and are, in general,
20 relatively unproductive.
21

22 Black Creek below the impoundment was listed in 2002 as "impaired" for aquatic life. Causes
23 for the listings were elevated copper at a sampling site located north-northeast of Hartsville and
24 elevated zinc at a sampling site 9 km (5.5 mi) southeast of Darlington (SCDHEC 2002b). Water
25 bodies are listed as impaired for such pollutants if any acute aquatic life criterion is exceeded
26 more than once in 5 years. In addition, high levels of methyl mercury in fish across eastern
27 South Carolina have prompted fish consumption advisories (SCDHEC 2002b). A naturally
28 occurring metal, mercury, can be present due to air deposition from coal-burning facilities and
29 incinerators. Advisories for Black Creek propose placing no restrictions on bluegill (*Lepomis*
30 *macrochirus*), redbreast sunfish (*L. auritus*), or redear sunfish (*L. microlophus*). These
31 advisories recommend limiting largemouth bass (*Micropterus salmoides*) to one meal per week
32 and limiting bowfin (*Amia calva*) to one meal per month. Advisories for Lake Robinson propose
33 no restrictions on bluegill or redear sunfish, limiting largemouth bass to one meal per month,
34 and suggest that people do not eat any bowfin.
35

36 Fish commonly observed in Lake Robinson include a variety of minnows, suckers, catfish,
37 sunfish, and perch. This is typical of other blackwater lakes in South Carolina and
38 North Carolina (CP&L 1976a). Fifty-five fish species were captured in Lake Robinson using a
39 variety of methods (electrofishing, rotenone, fyke nets) during CP&L studies conducted
40 between 1974 and 1993 (CP&L 1999a). More recent surveys have employed only

1 electrofishing and rotenone as sampling techniques. Between 1994 and 1998, such surveys
2 recorded 32 fish species from the lake, averaging 23 species observed per year (CP&L 1999a).
3 In 1998 (the most recent survey on record), bluegill were the dominant species (74 percent of
4 total fish sampled by electrofishing and 58 percent to 74 percent of the total fish densities
5 sampled with rotenone). Warmouth (*L. gulosus*), largemouth bass, and an unidentified sunfish
6 species were the next most abundant species captured when electrofishing and cove rotenone
7 sampling. Warmouth and other unidentified sunfish species were the next most abundant
8 species in 1998 cove rotenone samples. Warmouth are especially prevalent along the western
9 shore where riprap was installed to build the levy for the discharge canal. Anecdotaly, local
10 sport fisherman have recently attempted to stock the lake with white perch (*Morone americana*).
11 These fish are not native to the region and may compete with indigenous largemouth bass for
12 food and habitat.

13
14 Numerous aquatic species other than fish are also found in the vicinity of the Robinson site.
15 These include phytoplankton, zooplankton, benthic macroinvertebrates, and aquatic plants. In
16 the most recent survey, conducted in 1998, the phytoplankton class chlorophyceae (green
17 algae) had the highest densities throughout the lake (CP&L 1999a). Chrysophyceae (golden-
18 brown algae), cryptophyceae (cryptomonads), myxophyceae (blue-green algae), and
19 bacillariophyceae (diatoms) were also measured but were generally much lower in density.
20 Phytoplankton community stability, including taxa richness and species diversity, indicated no
21 significant declines or shifts since 1985 (CP&L 1996). Spatial differences in algal abundance
22 between 1985 and 1995 indicated that total phytoplankton densities were generally higher in the
23 lower impoundment and at the discharge than in the upper impoundment (CP&L 1996).

24
25 Zooplankton communities in the lake are historically characterized as low in taxa richness and
26 diversity but high in density and biomass (CP&L 1996). Throughout the lake, 37 zooplankton
27 species were identified in a 1998 survey. Mean total densities of rotifer species were highest
28 (40.3 percent), followed by cladocerans (34.7 percent), copepods (23.5 percent), and protozoa
29 (0.02 percent). Mean percent biomass of these taxa followed the same trend. Changes have
30 occurred in the zooplankton community composition since surveys were conducted in 1985,
31 with rotifer populations generally increasing and copepods decreasing. These changes are
32 attributed to size-selective feeding by fish, particularly bluegill (CP&L 2002a). The bluegill
33 population expanded rapidly following replacement of brass condenser tubes with stainless
34 steel condenser tubes in 1982. This action greatly reduced copper concentrations in the lake
35 and thereby increased the bluegill population.

36
37 Benthic invertebrates sampled in 1998 included 75 taxa. This number of taxa and community
38 composition is similar to collections between 1994 and 1997. Naidid worms (oligochaetes,
39 primarily *Pristina aequisetia*) and midge larvae (primarily *Zalutschia* spp. and *Parakiefferiella*)
40 represent the majority of benthic macroinvertebrates throughout the lake (CP&L 1999a). Taxa
41 richness and diversity are significantly less at the discharge than at upper and lower

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1 impoundment sample sites; however, but the population in the discharge region has not
2 significantly changed during the past 20 years, and there appears to have been little long-term
3 effect on the ecological structure of the benthic invertebrate community in the lake as a whole.
4 Monitoring for aquatic nuisance species, specifically Asiatic clams (*Corbicula fluminea*) and
5 zebra mussels (*Dreissena polymorpha*), is performed by CP&L on an annual basis. To date,
6 neither species has been found in Lake Robinson or in Black Creek.

7
8 According to plant species surveys conducted by CP&L between 1985 and 1995 (CP&L 1996),
9 no nuisance aquatic vascular plant species, as defined by the Water Resources Division of the
10 SCDNR, are found in Lake Robinson. Five native species that sometimes cause problems by
11 restricting use of waterbodies for recreation or other purposes are found in the lake including
12 variable-leaf milfoil (*Myriophyllum heterophyllum*), fragrant water-lily (*Nymphaea odorata*), water
13 shield (*Brasenia schreberi*), slender spikerush (*Eleocharis baldwinii*), and spatterdock (*Nuphar*
14 *luteum*). However, the mere presence of these aquatic plants does not constitute a problem,
15 and as long as they do not obstruct navigable waterways, clog water intakes, degrade water
16 quality, interfere with recreation, or upset the balance of desirable fish populations, they can
17 provide valuable food, shelter, and reproductive habitat for fish and wildlife, improve water
18 quality, and enhance the aesthetic appeal of surface water. In general, the greatest diversity
19 and abundance of aquatic vascular plants is found in the upper section of the lake, above the
20 discharge area and away from regions where dense vegetation could potentially impact power
21 plant operation (CP&L 1999a).

22
23 Eleven State and Federally protected aquatic species with potential to occur in the region
24 surrounding the Robinson site were identified through review of the South Carolina Heritage
25 Trust database, and through correspondence with the SCDHEC, the FWS, and the National
26 Marine Fisheries Service (NMFS) [now National Oceanic and Atmospheric Administration
27 Fisheries (NOAA Fisheries)] (Table 2-2). None of the fish or benthic invertebrate species
28 identified were ever recorded during CP&L environmental monitoring surveys conducted from
29 1974 to 1998 (CP&L 1999a) and are not considered to exist on or near the Robinson site.

30
31 Of the eleven protected species identified, only the Carolina heelsplitter (*Lasmigona decorata*)
32 and shortnose sturgeon (*Acipenser brevirostrum*) are on the Federal list of endangered
33 species. One species, the Atlantic sturgeon (*Acipenser oxyrinchus*), is a candidate for Federal
34 listing. Prior to a 1987 FWS survey (FWS 1993), the Carolina heelsplitter had not been found
35 since the mid-19th century. This Federally endangered freshwater mussel was historically
36 found in South Carolina in the Pee Dee River system. The FWS conducted intensive surveys
37 between 1987 and 1990 and found only two surviving populations of the Carolina heelsplitter in
38 the Pee Dee River system – the Goose Creek and Lynches River/Flat Creek populations. The
39

Table 2-2. Federally Listed and South Carolina State-Listed Aquatic Species Potentially Occurring in the Vicinity of RNP

Scientific Name	Common Name	Federal Status ^(a)	State Status ^(a)
<i>Acipenser brevirostrum</i>	shortnose sturgeon	E	E
<i>Acipenser oxyrinchus</i>	Atlantic sturgeon	C	---
<i>Etheostoma flabellare</i>	fantail darter	---	SC
<i>Notropis chiliticus</i>	redlip shiner	---	SC
<i>Semotilus lumbee</i>	sandhills chub	---	SC
<i>Elliptio congaraea</i>	Carolina slabshell	---	SC
<i>Elliptio lanceolata</i>	yellow lance	---	SC
<i>Lasmigona decorata</i>	Carolina heelsplitter	E	E
<i>Pyganodon cataracta</i>	Eastern floater	---	SC
<i>Villosa constricta</i>	notched rainbow	---	SC
<i>Villosa delumbis</i>	Eastern creekshell	---	SC

(a) E = endangered, C = candidate for listing, SC = state species of concern, --- = no listing

population nearest the plant was found in the Lynches River (downstream from the Black Creek/Pee Dee River junction) along the western boundary of Chesterfield County (FWS 1993). During the FWS surveys, a total of only 12 live individuals were found in Flat Creek (1987 to 1990) and two individuals were found in the Lynches River (both found in 1990).

Shortnose sturgeon occur in most major river systems along the eastern seaboard of the United States. They inhabit the main stems of natal rivers, migrating between freshwater and mesohaline river reaches. Spawning occurs in upper, freshwater areas, while feeding and overwintering activities may occur in both fresh and saline habitats (NMFS 1998). In South Carolina they are found in the river systems that empty into Winyah Bay (including the Pee Dee River). Shortnose sturgeon were documented in the Winyah Bay system during the late 1970s and early 1980s (Dadswell et al. 1984) and over 100 collections of juveniles and adults were collected (NMFS 1998).

In a letter dated June 7, 2001, the FWS office in Charleston indicated that the shortnose sturgeon possibly occurs in Darlington County. Additionally, the shortnose sturgeon is listed in Chesterfield, Darlington, Florence, and Sumter Counties by the FWS Southeast Regional Office on their website (FWS 1999); however, the species is not known to occur in Black Creek.

1 **2.2.6 Terrestrial Resources**
2

3 CP&L's ER described the terrestrial resources as follows (CP&L 2002a). The primary terrestrial
4 plant community in the vicinity of the site is the pine-turkey oak-wire grass community typical of
5 the Sandhills (Barry 1980). This community is characterized by longleaf (*Pinus palustris*) and
6 loblolly (*P. taeda*) pines with a mid-story of oaks, chiefly turkey oak (*Quercus laevis*), along with
7 blackjack oak (*Q. marilandica*), upland willow oak (*Q. incana*), and post oak (*Q. stellata*). Most
8 of the upland CP&L property west of Lake Robinson and south of Secondary State Route 346
9 consists of forest from which timber has been harvested in recent years. After timber is
10 removed, areas are replanted with tree species appropriate to the terrain, soils, and drainage
11 characteristics of a site. Harvested areas are usually replanted in loblolly pine, slash pine (*P.*
12 *elliottii*), or longleaf pine. CP&L property north of Secondary State Route 346 (approximately
13 346 ha [1,036 ac]) is leased to and managed by South Carolina Department of National
14 Resources (SCDNR) as a wildlife management area for activities such as public hunting and
15 fishing.
16

17 Lake Robinson (an impoundment of Black Creek) provides some limited marsh habitat in
18 shallow backwaters at the north (upstream) end of the impoundment. These marshes and
19 adjacent shallows are used by various waterfowl such as the mallard, green-winged teal, wood
20 duck, and Canada goose. Bottomland forest habitat occurs along Black Creek and is
21 characterized by cypress, white cedar, red maple, water oak, red bay, sweet bay, and black
22 willow (NRC 1975).
23

24 Terrestrial wildlife species that occur in forested portions of the RNP property are those typically
25 found in similar habitats in South Carolina. Common mammals in the Sandhills and bottomland
26 forest habitats include the opossum (*Didelphis virginiana*), eastern cottontail (*Sylvilagus*
27 *floridanus*), gray squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), and white-tailed deer
28 (*Odocoileus virginianus*). Semi-aquatic mammals such as the beaver (*Castor canadensis*) and
29 river otter (*Lutra canadensis*) occur along Black Creek. Numerous bird species (e.g., bobwhite
30 quail [*Colinus virginianus*], blue jay [*Cyanocitta cristata*], various warblers) and several reptile
31 and amphibian species occur throughout the site.
32

33 The transmission corridors are situated within the Carolina Sandhills and Upper Coastal Plain
34 physiographic regions. The principal land-use categories traversed by the transmission line
35 rights-of-way are row crops, pasture, and forest. Wooded habitats along transmission line
36 rights-of-way consist of pine forest, pine-hardwood forest, and bottomland hardwood forest. No
37 areas designated by the U.S. Fish and Wildlife Service (FWS) as critical habitat for endangered
38 species exist on the Robinson site or adjacent to associated transmission lines. The
39 transmission line rights-of-way also do not cross any State or Federal parks, wildlife refuges, or
40 wildlife management areas.

1 Based on a review of the SCDNR Heritage Trust Program database, the NRC and CP&L found
 2 no record of Federally or State-listed species occurring at the Robinson site or along the
 3 associated transmission line rights-of-way (SCDNR 2001a). Animal and plant species that are
 4 Federally or State-listed as endangered or threatened, and that are known to occur in counties
 5 traversed by the associated transmission lines (Darlington, Lee, Florence, and Sumter
 6 Counties) or in counties in which the Robinson site is situated (Darlington and Chesterfield
 7 Counties), are listed in Table 2-3 (SCDNR 2001b).

8
 9 **Table 2-3. Terrestrial Species Listed as Endangered or Threatened by the FWS/NOAA**
 10 **Fisheries and Species that are Candidates for Listing as Threatened or**
 11 **Endangered that Occur or Potentially Occur Within the Robinson Site or the**
 12 **Associated Transmission Line Rights-of-Way**
 13

14	Scientific Name	Common Name	Federal Status ^(a)	State Status ^(a)
15	Birds			
16	<i>Haliaeetus leucocephalus</i>	bald eagle	T	E
17	<i>Picoides borealis</i>	red-cockaded woodpecker	E	E
18	Mammals			
19	<i>Corynorhinus rafinesquii</i>	Rafinesque's big-eared bat	-	E
20	Amphibians			
21	<i>Hyla andersonii</i>	pine barrens treefrog	-	T
22	Plants			
23	<i>Schwalbea americana</i>	chaffseed	E	E
24	<i>Lysimachia asperulifolia</i>	rough-leaved loosestrife	E	E
25	<i>Oxypolis canbyi</i>	Canby's dropwort	E	E
26	(a) E = endangered, T = threatened.			
27	Source: SCDNR 2001b			

28
 29 Bald eagles are Federally listed as threatened and State-listed as endangered. Bald eagles are
 30 occasionally observed at Lake Robinson (CP&L 1998b), but there are no known eagle nests in
 31 the vicinity of the impoundment (SCDNR 2001a). Bald eagles are generally found in close
 32 proximity to impoundments, rivers, and coastal areas (FWS 2001). Bald eagles are known to
 33 nest in Florence County (SCDNR 2001b), but there are no known nests in the vicinity of the
 34 transmission line rights-of-way associated with RNP (SCDNR 2001a).

35
 36 Red-cockaded woodpeckers (*Picoides borealis*), Federally and State-listed as endangered, are
 37 known to occur in Darlington, Chesterfield, Lee, Sumter, and Florence Counties (SCDNR
 38 2001b). Active nest cavities of this cooperative breeder occur in open, mature pine stands with

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1 sparse midstory vegetation (FWS 2001). An active red-cockaded woodpecker colony is located
2 in Sandhills State Forest, approximately 8.4 km (5.2 mi) northwest of RNP (SCDNR 2001a).
3 Two abandoned red-cockaded woodpecker cavity trees are located on the Robinson site near
4 the Darlington County Internal Combustion Turbine Electric Plant. Both of these cavity trees
5 have been abandoned for many years. CP&L conducted a field survey for the red-cockaded
6 woodpecker in 1999 throughout the Robinson site; the survey identified no active cavity trees
7 and no foraging habitat for this species. CP&L requires surveys to be conducted when there is
8 timber harvesting or clearing of pine trees at the site (CP&L 1998b). In accordance with a Safe
9 Harbor Agreement with the State of South Carolina, CP&L manages the site to maintain and
10 enhance habitat for red-cockaded woodpeckers (CP&L 1999b). There are no known active or
11 abandoned cavity trees adjacent to RNP-associated transmission line rights-of-way (SCDNR
12 2001a).

13
14 Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) is State-listed as endangered. This bat is
15 found in forested areas, especially in pine flatwoods and pine-oak woodlands (Bellwood 1992).
16 It roosts in hollow trees, under bark, in old cabins and barns, and in wells and culverts (Brown
17 1997). The species has been recorded in Darlington County (SCDNR 2001b), but there are no
18 recorded occurrences on the Robinson site or along the transmission line rights-of-way
19 associated with RNP (SCDNR 2001a).

20
21 The pine barrens treefrog (*Hyla andersonii*) is State-listed as threatened and is known to occur
22 in Chesterfield County (SCDNR 2001b). This species inhabits swamps adjacent to Sandhills
23 habitats (Martof et al. 1980). There are no recorded occurrences of this species on the
24 Robinson site or along the transmission line rights-of-way associated with RNP (SCDNR
25 2001a).

26
27 Chaffseed (*Schwalbea americana*) is Federally and State-listed as endangered. Habitat for this
28 perennial herb consists of open, moist flatwoods, fire-maintained savannas, ecotones between
29 peaty wetlands and xeric sandy soils, and other open grass-sedge systems. Factors such as
30 fire, mowing, or fluctuating water tables are necessary to maintain the open to partly-open
31 conditions that chaffseed requires (FWS 2001). Chaffseed has been recorded in Lee,
32 Florence, and Sumter Counties (SCDNR 2001b), but there are no recorded occurrences on the
33 Robinson site or along the transmission line rights-of-way associated with RNP (SCDNR
34 2001a).

35
36 Rough-leaved loosestrife (*Lysimachia asperulifolia*) is Federally and State-listed as
37 endangered. Habitat for this perennial herb consists of Carolina bays and the ecotones
38 between longleaf pine uplands and pond pine pocosins, an upland swamp community type
39 (FWS 2001). The species has been recorded in Darlington County (SCDNR 2001b), but there
40 are no recorded occurrences on the Robinson site or along the transmission line rights-of-way
41 associated with RNP (SCDNR 2001a).

1 Canby's dropwort (*Oxypolis canbyi*) is Federally and State-listed as endangered. This perennial
2 plant is known to occur in Lee, Sumter, and Florence Counties (SCDNR 2001b). This coastal
3 plain species grows in wet meadows, wet pineland savannas, ditches, sloughs, and along the
4 edges of cypress-pine ponds (FWS 2001). There are no recorded occurrences of this species
5 on the Robinson site or along the transmission line rights-of-way associated with RNP (SCDNR
6 2001a).

7
8 CP&L annually conducts environmental self-assessments to update information and review
9 internal procedures relating to potential impacts of electrical generation and transmission
10 facilities on fish and wildlife (including endangered and threatened species) and natural
11 habitats. The results of these assessments are passed to CP&L's Transmission Department so
12 that appropriate measures can be taken to protect natural resources along the transmission line
13 rights-of-way.

14
15 The staff is unaware of any candidate terrestrial species (species that may warrant listing in the
16 future but have no current statutory protection under the Endangered Species Act) or species
17 proposed for listing by the FWS that occur on the Robinson site or along associated
18 transmission line rights-of-way.

19 20 **2.2.7 Radiological Impacts**

21 CP&L has conducted a radiological environmental monitoring program (REMP) around the
22 Robinson site since 1973 (CP&L 2002b). The radiological impacts to workers, the public, and
23 the environment have been routinely monitored, documented, and compared to the appropriate
24 standards. The purposes of the REMP are to

- 25 • measure accumulation of radioactivity in the environment
- 26
- 27 • determine whether this radioactivity is the result of operations at RNP,
- 28
- 29 • assess the potential dose to the offsite population based on the cumulative
- 30 measurements of radioactivity of RNP origin (CP&L 2002c).
- 31

32
33 Requirements for the REMP are established in the ODCM (CP&L 2002b). Radiological
34 releases are summarized in the annual reports (CP&L 2002c). The limits for all radiological
35 releases are specified in the ODCM, and these limits are designed to meet Federal standards
36 and requirements. The REMP includes monitoring of the air, direct radiation, surface water,
37 drinking water, groundwater, shoreline sediment, aquatic vegetation, bottom sediment, milk,
38 fish, broadleaf vegetation, and food products within about a 16 km (10 mi) radius of the plant.
39
40

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1 Review of historic data on releases and the resultant dose calculations revealed that the doses
2 to maximally exposed individuals in the vicinity of the Robinson site were a small fraction of the
3 limits specified in the EPA environmental radiation standards, 40 CFR Part 190, as required by
4 10 CFR 20.1301(d). For 2001 (the most recent year that data were available), dose estimates
5 were calculated based on actual liquid and gaseous effluent release data (CP&L 2002c) and on
6 concentrations of radionuclides measured by the REMP using the ODCM (CP&L 2002b). Dose
7 estimates based on effluent data were performed using the plant effluent release data, onsite
8 meteorological data, and appropriate pathways identified in the ODCM.

9
10 Breakdowns of maximum dose to an individual located at the RNP site boundary from effluent-
11 based releases and environmental-based releases for the year 2001 follow:

- 12
13 • Total body dose from liquid effluent-based estimates was 7.04×10^{-6} mSv ($7.04 \times$
14 10^{-4} mrem), which is less than 0.01 percent of the 0.03 mSv (3 mrem) dose limit
15 specified in 10 CFR Part 50, Appendix I. The maximum total organ dose for the liquid
16 effluent-based estimates was 8.31×10^{-6} mSv (8.31×10^{-4} mrem) to the adult
17 gastrointestinal tract-lower large intestine. This estimate is less than 0.01 percent of the
18 0.10-mSv (10-mrem) dose limit (CP&L 2002c).
- 19
20 • The air dose due to noble gases in gaseous effluents was 2.38×10^{-5} mGy ($2.38 \times$
21 10^{-3} mrad) beta and 4.94×10^{-5} mGy (4.94×10^{-3} mrad) gamma. These estimates are
22 less than 0.03 percent of the dose limits (CP&L 2002c).
- 23
24 • The critical organ dose from gaseous effluents due to iodine-131, iodine-133, tritium,
25 and particulates with half-lives greater than 8 days is 1.57×10^{-3} mSv (0.157 mrem) to
26 the adult lung, which is approximately 1 percent of the 0.15-mSv (15-mrem) dose limit
27 (CP&L 2002c).
- 28
29 • The maximum individual dose estimated from consumption of fish contaminated by
30 tritium is 6.0×10^{-5} mSv/yr (6.0×10^{-3} mrem/yr), which is 0.02 percent of the dose limit
31 (CP&L 2002c).

32
33 CP&L does not anticipate any significant changes to the radioactive effluent releases or
34 exposures from RNP operations during the renewal period, and therefore, the impacts to the
35 environment are not expected to change.
36

2.2.8 Socioeconomic Factors

The staff reviewed the CP&L ER and information obtained from several county, city, and economic development staff during a site visit to Darlington, Florence, Lee, and Chesterfield Counties from September 24 through 26, 2002. The following information describes the economy, population, and communities near the Robinson site.

2.2.8.1 Housing

Approximately 520 employees work at RNP (about 120 contract employees and approximately 400 permanent employees). Approximately 83 percent of CP&L's permanent employees live in Darlington and Florence Counties, and the rest of the employees live in other locations (see Table 2-4). Table 2-4 does not include information on the locations of the residences of the contract employees. Location information is not available for contractor employees, but the geographic distribution of their residences is assumed to be similar to that of the permanent employees. Given the predominance of CP&L employees living in Darlington and Florence Counties and the absence of the likelihood of significant socioeconomic effects in other locations, the focus of the analyses undertaken in this SEIS is on these two counties.

Table 2-4. RNP Permanent Employee Residence Information by County and City

County and City ^(a)	Number of CP&L Personnel	Percent of CP&L Personnel
Darlington County, S.C.		
Hartsville	199	49.9
Darlington	17	4.3
Total Named Places	216	54.1
Total Darlington County	226	56.6
Florence County		
Florence	102	25.6
Total Florence County	106	26.6
Chesterfield County		
Total Chesterfield County	16	4.0
Lee County		
Total Lee County	4	1.0
Other counties	47	11.8
Grand Total	399	100.0

(a) Addresses are for both incorporated cities and towns and rural areas with the same zip code. Only cities and towns with at least 10 employees are shown.

Source: NRC 2003a

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1 CP&L refuels RNP on an 18-month cycle. During these refueling outages, site employment
 2 increases by as many as 950 to 1050 temporary workers for 30 to 40 days. Most of these
 3 temporary workers are assumed to be located in same geographic areas as the permanent
 4 CP&L staff.

5
 6 Table 2-5 provides the number of housing units and housing unit vacancies for Darlington and
 7 Florence Counties for 1990 and 2000. Both the number and percentage vacant grew in both
 8 counties during the period. Both Darlington County and Florence County have urban
 9 development boundaries within which development is to take place. Land-use planning for
 10 each county addresses several issues with respect to successful co-existence of mixed land
 11 uses. The major areas of concern, as detailed in the Darlington County Comprehensive Plan,
 12 include efforts to reduce strip development, diminish incompatible mixed land uses, protect
 13 prime farmland, and accommodate urban/residential growth (Darlington County 1998, 1999).
 14 Urban residential growth is encouraged where infrastructure exists and maximized utilization of
 15 these facilities will spur the construction of additional facilities. Great deliberation is expected
 16 when determining whether or not prime agricultural land would be converted to urban/residential
 17 land in the future. The Florence County Comprehensive Plan details mitigative measures that
 18 County officials have put into place (Florence County 1999). New residential development will
 19 be guided (by zoning) to promote clusters and infill existing urban areas, to protect prime
 20 farmland, to expand future infrastructure on an as-needed basis, and to govern the locations of
 21 potentially incompatible land uses by zoning regulations.

22
 23 **Table 2-5. Housing Units and Housing Units Vacant (Available) by County During 1990**
 24 **and 2000**

	1990	2000	Approximate Percentage Change 1990-2000
DARLINGTON COUNTY, SC			
Housing Units	23,601	28,942	22.6%
Occupied Units %	93.2%	89.1%	-4.4%
Vacant Units %	6.8%	10.9%	60.3%
FLORENCE COUNTY, SC			
Housing Units	43,209	51,836	20.0%
Occupied Units %	93.1%	91.0%	-2.3%
Vacant Units %	6.9%	9.0%	30.4%

35 (a) USCB 2000a, 200b

1 **2.2.8.2 Public Services**

2

3 • **Water Supply**

4

5 Table 2-6 shows water supplies in Darlington and Florence Counties. Darlington County
6 receives the majority of its potable water from the Darlington County Water and Sewer
7 Authority, which has 11 deep wells that tap into the Middendorf aquifer. The City of
8 Hartsville has four deep wells that also tap the Middendorf aquifer. This aquifer provides
9 water to a five-county area, and the capability of the aquifer to replenish itself is presently
10 being taxed.

11

12 **Table 2-6. Darlington and Florence County Public Water Suppliers and Capacities**

13

Water Supplier	Average Daily Use m ³ /day (MGD)	Maximum Daily Capacity m ³ /day (MGD)
Darlington County		
Darlington County Water and Sewer Authority	16,300 (4.36)	32,800 (8.67)
City of Darlington	4700 (1.24)	7100 (1.87)
City of Hartsville	5000 (1.32)	13,200 (3.48)
Town of Lamar	300 (0.09)	2700 (0.72)
Florence County		
City of Florence	45,200 (11.94)	50,900 (13.45)
Town of Timmonsville	1400 (0.37)	1900 (0.50)
Town of Olanta	300 (0.09)	800 (0.22)
Lake City	4500 (1.19)	12,400 (3.29)
Town of Scranton	400 (0.11)	2000 (0.53)
Town of Pamplico	500 (0.14)	2500 (0.67)
City of Johnsonville	1600 (0.42)	3300 (0.88)
Town of Coward	200 (0.05)	1500 (0.40)
FCW/Effingham	4300 (1.13)	Not available in report
FCW/Hoffmeyer and Sewer Authority	100 (0.03)	Not available in report

33 Source: SCDHEC 2000

34

35 Long-term pumping has caused a 61-m (200-ft) reduction of the groundwater level in some
36 locations throughout much of the five-county surrounding area. The aquifer cannot be
37 continually pumped at the current rate of demand, so an alternative water source must be

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1 developed to satisfy demand for the next 10 years. The most apparent solution would be
2 the creation of a surface water treatment facility located on the Great Pee Dee River.
3 Based upon initial investigation, this water source would be able to supply water for both
4 domestic and industrial needs for many years. The project is expected to be an expensive
5 undertaking and would require the collaboration of surrounding counties and municipalities
6 (Darlington County 1998,1999).

7
8 The majority of the Florence County water supply is provided by the City of Florence
9 (23 wells), which is supported by the Black Creek and Middendorf aquifers. The County is
10 also involved in the process of researching/developing a new water supply source, and
11 operates and maintains a system to distribute water to its customers. Florence County has
12 agreements with Darlington County and the Town of Timmonsville for access to additional
13 water supplies. Residents outside the service area (including those south of the Lynches
14 River) use private wells for potable water. The County will not commit to an expansion of its
15 distribution facilities until the potential user base is large enough to justify the expense
16 (Florence County 1999).

17
18 Both Darlington and Florence counties anticipate water supply challenges in the future.
19 According to the data, there will be shortages in some areas and excess supply in others.
20 Future industries and residents will be encouraged to locate in areas with an adequate
21 water supply infrastructure.

22 23 • **Transportation**

24
25 Darlington County is served by Interstate 20 (I-20), which enters the county from the west
26 and connects Columbia and points west with Interstate 95, the major eastern states north-
27 south route, near Florence. The largest capacity highway in the immediate vicinity of the
28 Robinson site is South Carolina Highway 151 (S.C. 151), which is a north-south road.
29 U.S. Highway 15 (U.S. 15) traverses the middle of the county, from southwest to northeast
30 about 16 km (10 mi) to the south of the Robinson site.

31
32 Road access to RNP is via Old Camden Road (SSR 23), a two-lane paved road (see
33 Figure 2-2). Old Camden Road intersects S.C. 151 approximately 0.8 km (0.5 mi) west of
34 RNP. S.C. 151 has a northwest-southeast orientation and is used by employees traveling
35 from the Hartsville and Darlington rural areas south of RNP and employees from
36 Chesterfield County to the north. Employees from Lee County to the southwest travel east

1 on S.C. 34 or I-20 to intersect with S.C. 403/U.S. 15 North, a tributary to S.C. 151.
 2 Residents of Florence County connect directly to S.C. 151 via U.S. Highway 52 West or
 3 travel on I-20 West to S.C. 403/U.S. 15 North. Traffic count data for each of these
 4 highways/roads is shown in Table 2-7 (South Carolina Department of Transportation 2001a,
 5 2001b).

6
 7 The State of South Carolina does not make level of service determinations in rural, non-
 8 metropolitan areas unless it has deemed it necessary. None of the roads listed have had
 9 level-of-service determinations calculated by the South Carolina Department of Transporta-
 10 tion (South Carolina Department of Transportation 2001a). Both Darlington and Florence
 11 Counties are well-served by Class I railroads, and there is rail service to the Robinson site.

12
 13 **Table 2-7. Traffic Counts for Roads in the Vicinity of RNP**

Route No.	Vicinity of	Est. AADT ^(a,b)
SSR 23 (Old Camden Road)	S.C. 102	2100
S.C. 151	U.S. 15	11,000
S.C. 151	S.C. 34	17,300
Alternate S.C. 151	S.C. 151	8200
U.S. 52	Florence County Line to S.C.151	21,300
S.C. 403	I-20 to U.S. 15	3,800
U.S. 15	S.C. 403 to S.C. 151	7,600

24 AADT = Annual Average Daily Traffic volumes – all for 1999.

25 SSR = Secondary State Route.

26 S.C. = State primary road.

27 (a) South Carolina Department of Transportation 2001a.

28 (b) South Carolina Department of Transportation 2001b.

29 30 **2.2.8.3 Offsite Land Use**

31
 32 RNP is located at the southern end of Lake Robinson in an unincorporated portion of Darlington
 33 County, South Carolina. Darlington County is situated in the northeast quadrant of South
 34 Carolina about 130 km (80 mi) northwest of Myrtle Beach and 126 km (78 mi) northeast of
 35 Columbia. The counties surrounding and adjacent to Darlington County are Chesterfield,
 36 Marlboro, Florence, and Lee Counties. Darlington County has three major surface water
 37 resources: Black Creek, the Great Pee Dee River, and Lynches River. Darlington County
 38 covers an area of 1467 km² (566.7 mi²) and has a population of approximately 65,000. The
 39 terrain is slightly rolling and the soil is mostly well-drained, sandy loam. The City of Darlington,

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1 27 km (17 mi) southeast of the Robinson site, is the seat of county government and has a
2 population of approximately 7500. Hartsville, located approximately 8 km (5 mi) southeast of
3 the Robinson site, is the other major city in the county and has a population of approximately
4 8500. The county has two smaller incorporated townships, Lamar and Society Hill (Darlington
5 County Development Board 2002).

6
7 The majority of the land in Darlington County is rural in nature, either vacant, forested, or in
8 agricultural production. Approximately 54,000 ha (133,000 ac) are forested and 58,000 ha
9 (143,000 ac) are considered farmland. Of the farmland, approximately 51,000 ha (127,000 ac)
10 are in crop production and the remainder is pastureland. Residential development is the largest
11 non-agricultural use of land in the county. The majority of the housing is single family and is
12 within the cities of Darlington and Hartsville. Industrial uses occupy approximately 424 ha
13 (1046 ac) in the county.

14 **2.2.8.4 Demography**

15
16
17 Population was estimated from the Robinson site out to a distance of 80 km (50 mi). CP&L
18 used 2000 census data from the U.S. Census Bureau (USCB) website (USCB 2000a, 2000b)
19 and geographic information system software (ArcView) to determine demographic
20 characteristics in the RNP vicinity. The USCB provides updated annual projections, in addition
21 to decennial data, for selected portions of its demographic information. The USCB's year 2000
22 low-income census data was not yet available; therefore, CP&L used 1990 tract data for its low-
23 income analysis. CP&L included block groups or tracts if any of their area lay within 80 km
24 (50 mi) of the Robinson site. The 80-km (50-mi) radius includes 670 block groups and 189
25 tracts. CP&L defines the geographic area for RNP as the entire States of North and South
26 Carolina, separately, for block groups or tracts that are contained in each State. CP&L chose
27 to use 2000 data in discussing minority and total population.

28
29 NRC guidance calls for the use of the most recent USCB decennial census data, which in the
30 case of the Robinson site is data from the 2000 census (USCB 2000a, 2000b). The NRC staff
31 used 2000 census data in this section and in discussing both minority and low-income
32 populations.

33
34 Using USCB 2000 census information, CP&L estimated that 90,408 people lived within 32 km
35 (20 mi) of RNP. The NRC staff arrived at the slightly larger value of 91,800. Applying the GEIS
36 sparseness measures, Robinson has a population density of 29 persons/km² within 32 km
37 (73 persons/mi² within 20 mi) and falls into a less sparse category, Category 3 (having 60 to
38 120 persons per square mi or less than 60 persons per square mi with at least one community
39 with 25,000 or more persons within 20 mi).

1 Using USCB 2000 census information, CP&L estimated that 809,852 people live within 80 km
2 (50 mi) of the Robinson site. The NRC staff arrived at a slightly larger value of 814,200. This
3 equates to a population density of 40 persons/km² (104 persons/mi²) within 80 km (50 mi).
4 Applying the GEIS proximity measures, the Robinson site is classified as being "not in close
5 proximity," Category 3 (having no city of more than 100,000 persons and less than
6 73 persons/km² [190 persons/mi²] within 80 km [50 mi]). Based on the GEIS sparseness and
7 proximity matrix, the Robinson site meets sparseness Category 3 and proximity Category 3.
8 This results in the conclusion that the site is located in a medium population area. All or parts
9 of 20 counties and portions of the City of Columbia are located within 80 km (50 mi) of the
10 Robinson site (Figure 2-1). Approximately 83 percent of Robinson site employees live in
11 Florence and Darlington Counties. The remaining 17 percent is distributed across 11 counties,
12 with numbers ranging from 1 to 30 people. The towns of Hartsville, Florence, and Darlington
13 have the highest numbers of employees in residence, with 50 percent, 26 percent, and
14 4 percent, respectively (NRC 2003a).

15
16 Both Darlington and Florence Counties are growing at slower rates than South Carolina as a
17 whole. From 1990 to 2000, South Carolina's average annual population growth rate was
18 1.5 percent, while Florence County increased by only 1.0 percent per year and Darlington
19 County increased by 0.9 percent per year (USCB 2000c). In 1995, South Carolina reported a
20 population estimate of 3.7 million people. By the year 2025, South Carolina is projected to have
21 4.6 million people (USCB 1997), growing at an average annual rate of 0.8 percent (USCB
22 Undated, accessed 2001). By the year 2025, Darlington and Florence Counties are projected
23 to grow at average annual rates of 0.2 and 0.7 percent, respectively (South Carolina Office of
24 Research and Statistics Budget and Control Board 2000). Projections for the period from 2000
25 through 2025 show Florence and Darlington Counties with a growth rate less than the state's
26 growth of 25.6 percent with population increases of 17.1 and 7 percent, respectively (South
27 Carolina Office of Research and Statistics Budget and Control Board 2002).

28
29 Table 2-8 shows estimated populations and annual growth rates for Darlington and Florence
30 Counties. The table is based on USCB data for 1980, 1990, and 2000; State of South Carolina
31 projections through 2020; and a CP&L projection to 2030 that is based on linear regression
32 techniques.
33

Table 2-8. Regional Population Growth

Population and Average Annual Growth Rate (as a Percent) During the Previous Decade					
Year	Darlington County		Florence County		Percent
	Number	Percent	Number	Percent	
1980 ^(a)	62,717	1.7	110,163	2.3	
1990 ^(a)	61,851	0.1	114,344	0.4	
2000 ^(b)	67,394	0.9	125,761	1.0	
2010 ^(b)	67,800	0.06	134,200	0.7	
2020 ^(b)	69,900	0.3	142,800	0.7	
2030 ^(c)	72,027	0.3	150,993	0.6	

(a) USCB 1995.

(b) USCB 2000c.

(c) South Carolina Office of Research and Statistics Budget and Control Board 2000.

(d) Linear extrapolation.

- Resident Population Within 80 km (50 mi). Table 2-9 presents the population distribution within 80 km (50 mi) of the Robinson site for the year 2000.

The county planning departments for Darlington and Florence counties project relatively low growth in Hartsville and nearby areas.

Table 2-9. Population Distribution Within 80 km (50 mi) of the Robinson Site

0 to 16 km (0 to 10 mi)	16 to 32 km (10 to 20 mi)	32 to 48 km (20 to 30 mi)	48 to 64 km (30 to 40 mi)	64 to 80 km (40 to 50 mi)	Total
33,800	57,900	163,800	204,400	305,200	814,200

Detail may not add to total due to rounding error.

Source: USCB 2000a, 2000b

- Migrant Labor. Migrant farm workers are individuals whose employment requires travel to tend or harvest agricultural crops. Some migrant workers may follow seasonal crop cycles through North Carolina and South Carolina, while others may be permanent residents of the Robinson area who travel from farm to farm performing seasonal work.

Migrant workers can be members of minority or low-income groups. Because migrant workers travel and can spend significant time in an area without being residents, they may

1 be unavailable for counting by census takers. If this occurs, they would be "under-
2 represented" in census minority and low-income population counts.

3
4 There are 346 farms in Darlington County and 615 in Florence County (USDA 1997a).
5 Around 1870 farm workers are present at some time during the year in Florence County
6 (about 1470 for less than 150 days per year) and 1330 in Darlington County (1010 for less
7 than 150 days per year) (USDA 1997a, 1997b). Both counties are entirely within the 80-km
8 (50-mi) radius of the Robinson site. However, almost all of the laborers on farms in the area
9 are believed to reside in the area. Migrant labor plays little or no role and is not expected to
10 distort the minority and low-income statistics.

11 **2.2.8.5 Economy and Taxes**

12
13
14 Both Darlington and Florence Counties have experienced slow growth in economic activity
15 during the last decade. The two counties have ready access to domestic and international
16 markets, with a transportation network consisting of interstate highway access to major north-
17 south and east-west routes, trucking and rail terminals, two international airports, and two
18 international ports.

19
20 Darlington County is an industrial, academic, and cultural center. In recent years, the County's
21 economic development strategy has centered around attracting metals manufacturing firms.
22 Major metals employers in the county include Nucor Corporation (steel), American Stainless
23 and Alloy Products (products from secondary stainless steels and nickel alloy scrap), Talley
24 Metals Technology (stainless steel), Roller Bearing Co. of America, Frazier Industrial Company
25 (structural steel products), Hogge Precision Parts Company, Progressive Alloy Steels
26 Unlimited, LLC, and TechnoSteel, LLC (Aluminum Ladder Company). The area has a long
27 history of producing packaging materials (Sonoco) and textiles (Galey and Lord).

28
29 Florence County is a proven, successful location for business and industry. Over the past
30 5 years, new and expanding businesses have invested \$1.1 billion dollars, including companies
31 like Du Pont, Honda, and Roche.

32
33 Historically, the economies of both Florence and Darlington Counties were deeply rooted in
34 agriculture. In recent years, both counties have become more economically diversified. In
35 Florence County, the wholesale and retail trade sector was the largest employment sector
36 in 2001, employing 24 percent of the work force, and the services sector was the second
37 largest sector, employing 22 percent of the work force (South Carolina Department of
38 Employment Security 2002). In Darlington County, the manufacturing sector leads employment
39 with 31 percent, followed by the services sector at 21 percent (South Carolina Employment
40 Security Commission 2002).

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RNP is an important employer, but by no means the most important economic entity in Darlington and Florence Counties. It ranks about thirtieth of the list of Darlington and Florence Counties' top 60 employers, and employs about 1 percent of the 33,700-plus employees working for those employers (Team South Carolina 2002; South Carolina Employment Security Commission 2002; Florence County Economic Development Partnership 2002; supplemented by telephone calls to selected employers).

RNP pays annual property taxes to Darlington and Chesterfield Counties, South Carolina. CP&L is a significant property taxpayer in Darlington County. Property tax revenues fund Darlington County operations, school systems, the county general fund, fire districts, libraries, the emergency management system, and various environmental services (Copeland 2001). Chesterfield County property tax revenues fund the school districts, the county general fund, local technical colleges, road maintenance, libraries, county office maintenance, hospitals, and prisons (Sowell 2001a, 2001b). From 1995 to 2001, property taxes paid by CP&L for RNP provided slightly less than 20 percent of Darlington County's total property tax revenues. In Chesterfield County, RNP's taxes have represented only \$6000 of the \$2.5 to 3.5 million in revenues collected annually (less than 0.5 percent). If the operating license for RNP were not renewed and the plant were decommissioned, impacts to the tax basis of Darlington County and its economic structure could be significant, as discussed in Section 8.4.7 of the GEIS (NRC 1996). Table 2-10 compares RNP's tax payments to Darlington County tax revenues.

Table 2-10. Local Government Revenues and Property Tax Payments for RNP

Year	Annual Darlington County Property Tax Revenues	Annual Property Tax Paid by RNP	Percent of Total Property Taxes
1995	\$25,668,652	\$6,202,683	24
1996	\$26,699,800	\$6,486,468	24
1997	\$31,538,858	\$6,124,758	19
1998	\$33,845,257	\$6,482,958	19
1999	\$33,468,691	\$5,323,630	16
2000	\$38,077,751	\$6,105,886	16
2001	\$39,396,122	\$5,665,144	14

Sources: CP&L 2002a, NRC 2003a

In the RNP ER, CP&L assumed that RNP's annual property taxes will remain constant at about \$6 to 7 million through the license renewal period. The South Carolina legislature is studying the issue of electric power industry deregulation. The effects of deregulation are not yet fully

1 known, but could affect tax payments by utilities to the counties. Any changes to RNP tax rates
2 due to deregulation would, however, be independent of license renewal.

3 4 **2.2.9 Historic and Archaeological Resources**

5
6 This section discusses the cultural background and the known historic and archaeological
7 resources at the site of RNP and in the surrounding area.

8 9 **2.2.9.1 Cultural Background**

10
11 The region around the Robinson site was home to several Native American peoples in
12 prehistoric and historic times, although those cultural periods have not been extensively
13 documented. Historical aspects of the Pee Dee (Spivey 2000) and the Lumbee (Blu 1980) can
14 be found and archaeological resources in the immediate area of the plant are documented;
15 however, all are extremely limited. Non-Indian history of the county, including information on
16 historic families and properties also has been documented (Ervin and Rudisill 1964; Rudisill
17 1986).

18 19 • Prehistoric Period

20
21 The prehistoric Native American occupation of the region that encompasses the Robinson
22 site includes three periods: the Paleo-Indian period (about 10,000 to 8000 B.C.), the
23 Archaic period (about 8000 to 1000 B.C.), and the Woodland period (about 1000 B.C. to
24 A.D. 1600). Toward the end of the Woodland period from about A.D. 1500 to 1675, a
25 transitional episode known as the Protohistoric period occurred during which initial contacts
26 with Europeans and cultural changes associated with subsequent European settlement of
27 the area took place.

28
29 The prehistoric periods were marked by initial reliance on big game hunting for subsistence,
30 followed by increased use of smaller game animals and plant foods in the Archaic era.
31 Major environmental changes in the Archaic period led to an increasingly more sedentary
32 lifestyle, focused primarily in riverine settings. Late in the Archaic era, more sedentary
33 villages and an increasing reliance on cultivated crops became the norm, and the
34 subsequent Woodland period was characterized by larger base camps in the river valleys
35 with subsistence based on agriculture, hunting and gathering, and intergroup trade. The
36 latter part of the Woodland period is primarily identified by the added presence of European
37 trade goods.

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- 1 • Native American Historic Period

2
3 Early documentation is sparse for the region around Robinson, but the Pee Dee, Wateree,
4 and Cheraw were the major inhabitants at the time of European contact. Initial contact with
5 explorers occurred in the first half of the 16th century, however extensive contact with
6 colonies is not recorded until the end of the 17th century. The first half of the 18th century
7 was marked by wars in which tribes both allied with and battled against colonists as well as
8 wars between different tribes. In the latter half of the 18th century some of the Pee Dee and
9 Cheraw, and the majority of the Wateree joined with the Catawba Tribe near present day
10 York County. Today, the Catawba Tribe is the only Federally recognized tribe in South
11 Carolina. Although some of the Cheraw joined with the Catawba, many migrated north into
12 Robinson County, North Carolina and eventually formed the Lumbee Tribe, currently a
13 North Carolina State recognized tribe. Some of the Pee Dee went with the Catawba and
14 some also went with the Cheraw, but a large number stayed in the area of Marlboro and
15 Dillon Counties located east of Darlington County (South Carolina Information Highway
16 2003). The Pee Dee tribe formally reunited under a state charter in 1974 as an Indian
17 Association (Spivey 2000) and filed a letter of intent with the Bureau of Indian Affairs to
18 petition for Federal recognition in 1995.^(a)

- 19 • Euro-American Historic Period

20
21
22 RNP is located approximately 8 km (5 mi) west-northwest of Hartsville in Darlington County.
23 The Darlington County area was originally part of the Cheraws District, one of seven
24 Judicial Districts created by South Carolina's colonial General Assembly in 1769. In 1785,
25 following the Revolutionary War, Darlington County became one of the original counties in
26 the newly created state of South Carolina; however, it continued to be a part of the Cheraws
27 District until 1798 (the Lewis families 2003). Darlington County did not appear
28 independently in the 1790 census, but in the 1800 census, the County had a population of
29 just over 7600 (Inter-University Consortium for Political and Social Research 2003).
30 Agriculture dominated the economy and land-use patterns of the County and many
31 advanced techniques in the scientific breeding of crops were developed just west of
32 Hartsville at the Coker Experimental Farms. Although agriculture continued to be
33 significant, other industries began to grow in the latter part of the 19th century. During the
34 period of 1889 through 1911, two rail lines were connected to Hartsville and at least a half-
35 dozen separate industries were started in the town. One of the most significant companies
36 created in the Hartsville area during this time was the Southern Novelty Company,
37 predecessor to the Sonoco Company, a Fortune 500 company that manufactures industrial

(a) Personal communication with Bureau of Indian Affairs, Public Affairs Office, January 14, 2003.

1 and consumer packaging products. Also during this period the town of Hartsville was
2 chartered and the population increased from 300 to 2400 (Ervin and Rudisill 1964; Rudisill
3 1986).

4
5 An important event in the history of Hartsville and Darlington County was the impoundment
6 of Black Creek to construct Lake Robinson in 1958. The newly formed Lake Robinson was
7 impounded to provide cooling for RNP as well as a co-located coal-fired plant.

8 9 **2.2.9.2 Historic and Archaeological Resources**

10
11 To assess known and potential cultural resources at the Robinson site, several existing
12 literature and database sources were consulted, along with direct contacts at several
13 organizations (see Appendix D). In addition to the sources included in Appendix D, electronic
14 database searches were conducted at the National Park Service's National Register of Historic
15 Places Information System (DOI 2003) and the Historic American Buildings Survey/Historic
16 American Engineering Record listings (Library of Congress 2003).

17
18 Examination of the National Register listings did not disclose any listed or potentially eligible
19 properties on or adjacent to the plant site. Twenty-five sites were within a 10-km (6-mi) radius
20 of RNP; 24 of these sites were clustered in or near the town of Hartsville, and one in the Town
21 of McBee in Chesterfield County.

22
23 Examination of archaeological and historic site files at the South Carolina Department of
24 Archives and History and the South Carolina Institute of Archaeology and Anthropology
25 indicated that no prehistoric or historic properties have been recorded at the Robinson site
26 itself. However, no formal archaeological surveys have been conducted at the plant or the lake.
27 The nearest recorded archaeological sites are located along South Carolina Highway 151,
28 running north-south to the west of the plant site (Cable and Cantley 1979) and along the Lake
29 Robinson to Sumter transmission line right-of-way, southeast of the site, which were surveyed
30 in 1980 (Canouts et al.1984). Several of these archaeological sites fall within 10 km (6 mi) of
31 the plant, the closest being situated in a transmission line right-of-way at a distance of about
32 1 km (0.6 mi). None of these sites has been evaluated as being potentially eligible for the
33 National Register of Historic Places.

34
35 Eight Native American tribes or groups were contacted by NRC while preparing this EIS:
36 (1) the Lumbee Tribe, (2) the Beaver Creek Band of Pee Dee Indians, (3) the Catawba Indian
37 Nation, (4) the Chaklokowas Indian People of the Chickasaw Nation, (5) the Natchez Pee Dee
38 Indian Tribe of Orangeburg, (6) the Pee Dee Indian Nation of Beaver Creek, (7) the Pee Dee
39 Indian Nation, and (8) the Santee Indian Nation of South Carolina.

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1 Examination of historical records such as plat records and historic maps reveal the potential
2 presence of historic properties either close to or within the plant site boundaries. Copies of
3 these documents are located at the South Carolina Department of Archives and History. One
4 document examined was the Wiley Warren Plat for 223 Acres on Black Creek, Darlington
5 District. This plat, shows the location of the 223-acre Wiley Warren family farm located on what
6 is now the Robinson site. Any structures that were part of the farm have been destroyed.
7 There reportedly was a family cemetery located on the same knoll as the RNP visitor center.^(a)
8 According to these same records, other historic farms were located on or near the Robinson
9 site; however, current information does not indicate their historical value. Secondary state
10 Route 23, the Old Camden Road, passes in front of the site; this road was called the Road to
11 Camden on historical maps and is also of historical value.

12 13 **2.2.10 Related Federal Project Activities and Consultations**

14
15 The staff reviewed the possibility that activities of other Federal agencies might impact the RNP
16 during the renewal term. Any such activities could result in cumulative environmental impacts
17 and the possible need for a Federal agency to become a cooperating agency for preparation of
18 the SEIS [10 CFR 51.10(b)(2)].

19
20 The only Federal land in close proximity to the RNP plant is the Carolina Sandhills National
21 Wildlife Refuge located approximately 11 km (7 mi) north of the plant site. A principal objective
22 of the Carolina Sandhills National Wildlife Refuge is to restore, maintain, and enhance longleaf
23 pine habitat and associated plant and animal species.

24
25 After reviewing the Federal activities in the vicinity of RNP, the staff determined that there were
26 no Federal project activities that would make it desirable for another Federal agency to become
27 a cooperating agency for preparation of the SEIS.

28
29 NRC is required under Section 102(C) of the National Environmental Policy Act (NEPA 1969) to
30 consult with and obtain the comments of any Federal agency that has jurisdiction by law or
31 special expertise with respect to any environmental impact involved in the subject matter of the
32 SEIS. During the preparation of this SEIS, NRC consulted with the FWS. Consultation
33 correspondence is included in Appendix E.

(a) Personal communication with Horace Fraser Rudisill, Darlington County Historian, September 25,
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3.0 Environmental Impacts of Refurbishment

Environmental issues associated with refurbishment activities 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 measures 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 likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required in this SEIS 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.

License renewal actions may require refurbishment activities for the extended plant life. These actions may have an impact on the environment that requires evaluation, depending on the type of action and the plant-specific design. Environmental issues associated with refurbishment that were determined to be Category 1 issues are listed in Table 3-1.

Environmental issues related to refurbishment considered in the GEIS for which these conclusions could not be reached for all plants, or for specific classes of plants, are Category 2 issues. These issues are listed in Table 3-2.

(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.

Environmental Impacts of Refurbishment

Table 3-1. Category 1 Issues for Refurbishment Evaluation

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
SURFACE-WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)	
Impacts of refurbishment on surface-water quality	3.4.1
Impacts of refurbishment on surface-water use	3.4.1
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Refurbishment	3.5
GROUNDWATER USE AND QUALITY	
Impacts of refurbishment on groundwater use and quality	3.4.2
LAND USE	
Onsite land use	3.2
HUMAN HEALTH	
Radiation exposures to the public during refurbishment	3.8.1
Occupational radiation exposures during refurbishment	3.8.2
SOCIOECONOMICS	
Public services: public safety, social services, and tourism and recreation	3.7.4; 3.7.4.3; 3.7.4.4; 3.7.4.6
Aesthetic impacts (refurbishment)	3.7.8

Category 1 and Category 2 issues related to refurbishment that are not applicable to H. B. Robinson Steam Electric Plant, Unit No. 2 (RNP), because they are related to plant design features or site characteristics not found at RNP are listed in Appendix F.

The potential environmental effects of refurbishment actions would be identified, and the analysis would be summarized within this section, if such actions were planned. Carolina Power and Light Company (CP&L) indicated that it has performed an evaluation of systems, structures, and components pursuant to 10 CFR 54.21 to identify activities that are necessary to continue operation of RNP during the requested 20-year period of extended operation. CP&L conducted an integrated plant assessment as part of this evaluation. In its Environmental Report for RNP, CP&L stated that it “has not identified the need to undertake any major refurbishment or replacement actions to maintain the functionality of important systems, structures, and components during the RNP license renewal period” (CP&L 2002). Therefore, refurbishment is not considered in this draft Supplemental Environmental Impact Statement.

Table 3-2. Category 2 Issues for Refurbishment Evaluation

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53 (c)(3)(ii) Subparagraph
TERRESTRIAL RESOURCES		
Refurbishment impacts	3.6	E
THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)		
Threatened or endangered species	3.9	E
AIR QUALITY		
Air quality during refurbishment (nonattainment and maintenance areas)	3.3	F
SOCIOECONOMICS		
Housing impacts	3.7.2	I
Public services: public utilities	3.7.4.5	I
Public services: education (refurbishment)	3.7.4.1	I
Offsite land use (refurbishment)	3.7.5	I
Public services, transportation	3.7.4.2	J
Historic and archaeological resources	3.7.7	K
ENVIRONMENTAL JUSTICE		
Environmental justice	Not addressed ^(a)	Not addressed ^(a)
<p>(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. If an applicant plans to undertake refurbishment activities for license renewal, environmental justice must be addressed in the applicant's environmental report and the staff's environmental impact statement.</p>		

3.1 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

Environmental Impacts of Refurbishment

- 1 Carolina Power and Light Company (CP&L). 2002. *Applicant's Environmental Report –*
2 *Operating License Renewal Stage, H.B. Robinson Steam Electric Plant, Unit No. 2.* Docket No.
3 50-261, License No. DPR-23, Hartville, South Carolina.
4
- 5 U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement*
6 *for License Renewal of Nuclear Plants.* NUREG-1437, Volumes 1 and 2, Washington, D.C.
7
- 8 U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement*
9 *for License Renewal of Nuclear Plants Main Report.* "Section 6.3 – Transportation, Table 9.1
10 Summary of findings on NEPA issues for license renewal of nuclear power plants, Final
11 Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C.
12
13

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 measures 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 likely not 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 H.B. Robinson Steam Electric Plant, Unit No. 2 (RNP). Section 4.1 addresses issues applicable to the RNP cooling canal. 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 potential new information that was identified during the scoping period. The results of the evaluation of environmental issues related to operation during the renewal

(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.

Environmental Impacts of Operation

1 term are summarized in Section 4.8, and finally, the references cited are listed in Section 4.9.
2 Category 1 and Category 2 issues that are not applicable to RNP because they are related to
3 plant design features or site characteristics not found at RNP are listed in Appendix F.
4

5 **4.1 Cooling System**

6
7 Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable
8 to the RNP cooling system operation during the renewal term are listed in Table 4-1. Carolina
9 Power and Light Company (CP&L) stated in its Environmental Report (ER) (CP&L 2002) that it
10 is not aware of any new and significant information associated with the renewal of the RNP
11 operating license (OL). The staff has not identified any significant new information during its
12 independent review of the CP&L ER, the staff's site visit, the scoping process, or its evaluation
13 of other available information. Therefore, the staff concludes that there are no impacts related
14 to these issues beyond those discussed in the GEIS. For all of the issues, the staff concluded
15 in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are
16 not likely to be sufficiently beneficial to be warranted.
17

18 A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for
19 each of these issues follows:
20

21 **Table 4-1. Category 1 Issues Applicable to the Operation of the RNP Cooling System During**
22 **the Renewal Term**
23

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; 4.3.2.2; 4.4.2
Altered thermal stratification of lakes	4.2.1.2.2; 4.4.2.2
Temperature effects on sediment transport capacity	4.2.1.2.3; 4.4.2.2
Scouring caused by discharged cooling water	4.2.1.2.3; 4.4.2.2
Eutrophication	4.2.1.2.3; 4.4.2.2
Discharge of chlorine or other biocides	4.2.1.2.4; 4.4.2.2
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4; 4.4.2.2
Discharge of other metals in wastewater	4.2.1.2.4; 4.3.2.2; 4.4.2.2

Table 4-1. Category 1 Issues Applicable to the Operation of the RNP Cooling System During the Renewal Term (continued)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Accumulation of contaminants in sediments or biota	4.2.1.2.4; 4.3.3; 4.4.3; 4.4.2.2
Entrainment of phytoplankton and zooplankton	4.2.2.1.1; 4.3.3; 4.4.3
Cold shock	4.2.2.1.5; 4.3.3; 4.4.3
Thermal plume barrier to migrating fish	4.2.2.1.6; 4.4.3
Distribution of aquatic organisms	4.2.2.1.6; 4.4.3
Premature emergence of aquatic insects	4.2.2.1.7; 4.4.3
Gas supersaturation (gas bubble disease)	4.2.2.1.8; 4.4.3
Low dissolved oxygen in the discharge	4.2.2.1.9; 4.3.3; 4.4.3
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.2.2.1.10; 4.4.3
Stimulation of nuisance organisms	4.2.2.1.11; 4.4.3
TERRESTRIAL RESOURCES	
Cooling pond impacts on terrestrial resources	4.4.4
HUMAN HEALTH	
Noise	4.3.7

- 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 CP&L ER, the staff's site visit, the scoping process, or its 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.

Environmental Impacts of Operation

- 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 CP&L ER, the staff's site visit, the scoping process, its review of monitoring programs,
10 or its evaluation of other available information. Therefore, the staff concludes that there are
11 no impacts of altered thermal stratification of lakes during the renewal term beyond those
12 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 These effects have not been found to be a problem at operating nuclear power
18 plants and are not expected to be a problem during the license renewal term.
19

20 The staff has not identified any significant new information during its independent review of
21 the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other available
22 information. Therefore, the staff concludes that there are no impacts of temperature effects
23 on sediment transport capacity during the renewal term beyond those discussed in the
24 GEIS.
25

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

28
29 Scouring has not been found to be a problem at most operating nuclear power
30 plants and has caused only localized effects at a few plants. It is not expected to
31 be a problem during the license renewal term.
32

33 The staff has not identified any significant new information during its independent review of
34 the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other available
35 information. Therefore, the staff concludes that there are no impacts of scouring caused by
36 discharged cooling water during the renewal term beyond those discussed in the GEIS.
37
38

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

2
3 Eutrophication has not been found to be a problem at operating nuclear power
4 plants and is not expected to be a problem during the license renewal term.

5
6 The staff has not identified any significant new information during its independent review of
7 the CP&L ER, the staff's site visit, the scoping process, its review of monitoring programs,
8 or its evaluation of other available information including plant monitoring data and technical
9 reports. Therefore, the staff concludes that there are no impacts of eutrophication during
10 the renewal term beyond those discussed in the GEIS.

- 11
12 • Discharge of chlorine or other biocides. Based on information in the GEIS, the
13 Commission found that

14
15 Effects are not a concern among regulatory and resource agencies, and are not
16 expected to be a problem during the license renewal term.

17
18 The staff has not identified any significant new information during its independent review of
19 the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other available
20 information including the National Pollutant Discharge Elimination System (NPDES) permit
21 for RNP, or discussion with the NPDES compliance office (South Carolina Department of
22 Health and Environmental Control [SCDHEC]). Therefore, the staff concludes that there are
23 no impacts of discharge of chlorine or other biocides during the renewal term beyond those
24 discussed in the GEIS.

- 25
26 • Discharge of sanitary wastes and minor chemical spills. Based on information in the
27 GEIS, the Commission found that

28
29 Effects are readily controlled through NPDES permit and periodic modifications,
30 if needed, and are not expected to be a problem during the license renewal term.

31
32 The staff has not identified any significant new information during its independent review of
33 the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other available
34 information, including the NPDES permit for RNP, or discussion with the NPDES
35 compliance office (SCDHEC). Therefore, the staff concludes that there are no impacts of
36 discharges of sanitary wastes and minor chemical spills during the renewal term beyond
37 those discussed in the GEIS.

Environmental Impacts of Operation

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

3
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 been
6 satisfactorily mitigated at other plants. They are not expected to be a problem
7 during the license renewal term.
8

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

- 15 • Accumulation of contaminants in sediments or biota. Based on information in the GEIS,
16 the Commission found that

17
18 Accumulation of contaminants has been a concern at a few nuclear power plants
19 but has been satisfactorily mitigated by replacing copper alloy condenser tubes
20 with those of another metal. It is not expected to be a problem during the license
21 renewal term.
22

23 The staff has not identified any significant new information during its independent review of
24 the CP&L ER, the staff's site visit, the scoping process, or its evaluation of available
25 information. Therefore, the staff concludes that there are no impacts of accumulation of
26 contaminants in sediments or biota during the renewal term beyond those discussed in the
27 GEIS.
28

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

31
32 Entrainment of phytoplankton and zooplankton has not been found to be a
33 problem at operating nuclear power plants and is not expected to be a problem
34 during the license renewal term.
35

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

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

2
3 Cold shock has been satisfactorily mitigated at operating nuclear plants with
4 once-through cooling systems, has not endangered fish populations or been
5 found to be a problem at operating nuclear power plants with cooling towers or
6 cooling ponds, and is not expected to be a problem during the license renewal
7 term.

8
9 The staff has not identified any significant new information during its independent review of
10 the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other available
11 information. Therefore, the staff concludes that there are no impacts of cold shock during
12 the renewal term beyond those discussed in the GEIS.

- 13
14 • Thermal plume barrier to migrating fish. Based on information in the GEIS, the
15 Commission found that

16
17 Thermal plumes have not been found to be a problem at operating nuclear
18 power plants and are not expected to be a problem during the license renewal
19 term.

20
21 The staff has not identified any significant new information during its independent review of
22 the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other available
23 information. Therefore, the staff concludes that there are no impacts of thermal plume
24 barriers to migrating fish during the renewal term beyond those discussed in the GEIS.

- 25
26 • Distribution of aquatic organisms. Based on information in the GEIS, the Commission
27 found that

28
29 Thermal discharge may have localized effects but is not expected to effect the
30 larger geographical distribution of aquatic organisms.

31
32 The staff has not identified any significant new information during its independent review of
33 the CP&L ER, the staff's site visit, the scoping process, its review of monitoring programs,
34 or its evaluation of other available information. Therefore, the staff concludes that there are
35 no impacts on the distributions of aquatic organisms during the renewal term beyond those
36 discussed in the GEIS.

37

Environmental Impacts of Operation

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

3
4 Premature emergence has been found to be a localized effect at some operating
5 nuclear power plants but has not been a problem and is not expected to be a
6 problem during the license renewal term.

7
8 The staff has not identified any significant new information during its independent review of
9 the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other available
10 information. Therefore, the staff concludes that there are no impacts of premature
11 emergence of aquatic insects during the renewal term beyond those discussed in the GEIS.

- 12
13 • Gas supersaturation (gas bubble disease). Based on information in the GEIS, the
14 Commission found that

15
16 Gas supersaturation was a concern at a small number of operating nuclear
17 power plants with once-through cooling systems but has been satisfactorily
18 mitigated. It has not been found to be a problem at operating nuclear power
19 plants with cooling towers or cooling ponds and is not expected to be a problem
20 during the license renewal term.

21
22 The staff has not identified any significant new information during its independent review of
23 the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other available
24 information. Therefore, the staff concludes that there are no impacts of gas supersaturation
25 during the renewal term beyond those discussed in the GEIS.

- 26
27 • Low dissolved oxygen in the discharge. Based on information in the GEIS, the
28 Commission found that

29
30 Low dissolved oxygen has been a concern at one nuclear power plant with a
31 once-through cooling system but has been effectively mitigated. It has not been
32 found to be a problem at operating nuclear power plants with cooling towers or
33 cooling ponds and is not expected to be a problem during the license renewal
34 term.

35
36 The staff has not identified any significant new information during its independent review of
37 the CP&L ER, the staff's site visit, the scoping process, its review of monitoring programs,
38 or its evaluation of other available information. Therefore, the staff concludes that there are
39 no impacts of low dissolved oxygen in the discharge during the renewal term beyond those
40 discussed in the GEIS.

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

3
4 These types of losses have not been found to be a problem at operating nuclear
5 power plants and are not expected to be a problem during the license renewal
6 term.

7
8 The staff has not identified any significant new information during its independent review of
9 the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other available
10 information. Therefore, the staff concludes that there are no impacts of losses from
11 predation, parasitism, and disease among organisms exposed to sublethal stresses during
12 the renewal term beyond those discussed in the GEIS.

- 13
14 • Stimulation of nuisance organisms. Based on information in the GEIS, the Commission
15 found that

16
17 Stimulation of nuisance organisms has been satisfactorily mitigated at the single
18 nuclear power plant with a once-through cooling system where previously it was
19 a problem. It has not been found to be a problem at operating nuclear power
20 plants with cooling towers or cooling ponds and is not expected to be a problem
21 during the license renewal term.

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

- 27
28 • Cooling pond impacts on terrestrial resources. Based on information in the GEIS, the
29 Commission found that

30
31 Impacts of cooling ponds on terrestrial ecological resources are considered to be of
32 small significance at all sites.

33
34 The staff has not identified any significant new information during its independent review of
35 the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other available
36 information. Therefore, the staff concludes that there are no cooling pond impacts on
37 terrestrial resources during the renewal term beyond those discussed in the GEIS.

Environmental Impacts of Operation

- 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 CP&L ER, the staff's site visit, the scoping process, or its 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 RNP are discussed in the sections that follow, and are listed in Table 4-2. The CP&L ER identified these Category 2 issues related to cooling system operation as applicable to the RNP.

Table 4-2. Category 2 Issues Applicable to the Operation of the RNP 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 Section
SURFACE-WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)			
Water use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)	4.3.2.1; 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			
Microbiological organisms (public health) (plants using lakes or canals or cooling towers that discharge into a small river)	4.3.6	G	4.1.5

4.1.1 Water Use Conflicts (Makeup Water from a Small River)

Both natural and induced evaporation in Lake Robinson reduce the water that flows into Black Creek downstream from Lake Robinson. If RNP were to cease operation, natural evaporation would continue unless the dam forming the impoundment was removed, whereas induced evaporation would be eliminated regardless of the final disposition of the impoundment. In the case that the impoundment were removed, some of the natural lake evaporation would be offset by the evapotranspiration of the vegetated landscape that would eventually return to the reservoir's former area.

Two U.S. Geological Survey (USGS) stream gauges are located on Black Creek. Upstream of the impoundment is a stream gauge that monitors the drainage from the upper 280 km² (108 mi²) of Black Creek. A second gauge exists just downstream from the impoundment's discharge. This gauge monitors the drainage from the upper 448 km² (173 mi²) of Black Creek (including the drainage area monitored by the first gauge). Other factors assumed equal, the drainage areas covered by the two gauges should be nearly proportional at the average streamflows at the two gauges. However, the ratio of the drainage areas (1.60) is less than the ratio of the streamflow (1.43). This suggests as much as 17 percent of the average downstream flow may be lost due to evaporation in the reservoir.

A bounding analysis was performed to estimate the likely maximum reduction in streamflows below the impoundment resulting from natural and induced evaporation. By neglecting groundwater contributions and assuming a hydrologically homogeneous landscape, the bounding analysis overestimates the annual average induced evaporation losses.

Evaporative losses can be divided into two components: (1) natural evaporation and induced evaporation from Unit 1, and (2) induced evaporation from Unit 2. Natural evaporation is the component of the total lake evaporation that would occur if there were no cooling water discharges to the lake. Van der Leeden et al. (1990) reported an annual reservoir evaporation for Columbia, South Carolina of 130 cm (51 in.) with 48 percent of this annual evaporation occurring in the four-month period of June through September. Induced evaporative losses are a result of the increased evaporation resulting from the elevated water-surface temperature caused by the cooling water discharges to the lake. The discharge temperature to the lake is regulated by permit (see Section 2.2.3) with the maximum allowable discharge temperatures of 44.0°C (111.2°F) occurring in the four-month period of June through September. Therefore, the period of greatest natural evaporation, greatest induced evaporation, and lowest inflow all occur in the four-month period of June through September making this the critical period for water use. However, comparison of observed streamflows at the two gauges shows an increased fraction of flow increase between the two gauges during this critical season. Therefore, some natural (groundwater discharge to the lake) or artificial (reduced storage in the reservoir) process must be mitigating some of the impact of evaporative losses on streamflow.

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1 Since the cooling discharges are not expected to change during the renewal period, the
2 evaporative losses resulting from future operation of RNP are not expected to change from the
3 current levels of evaporation experienced by Lake Robinson. Therefore, based on its review of
4 the CP&L ER and streamflow records from the USGS, in addition to its independent analysis,
5 the staff concludes that the potential impacts to the regional water supply resulting from
6 operation of the plant's cooling water system are SMALL, and additional mitigation is not
7 warranted.

8 9 **4.1.2 Entrainment of Fish and Shellfish in Early Life Stages**

10 For plants with cooling pond heat-dissipation systems, entrainment of fish and shellfish in early
11 life stages into cooling water systems associated with nuclear power plants is considered a
12 Category 2 issue, requiring a site-specific assessment prior to license renewal.

13
14 The staff independently reviewed the RNP ER, visited the site, and reviewed NPDES Permit
15 No. SC0002925, which was issued September 29, 1997, by the SCDHEC (SCDHEC 1997).
16 The staff also reviewed CP&L's application for renewal of the NPDES permit, which was
17 granted January 16, 2003 (SCDHEC 2003).
18

19
20 In June 1976, CP&L submitted a 316 demonstration to the SCDHEC (CP&L 1976a, 1976b,
21 1976c) pursuant to Sections 316(a) and (b) of the Federal Water Pollution Control (FWPC) Act
22 of 1972, also known as the Clean Water Act. After reviewing CP&L's submittal, SCDHEC
23 concurred with the conclusions of the study and issued a November 1977 determination
24 indicating that the location, design, construction, and capacity of the cooling water intake
25 structures reflected the best available technology for minimizing adverse environmental impact.
26 This finding has been reiterated with each subsequent NPDES permit renewal.
27

28 Intake structures for Unit 2 (RNP) are located on the west bank of the lake near the dam, and
29 next to, but separate from, the intake structure associated with Unit 1. RNP has four pumps for
30 three intake bays. A skimmer wall extends downward inside each bay so that water is
31 withdrawn only from lake depths between 5.5 m (18 ft) and 11.0 m (36 ft). A floating security
32 boom and separating bars in front of the intake structure exclude floating logs and other large
33 debris from the cooling water system. In 1993 and 1995, the original Unit 2 traveling screens
34 were replaced (1 screen, followed by 2 screens). Screening devices for both units currently
35 consist of redundant traveling water screens with 0.95 cm (3/8 in.) square mesh of coated wire.
36 The screens are triggered to rotate when a pre-set differential pressure is detected across the
37 face of the screen. A backwash spray system removes any accumulated debris and flushes it
38 via storm drains into Black Creek below the dam (CP&L 1976b). Dredging has not been
39 required to keep the intakes clear of sediment.
40

1 Predicted intake water velocities for Unit 2 (modeled as part of the original 316(b)
2 demonstration were between 0.31 m/s to 0.92 m/s (1.0 ft/s to 3.0 ft/s) (CP&L 1976b). Design
3 flow calculations indicated an average flow of 0.5 m/s (1.65 ft/s) within each bay, and measured
4 velocities reportedly compared reasonably with this estimate (CP&L 1976b).

5
6 There are no ongoing studies monitoring entrainment of fish or shellfish at RNP. In the original
7 316(b) demonstration, entrainment of ichthyoplankton was addressed based on studies
8 conducted on a weekly basis between March 1975 and February 1976. Duplicate samples
9 were collected during day and night using plankton nets. During the study period, no fish eggs
10 were collected, though larval fish were collected during every month but January. Of all the fish
11 collected, 93.8 percent were percids (perch and darters). Other larval fish entrained included
12 2.6 percent centrarchids (sunfish) and 0.3 percent catostomids (chubsuckers). The remaining
13 fish (3.3 percent) could not be identified to family. None of the species entrained are known to
14 prefer pelagic areas (e.g., near the intake structure) for spawning. However, based on early
15 CP&L ichthyoplankton sampling conducted in the lower impoundment and discharge areas,
16 there is evidence that darters may move into pelagic areas soon after spawning (CP&L 1976a).
17 The continued presence and abundance of darters in the lake during the early studies (4 years
18 after initial Unit 2 operation) suggested that the effects of entrainment on their population were
19 negligible (CP&L 1976a). More recent declines in the darter population are attributed to other
20 habitat changes, non-native species introductions, and competitive interactions that have
21 increased since the 1982 replacement of brass condenser tubes with tubes that reduced copper
22 concentrations in the lake (CP&L 2002).

23
24 Based on the results of entrainment studies and operating history of the RNP intake, the staff
25 has reviewed the available information and concludes that the potential impacts of the cooling
26 water intake system's entrainment on fish and shellfish in the early life stages are SMALL, and
27 therefore, no additional mitigation is warranted. Furthermore, RNP will be required to comply
28 with any future requirements imposed in its NPDES permit by EPA or SCDHEC, thus ensuring
29 that entrainment impacts at RNP will continue to be SMALL in the future.

30 31 **4.1.3 Impingement of Fish and Shellfish**

32
33 For plants with cooling pond heat dissipation systems, impingement of fish and shellfish on
34 debris screens of cooling water systems associated with nuclear power plants is considered a
35 Category 2 issue, requiring a site-specific assessment prior to license renewal.

36
37 The staff independently reviewed the RNP ER, visited the site, and reviewed NPDES Permit
38 No. SC0002925, which was issued September 29, 1997, by the SCDHEC (SCDHEC 1997).
39 The staff also reviewed CP&L's application for renewal of the NPDES permit, which was
40 granted January 16, 2003 (SCDHEC 2003).

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1 In June 1976, CP&L submitted a 316 demonstration to the SCDHEC (CP&L 1976a, 1976b,
2 1976c) pursuant to Sections 316(a) and (b) of the FWPCA. After reviewing CP&L's submittal,
3 the SCDHEC concurred with the conclusions of the study and issued a November 1977
4 determination indicating that the location, design, construction, and capacity of the cooling
5 water intake structures reflected the best technology available for minimizing adverse
6 environmental impacts. This finding has been reiterated with each subsequent NPDES permit
7 renewal.
8

9 There are no ongoing studies monitoring impingement of fish or shellfish at RNP. In the
10 original 316(b) demonstration, impingement of fish was addressed based on studies conducted
11 on a monthly basis (48-hr samples) between December 1973 and July 1975. Sampling
12 continued on a weekly basis (24-hr samples) from July 1975 through December 1975. An initial
13 screen washing was followed every 12 hours by additional screen washes. Fish washed from
14 the screens were identified, weighed, and measured. Impingement of fish at the Unit 2 intake
15 averaged 866 fish per day in 1974 and 291 fish per day in 1975. Of these, bluegill made up
16 74 percent and 57 percent of the biomass in 1974 and 1975, respectively. Most bluegill
17 impinged were less than 115 mm (4.5 in.) in length. Chain pickerel (*Esox niger*) were the next
18 most common species impinged, comprising 14 percent and 28 percent of the biomass in 1974
19 and 1975, respectively. Maximum impingement occurred during the summer, and minimum
20 impingement occurred during the winter. Fewer fish were impinged on Unit 1 intake screens
21 than on those of Unit 2 because Unit 1 draws less water through the intake pumps. The
22 continued abundance of bluegill in the lake indicates that there are no significant impacts to the
23 fish population from impingement on the intake screens.
24

25 The staff has reviewed the available information relative to potential impacts of the cooling
26 water intake on the impingement of fish and shellfish and, based on this data, concludes that
27 the potential impacts are SMALL, and no additional mitigation is warranted. Furthermore, RNP
28 will be required to comply with any future requirements imposed in its NPDES permit, thus
29 ensuring that impingement impacts at RNP will continue to be SMALL in the future.
30

31 4.1.4 Heat Shock

32
33 For plants with cooling pond heat dissipation systems, the effects of heat shock are listed as a
34 Category 2 issue and require plant-specific evaluation before license renewal.
35

36 The staff independently reviewed the RNP ER, visited the site, and reviewed NPDES Permit
37 No. SC0002925, which was issued September 29, 1997, by the SCDHEC (SCDHEC 1997).
38 The staff also reviewed CP&L's application for renewal of the NPDES permit, which was
39 granted January 16, 2003 (SCDHEC 2003).
40

1 CP&L submitted an FWPCA Section 316(a) demonstration for RNP to the SCDHEC in
2 June 1976 (CP&L 1976a, 1976b, 1976c). In November 1977, the SCDHEC stated that “the
3 protection and propagation of a balanced, indigenous population of fish, shellfish, and other
4 aquatic organisms in and on Lake Robinson will be assured by the continued operation of the
5 H.B. Robinson Steam Electric Plant in its present once-through mode,” and granted a 316(a)
6 thermal effluent variance to RNP. CP&L provided additional reports supporting renewal of the
7 316(a) variance to SCDHEC with its application for renewal of the NPDES permit in 1996.
8 SCDHEC granted the thermal variance to CP&L with monthly agreed-upon thermal limitations
9 for the discharge.

10
11 Because Black Creek was impounded for the purpose of providing cooling water to the
12 Robinson plants, the NRC considers the lake a “cooling pond” by definition. Units 1 and 2
13 share the cooling water discharge canal that extends approximately 6.4 km (4 mi) to the north
14 of the plant along the western edge of the lake (CP&L 2002). The canal was designed to allow
15 the discharge water to cool somewhat before entering the lake.

16
17 Thermal monitoring was performed to provide documentation for CP&L’s original application for
18 a 316(a) variance. Initial measurements were taken in 1973, and sampling stations were added
19 and monitored through March 1976 (CP&L 1976b). Water temperatures were recorded at least
20 monthly at the surface and at 0.9-m (3-ft) vertical intervals. Starting in June 1975, strip chart
21 recorders monitored temperature continuously at a 0.9-m (3-ft) depth at five stations that
22 included the region upstream of the discharge, the discharge canal, the lower impoundment,
23 and Black Creek, downstream of the dam. Because the discharge canal terminates at a weir,
24 the heated water is forced to enter the lake at the surface (to a depth of 0.8 m [2.6 ft]). Thus,
25 water near the discharge is artificially stratified. Water flowing in from the upper impoundment
26 and Black Creek provides cooler bottom waters. In the warmest summer months, temperatures
27 at the surface (upper 2 m to 3 m [6.5 ft to 10 ft]) near the discharge are approximately 6°C to
28 7°C (11°F to 13°F) greater than temperatures recorded at the bottom (CP&L 1976b, 1976c,
29 1996b). Normal circulation patterns move water southward toward the dam, although warmed
30 surface waters occasionally move north toward the SR 346 bridge.

31
32 The current NPDES permit (SCDHEC 2003) and the associated 316(a) variance limit the
33 thermal effluent at the discharge canal to daily temperature maximums based on the month
34 (seven tiers of maximum temperatures are allowed). These limits range from a maximum
35 allowable discharge of 32.2°C (90°F) between December and February to a maximum of
36 44.0°C (111.2°F) between June and September. Water temperature released from the dam
37 into Black Creek is limited year-round to a maximum 33.0°C (91.4°F).

38
39 Heated effluent from the plant affects aquatic organisms in the vicinity of the discharge. Low
40 abundance of benthic organisms and low species diversity in the discharge region may create
41 an unstable food supply for some fish species, including bluegill, especially during the summer

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1 when thermal effluents are at their highest (CP&L 1976b, 1996b, 1996c). During the warmest
2 months of the year, zooplankton numbers also decline in the discharge. CP&L studies indicate,
3 however, that zooplankton populations recover to previous levels, generally by the month of
4 October (CP&L 1996b). At temperatures exceeding 32°C (90°F) for long periods of time, a
5 stress on the phytoplankton population was indicated (CP&L 1976b). The population
6 composition and total abundance were not altered as a result of this stress, so it can be
7 concluded that the population is stable and can recover from periodic stresses rapidly when
8 conditions are more favorable. In general, over the course of the year, the phytoplankton
9 standing crop and primary productivity may be enhanced in the discharge and lower
10 impoundment as a result of the plant's thermal input (CP&L 1976b).

11
12 Around the discharge, the thermal effluent restricts growth of aquatic plants in protected
13 eastern shores opposite the discharge canal and in the cove directly north of the discharge
14 canal (CP&L 1976a). These areas have habitat characteristics that would normally support
15 aquatic plant growth. In other areas of the lake, turbulence, substrate, and physiographic and
16 man-made features are the primary reasons for reduced abundance of aquatic vegetation, not
17 temperature. The limited areas where thermal effects are apparent do not pose a threat to the
18 aquatic plant population of the lake as a whole.

19
20 Fish generally avoid areas with temperatures outside their tolerance limits. So long as enough
21 food and habitat are available to support balanced, indigenous fish populations in the lake
22 throughout the year, impacts from thermal effects can be considered minimal, even if seasonal
23 impacts are apparent at the discharge. Short-term seasonal movements and distribution of fish
24 in response to increased temperature has occurred, but the overall long-term distribution
25 patterns are influenced primarily by differences in habitat, such as aquatic vegetation diversity
26 and abundance. The composition and standing crop of fish species in Lake Robinson is
27 comparable to similar water bodies in South Carolina and North Carolina (CP&L 1976a, 1996b).
28 Early studies of fish distribution in the lake indicated that while there was a general decrease in
29 species, number, and weight of fish in the discharge area during the warmer months of the
30 year, a variety of fish were documented utilizing the area even during maximum thermal output
31 (CP&L 1976b). A number of springs, seeps, and streams provide cool water to the lake that is
32 used by fish for resting and refuge throughout the year.

33
34 Fishery studies required by the NPDES permit were conducted in 1994 and 1995 by CP&L
35 using radiotelemetry, littoral rotenone, electrofishing, hydroacoustics surveys, and angler creel
36 surveys (CP&L 1996b). Results indicated that while certain minor fish species were temporarily
37 reduced in number near the discharge during summer, these species rapidly recolonized the
38 area as water temperatures cooled in the fall (CP&L 1996b). In summary, the study concluded

1 that fish in Lake Robinson have sufficient suitable habitat containing cooler, oxygenated water
2 available to them in the critical hotter months beneath the upper layer of the thermal plume,
3 even in the discharge area (CP&L 1996b).

4
5 Thus, while impacts from the thermal effluent are apparent near the discharge area, the
6 impacts are limited in their extent and do not threaten the continued existence of a balanced
7 and indigenous community of fish and wildlife in and around the lake.

8
9 The staff concludes that the potential heat shock impacts resulting from operation of the plant's
10 cooling water discharge system to the aquatic environment on or in the vicinity of the site are
11 SMALL, and mitigation is not warranted.

12 13 **4.1.5 Microbiological Organisms (Public Health)**

14
15 RNP has a cooling pond heat-dissipation system that utilizes water from Black Creek as the
16 cooling source. Black Creek, which was impounded to form Lake Robinson adjacent to the
17 site, has an average annual flow rate of $1.42 \times 10^8 \text{ m}^3/\text{yr}$ ($5.01 \times 10^9 \text{ ft}^3/\text{yr}$). This flow rate is
18 below the $9 \times 10^{10} \text{ m}^3/\text{yr}$ ($3.15 \times 10^{10} \text{ ft}^3/\text{yr}$) that 10 CFR 51.53 (c)(3)(ii)(G) sets as the threshold
19 below which an evaluation of potentially harmful thermophilic (heat-loving) microorganisms on
20 human health is required. The concern is that the low flow rate could increase the potential for
21 waters passing from the condenser cooling system to retain heat and create conditions
22 conducive to growth of thermophilic organisms, such as *Naegleria fowleri*. This free-living
23 amoeba causes a rare, acute, and almost invariably fatal condition called primary amoebic
24 meningoencephalitis (PAME). The disease usually affects children and young adults. In almost
25 all cases, the victims contact the amoebas by swimming in infected fresh water. Other
26 microbiological organisms of concern to the public include the enteric pathogens *Salmonella*
27 and *Shigella*, the *Pseudomonas aeruginosa* bacterium, thermophilic Actinomycetes ("fungi"),
28 and the many species of *Legionella* bacteria.

29
30 CP&L owns the land around the impoundment, but leases a portion of it to adjacent property
31 owners for access to the impoundment (CP&L 2002). As a result, the eastern side of Lake
32 Robinson is developed with homes, recreational areas, a marina, and public access points
33 (CP&L 2002). Lake Robinson is used for recreational purposes by boaters, fishermen, water
34 skiers, and swimmers.

35
36 Heated water from RNP enters Lake Robinson through a discharge canal. Water flows through
37 the canal for approximately 6.4 km (4 mi) northward from the plant and along the western shore
38 of the lake. The canal terminates at a weir where water enters the lake at its surface. Normal
39 circulation patterns move water southward toward the dam, although warmed surface waters
40 occasionally move north toward the SR 346 bridge. There is no public access to the discharge
41 canal.

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1 SCDHEC is the state agency responsible for public health in South Carolina. CP&L consulted
2 with this agency to determine if there is a concern about the potential occurrence of
3 thermophilic organisms in Lake Robinson, with particular emphasis on the possible presence of
4 *N. fowleri* in the lake. By letter dated May 25, 2001, SCDHEC summarized the agency's
5 position and opinion regarding the risk to individuals using Lake Robinson for recreational
6 activities. The SCDHEC stated that "the potential health hazard from pathogenic
7 microorganisms whose abundance might be promoted by artificial warming of recreational
8 waters is largely theoretical and not substantiated by available data. There is some justification
9 for providing appropriate respiratory and dermal protection for workers regularly exposed to
10 known contaminated water, but there seems no significant threat to offsite persons near such
11 heated recreational waters."

12
13 There has been no known impact of operation of RNP on public health related to thermophilic
14 microorganisms. The data indicate that the impact of such organisms during continued
15 operation of the plant during the renewal term is low.

16
17 Based on its review of the above information, the staff concludes that the potential impacts to
18 public health from microbiological organisms resulting from operation of the plant's cooling
19 water discharge system to the aquatic environment on or in the vicinity of the site are SMALL,
20 and additional mitigation is not warranted.

21 22 4.2 Transmission Lines

23
24 The Robinson plant has four transmission lines for the specific purpose of connecting RNP to
25 the transmission system (CP&L 2002, NRC 1975). The rights-of-way for the Rockingham,
26 Florence-North, Sumter, and Florence-South lines range in width from 30 m to 103 m (100 to
27 340 ft) and in length from 29 km to 62 km (18 mi to 39 mi) for a total area of approximately
28 613 ha (1517 ac) and a total length of 162 km (102 mi) (see Table 2-1). The transmission line
29 rights-of-way are maintained by mowing and trimming undesirable vegetation, and by use of
30 "non-restricted use" herbicides. Under normal circumstances, the mowing and herbicide
31 schedule follows a 3-year cycle. Aerial patrols are conducted three times per year and after
32 major storms. Dead and diseased trees at the edges of rights-of-way are removed if it appears
33 that they could fall and strike the transmission lines or support structures. CP&L participates
34 with the U.S. Department of Agriculture-Natural Resources Conservation Service, SCDNR, and
35 other organizations in a wildlife management program for transmission line rights-of-way. The
36 SCDNR "Power for Wildlife" program is designed to help landowners whose property is crossed
37 by transmission lines to convert transmission line rights-of-way into productive habitat for
38 wildlife.

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to transmission lines from the RNP are listed in Table 4-3. CP&L stated in its ER that it is not aware of any new and significant information associated with the license renewal of RNP. The staff has not identified any significant new information during its independent review, the staff site visit, the scoping process, or the evaluation of other 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 measures are not likely to be sufficiently beneficial to be warranted.

Table 4-3. Category 1 Issues Applicable to the RNP 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 wetland 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

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

- 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 CP&L ER, the staff's site visit, the scoping process, consultation with the FWS and the SCDNR, or its 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.

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

3
4 Impacts are expected to be of small significance at all sites.
5

6 The staff has not identified any significant new information during its independent review of the
7 CP&L ER, the staff's site visit, the scoping process, consultation with the FWS and SCDNR, or
8 its evaluation of other information. Therefore, the staff concludes that there are no impacts of
9 bird collisions with power lines during the renewal term beyond those discussed in the GEIS.
10

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

14
15 No significant impacts of electromagnetic fields on terrestrial flora and fauna
16 have been identified. Such effects are not expected to be a problem during the
17 license renewal term.
18

19 The staff has not identified any significant new information during its independent review of the
20 CP&L ER, the staff's site visit, the scoping process, or its evaluation of other information.
21 Therefore, the staff concludes that there are no impacts of electromagnetic fields on flora and
22 fauna during the renewal term beyond those discussed in the GEIS.
23

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

26
27 Periodic vegetation control is necessary in forested wetlands underneath power
28 lines and can be achieved with minimal damage to the wetland. No significant
29 impact is expected at any nuclear power plant during the license renewal term.
30

31 The staff has not identified any significant new information during its independent review of the
32 CP&L ER, the staff's site visit, the scoping process, consultation with the FWS and SCDNR, or
33 its evaluation of other information. Therefore, the staff concludes that there are no impacts of
34 power line rights-of-way on flood plains and wetlands during the renewal term beyond those
35 discussed in the GEIS.
36
37
38
39

- 1 • Air-quality effects of transmission lines. Based on the information in the GEIS, the
2 Commission found that

3
4 Production of ozone and oxides of nitrogen is insignificant and does not
5 contribute measurably to ambient levels of these gases.
6

7 The staff has not identified any significant new information during its independent review of the
8 CP&L ER, the staff's site visit, the scoping process, or its evaluation of other information.
9 Therefore, the staff concludes that there are no air quality impacts of transmission lines during
10 the renewal term beyond those discussed in the GEIS.

- 11
12 • Onsite land use. Based on the information in the GEIS, the Commission found that

13
14 Projected onsite land use changes required during ... the renewal period would
15 be a small fraction of any nuclear power plant site and would involve land that is
16 controlled by the applicant.
17

18 The staff has not identified any significant new information during its independent review of the
19 CP&L ER, the staff's site visit, the scoping process, or its evaluation of other information.
20 Therefore, the staff concludes that there are no onsite land-use impacts during the renewal
21 term beyond those discussed in the GEIS.

- 22
23 • Power line right-of-way (land use). Based on information in the GEIS, the Commission
24 found that

25
26 Ongoing use of power line right of ways would continue with no change in
27 restrictions. The effects of these restrictions are of small significance.
28

29 The staff has not identified any significant new information during its independent review of the
30 CP&L ER, the staff's site visit, the scoping process, or its evaluation of other information.
31 Therefore, the staff concludes that there are no impacts of power line rights-of-way on land use
32 during the renewal term beyond those discussed in the GEIS.
33

34 There is one Category 2 issue related to transmission lines, and another issue related to
35 transmission lines is being treated as a Category 2 issue. These issues are listed in Table 4-4
36 and are discussed in Sections 4.2.1 and 4.2.2.
37
38
39
40

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Table 4-4. Category 2 and Uncategorized Issues Applicable to the RNP Transmission Lines 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
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 the NESC (IEEE 1997) criteria, 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 the transmission lines may have changed, or the 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.

The RNP switchyard is connected to the primary CP&L transmission system by four 230 kV double-circuit overhead transmission lines. The utility completed an evaluation of the transmission lines and determined the measured clearances from the line sag and profile of each of the 230 kV transmission lines for all spans exceeding 8.3 m (27 ft), which is the vertical clearance requirement under NESC. The utility did not perform any specific modeling or experimental studies to determine if induced currents would exceed requirements established in NESC. However, upon review of the information provided by the utility, the staff concluded the assessment was adequate to meet 10 CFR 51.53. The staff also concludes the impact of the potential for electric shock is SMALL, and additional mitigation is not warranted.

4.2.2 Electromagnetic Fields – Chronic Effects

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

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

5
 6 The NIEHS concludes that ELF-EMF [extremely low frequency-electromagnetic field]
 7 exposure cannot be recognized as entirely safe because of weak scientific evidence that
 8 exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to
 9 warrant aggressive regulatory concern. However, because virtually everyone in the
 10 United States uses electricity and is routinely exposed to ELF-EMF, passive regulatory
 11 action is warranted such as a continued emphasis on educating both the public and the
 12 regulated community on means aimed at reducing exposure. The NIEHS does not
 13 believe that other cancers or non-cancer health outcomes provide sufficient evidence of
 14 a risk to currently warrant concern.

15
 16 This statement is not sufficient to cause the staff to change its position with respect to the
 17 chronic effects of electromagnetic fields. The staff considers the GEIS finding of "not
 18 applicable" still appropriate and will continue to follow developments on this issue.

20 4.3 Radiological Impacts of Normal Operations

21
 22 Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to
 23 RNP in regard to radiological impacts are listed in Table 4-5. CP&L stated in its ER that it is not
 24 aware of any new and significant information associated with the renewal of the RNP OL. No
 25 significant new information has been identified by the staff during its independent review.
 26 Therefore, the staff concludes that there are no impacts related to these issues beyond those
 27 discussed in the GEIS (NRC 1996). For these issues, the GEIS concluded that the impacts are
 28 SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be
 29 warranted.

31 **Table 4-5. Category 1 Issues Applicable to Radiological Impacts of Normal Operations**
 32 **During the Renewal Term**

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

Environmental Impacts of Operation

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

- 3
4 • Radiation exposures to public (license-renewal term). Based on information in the
5 GEIS, the Commission found that

6
7 Radiation doses to the public will continue at current levels associated with
8 normal operations.

9
10 The staff has not identified any significant new information during its independent review of
11 the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other available
12 information. Therefore, the staff concludes that there are no impacts of radiation exposures
13 to the public during the renewal term beyond those discussed in the GEIS.

- 14
15 • Occupational radiation exposures (license-renewal term). Based on information in the
16 GEIS, the Commission found that

17
18 Projected maximum occupational doses during the license renewal term are
19 within the range of doses experienced during normal operations and normal
20 maintenance outages, and would be well below regulatory limits.

21
22 The staff has not identified any significant new information during its independent review of
23 the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other available
24 information. Therefore, the staff concludes that there are no impacts of occupational
25 radiation exposures during the renewal term beyond those discussed in the GEIS.

26
27 There were no Category 2 issues related to radiological impacts of routine operations.
28

29 **4.4 Socioeconomic Impacts of Plant Operations During the** 30 **License-Renewal Period**

31
32 Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to
33 socioeconomic impacts during the renewal term are listed in Table 4-6. CP&L stated in its ER
34 that it is not aware of any new and significant information associated with the renewal of the
35 RNP OL. The staff has not identified any significant new information during its independent
36 review of the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other
37 information. Therefore, the staff 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 measures are not likely to be sufficiently beneficial to be warranted.

Table 4-6. Category 1 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
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

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 CP&L ER, the staff's site visit, the scoping process, or its 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 CP&L ER (CP&L 2002), the staff's site visit, the scoping process, or its 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.

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- 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 CP&L ER, the staff's site visit, the scoping process, or its 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 CP&L ER, the staff's site visit, the scoping process, or its 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 4-7 lists the Category 2 socioeconomic issues, which require plant-specific analysis and environmental justice, which was not addressed in the GEIS.

Table 4-7. 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 Section	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 must be addressed in the licensee's environmental report and the staff's environmental impact statement.			

4.4.1 Housing Impacts During Operations

Impacts on housing are considered **SMALL** when a small or not easily discernible change in housing availability occurs. Impacts are considered moderate when there is a discernible but short-lived reduction in available housing units because of project-induced migration. Impacts are considered **LARGE** when project-related housing demands result in very limited housing availability and would increase rental rates and housing values far above normal inflation (NRC 1996).

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" (NRC 1996, 1999). 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).

In 2000, the population living within 32 km (20 mi) of RNP was estimated to be approximately 91,800 (CP&L 2002). This translates to around 29 persons/km² (73 persons/mi²) living on the land area within a 32-km (20-mi) radius of the Robinson site. This concentration falls into the GEIS sparseness Category 3 (i.e., having 23 to 46 persons/km² [60 to 120 persons/mi²]).

The conservative estimate of population within 80 km (50 mi) of the site using the 2000 census was about 814,200, or 40 persons/km² (104 persons/mi²), well within proximity Category 3. Applying the GEIS proximity measures (NRC 1996), RNP is classified as Category 3 (i.e., having less than or equal to 73 persons/km² [190 persons/mi²]) within 80 km (50 mi) of the site. According to the GEIS, these sparseness and proximity scores identify the nuclear units as being located in a medium-population area.

In 10 CFR Part 51, Subpart A, Appendix B, Table B-1, NRC concluded 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. The Robinson site is located in a medium- population area, and both Darlington County and Florence County attempt to direct growth to maintain the rural character of the counties (Florence County Planning Commission 1999, Darlington County Planning Commission 1998, 1999). However, these growth-control measures would not be binding on housing availability, because housing units would not be limited and no additional population is expected as a result of license renewal. Based on the NRC criteria, CP&L expects housing impacts to be **SMALL** during continued operations (CP&L 2002).

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1 The staff reviewed the available information relative to housing impacts and CP&L's
2 conclusions. Based on this review, the staff concludes that the impact on housing during the
3 license-renewal period would be SMALL, and further mitigation is not warranted.
4

5 **4.4.2 Public Services: Public Utility Impacts During Operations**

6
7 Impacts on public utility services are considered SMALL if there is little or no change in the
8 ability of the system to respond to the level of demand, and thus there is no need to add capital
9 facilities. Impacts are considered MODERATE if overtaxing of service capabilities occurs
10 during periods of peak demand. Impacts are considered LARGE if existing levels of service
11 (e.g., water or sewer services) are substantially degraded and additional capacity is needed to
12 meet ongoing demands for services. The GEIS indicates that, in the absence of new and
13 significant information to the contrary, the only impacts on public utilities that could be
14 significant are impacts on public water supplies (NRC 1996).
15

16 Analysis of impacts on the public water supply system considered both plant demand and plant-
17 related population growth. Section 2.2.2 describes the RNP permitted withdrawal rate and
18 actual use of water. CP&L plans no refurbishment in conjunction with this license renewal, so
19 plant demand would not change beyond current demands (CP&L 2002).
20

21 CP&L assumed no increase of employees during license renewal, which would create no
22 impacts from plant-related population increases and no additional demand for potable water
23 (CP&L 2002). The current potable water demand is within the residual capacity of the existing
24 water system that services Darlington County. The current approximate average daily demand
25 for the Darlington County Water and Sewer Authority is 16,300 m³/day (4.36 MGD), of which
26 the Robinson site nominal demand, based on the NPDES permit, is only 27 m³/day (7200 g/d or
27 5 gpm) (NRC 2003a). Five wells on the Robinson site yield an average 4500 m³/day
28 (1.18 MGD). Long-term pumping in the five-county region has caused a 61-m (200-ft) reduction
29 in the groundwater level in the source aquifer, so a new source (probably the Great Pee Dee
30 River) will need to be tapped in the next 10 years. This source is expected to be adequate to
31 serve future demands of the region. CP&L notes that no increase in plant work force or
32 demand on water systems from the plant is expected, so the incremental impact of relicensing
33 the plant on either the public water system or the regional groundwater situation is minimal. As
34 a result, the staff concludes that the impact on water use is SMALL and mitigation is not
35 warranted.
36

4.4.3 Offsite Land Use During Operations

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

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.

CP&L determined that no additional plant workers will be required during the license-renewal term (CP&L 2002). Section 3.7.5 of the GEIS (NRC 1996) states that, if plant-related population growth is less than 5 percent of the study area's total population, offsite land-use changes would be **SMALL**, especially if the study area has established patterns of residential and commercial development, a population density of at least 23 persons/km² (60 persons/mi²), and at least one urban area with a population of 100,000 or more within 80 km (50 miles). In this case, there is no expected population growth as a result of license renewal. 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.

Section 4.7.4.1 of the GEIS 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. Section 4.7.2.1 of the GEIS 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 (10 to 20 percent) relative to the community's total revenue, new tax-driven land-use changes would be **MODERATE**. This is most likely to be true where the community has no pre-established patterns of development (i.e., land-use plans or controls)

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1 or has not provided adequate public services to support and guide development in the past,
2 especially infrastructure that would allow industrial development. If the plant's tax payments are
3 projected to be a dominant source of the community's total revenue, new tax-driven land-use
4 changes would be large. This would be especially true where the community has no pre-
5 established pattern of development or has not provided adequate public services to support and
6 guide development in the past.

7
8 Property tax payments made by CP&L to Darlington County for RNP constitute slightly less than
9 20 percent of the county's total property tax revenue (NRC 2003a). The comparable
10 percentage for Chesterfield County is less than 0.5 percent. Nevertheless, Darlington and
11 Chesterfield Counties have not experienced large land-use changes as a result of past tax
12 payments made by CP&L for RNP. Population growth rates have been low, and county
13 planners are not projecting large changes. The area surrounding the Robinson site has
14 remained largely rural. Consequently, the staff concludes that tax-driven land-use impacts
15 resulting from license renewal are likely to be SMALL.

16 17 **4.4.4 Public Services: Transportation Impacts During Operations**

18
19 On October 4, 1999, 10 CFR 51.53(c)(3)(ii)(J) and 10 CFR Part 51, Subpart A, Appendix B,
20 Table B-1, were revised to clearly state that "Public Services: Transportation Impacts During
21 Operations" is a Category 2 issue (see NRC 1999 for more discussion of this clarification). The
22 issue is treated as such in this supplemental environmental impact statement (SEIS).

23
24 Growth is expected in both Darlington and Florence Counties during the license-renewal term.
25 However, expected growth will not be due directly to increases in employment at RNP. The
26 permanent employment associated with RNP is currently about 520 employees (CP&L and
27 contractor employees [CP&L 2002]). During refueling outages, which occur about once in
28 18 months, as many as 950 to 1050 additional workers are hired on a temporary basis. The
29 South Carolina Department of Transportation does not maintain level-of-service designations
30 for roadways in the state; however, the local residents have not identified the plant-related
31 annual traffic increase as a problem. Since no additional employment increment is expected as
32 a result of license renewal, CP&L concluded that the impacts on transportation during the
33 license-renewal term would be SMALL.

34
35 The staff reviewed CP&L's assumptions and resulting conclusions. The staff concludes that
36 any impact of CP&L on transportation service degradation is likely to be SMALL and would not
37 require further mitigation.

1 **4.4.5 Historic and Archaeological Resources**

2
3 The National Historic Preservation Act (NHPA) requires that Federal agencies take into account
4 the effects of their undertakings on historic properties. The historic preservation review process
5 mandated by Section 106 of the NHPA is outlined in regulations issued by the Advisory Council
6 on Historic Preservation at 36 CFR Part 800, as amended. Renewal of an OL for a nuclear
7 power plant is an undertaking that could potentially affect historic properties. Therefore,
8 according to the NHPA, the NRC is to make a reasonable effort to identify historic properties in
9 the areas of potential effects. If no historic properties are present or affected, NRC is required
10 to notify the State Historic Preservation Officer (SHPO) before proceeding. If it is determined
11 that historic properties are present, the NRC is required to assess the possible adverse effects
12 of the undertaking.

13
14 On May 31, 2001, CP&L wrote to the South Carolina SHPO requesting its comment on the
15 RNP license-renewal process and on the determination by CP&L that the continued operation
16 of RNP will not have an adverse effect on historic or cultural resources (Fletcher 2001a). In a
17 response dated August 8, 2001, the South Carolina SHPO stated that based on the information
18 provided, license renewal should not affect historic properties nor archeological sites (Brock
19 2001). It should be noted, however, that there is no record of any archaeological surveys
20 having been conducted on the Robinson site to assist the SHPO in the determination.

21
22 As discussed in Section 2.2.9, the NRC also contacted eight Native American tribes or groups.
23 These tribes or groups did not identify cultural resources of concern or potential cultural
24 resources at the Robinson site.

25
26 Areas within a nuclear plant site boundary can be placed into one of the following three
27 categories.

- 28
29 (1) Areas with no potential for historic or archaeological resources include areas where past
30 disturbances related to construction of the power station and appurtenant facilities have
31 taken place to such an extent that any cultural resources that once existed are no longer
32 present. No further archaeological investigations are recommended for these areas.
33
34 (2) Areas with low potential for historic or archaeological resources include areas that are
35 relatively undisturbed but possess characteristics, which would normally indicate a low
36 probability for most types of cultural resources to occur. For the most part, these lands
37 have a degree of slope greater than 15 percent. For most of these areas, further
38 archaeological work would not be necessary, although there could be smaller areas within
39 the larger zone where specific ground conditions could require investigation.
40

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1 (3) Areas with moderate-to-high potential for archaeological resources include areas that are
2 relatively undisturbed by past activities and that have a likelihood for prehistoric and historic
3 archaeological sites according to local models of prehistoric and historic land use and
4 settlement patterning. Archaeological investigation is recommended prior to undertaking
5 any ground-disturbing activities in these areas.
6

7 According to the CP&L ER, the Robinson site is more than 2000 ha (5000 ac) of which Lake
8 Robinson comprises 911 ha (2250 ac) of that. In addition to the H.B. Robinson Steam Electric
9 Plant, Units 1 and 2, the Darlington County Internal Combustion Turbine Electric Plant is
10 located on the same property. Therefore, features of these three facilities take up much of the
11 available landscape. CP&L leases the northern portion of its property to the State of South
12 Carolina and manages the balance of undeveloped property for timber production. Given the
13 potential for historical period archaeological resources (e.g., dwelling and outbuilding
14 foundations, dumps, privies, etc.; see Section 2.2.9.2), forested areas within the exclusion zone
15 should be treated as having moderate-to-high potential for historic or archaeological resources.
16

17 Major refurbishment of RNP is not expected during the license-renewal period, and it is
18 anticipated that there will be no need to use the few currently undeveloped portions of the RNP
19 site for operations during the renewal period. Continued operation of RNP would have a
20 beneficial effect on any potential unknown or undiscovered historic or archaeological resources
21 in undisturbed areas for the duration of the license-renewal period by protecting the natural
22 landscape and vegetation and by restricting access to the site.
23

24 However, care should be taken by the licensee while undertaking normal operational and
25 maintenance activities to ensure that historic properties are not inadvertently impacted. These
26 activities may include not only operation of the plant itself, but also land-management-related
27 actions such as recreation, timber management, wildlife habitat enhancement, or maintaining/
28 upgrading plant access roads through the plant site. Special care should be taken in forested
29 areas, because there is a moderate-to-high potential for historic and archaeological resources
30 on the Robinson site. Also, ground-disturbing activities near the RNP visitors center should be
31 carefully planned and implemented to avoid possible disturbance of the Wiley Warren family
32 cemetery (see Section 2.2.9.2).
33

34 Based on the staff's cultural resources analysis and consultation, the staff concludes that the
35 potential impacts on historic and archaeological resources are SMALL, and no additional
36 mitigation is warranted.
37

4.4.6 Environmental Justice

Environmental justice refers to a Federal policy that requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse impacts on minority^(a) or low-income populations. The memorandum accompanying Executive Order 12898 (59 FR 7629) directs Federal executive agencies to consider environmental justice under the National Environmental Policy Act of 1969 (NEPA). The Council on Environmental Quality (CEQ) has provided guidance for addressing environmental justice (CEQ 1997). Although the Executive Order is not mandatory for independent agencies, the 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 recorded during the 2000 Census (USCB 2000a, 2000b) within 80 km (50 mi) of RNP, encompassing all of Darlington, Lee, Kershaw, Marlboro, and Chesterfield Counties in South Carolina; parts of Florence, Marion, Dillon, Lancaster, Chester, Fairfield, Richland, Sumter, Clarendon, and Williamsburg Counties in South Carolina; and parts of Robeson, Scotland, Richmond, Anson, and Union Counties in North Carolina. The analysis was also supplemented by field inquiries to the planning department and social service agencies in Darlington and Lee Counties.^(b)

For the purpose of the staff's review, a minority population is defined to exist if the percentage of minorities within the census block groups^(c) in each state within the 80-km (50-mi) radius potentially affected by the license renewal of RNP exceeds the corresponding percentage of minorities in the state of which it is a part by 20 percent, or if the corresponding percentage of

(a) The NRC guidance for performing environmental justice reviews defines "minority" as American Indian or Alaskan Native; Asian; Native Hawaiian or other Pacific Islander; or Black races; or Hispanic ethnicity. "Other" races and multi-racial individuals may be considered as separate minorities (NRC 2001).

(b) Darlington and Lee Counties were the focus of this inquiry because both counties lie within the 80-km (50-mi) radius and contain the minority and low-income populations that are nearest the Robinson site. The staff concluded that any findings of environmental justice issues in these counties would warrant further field inquiries in more distant counties. For reasons stated later in this section, further investigation was not warranted.

(c) 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 USCB 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 USCB 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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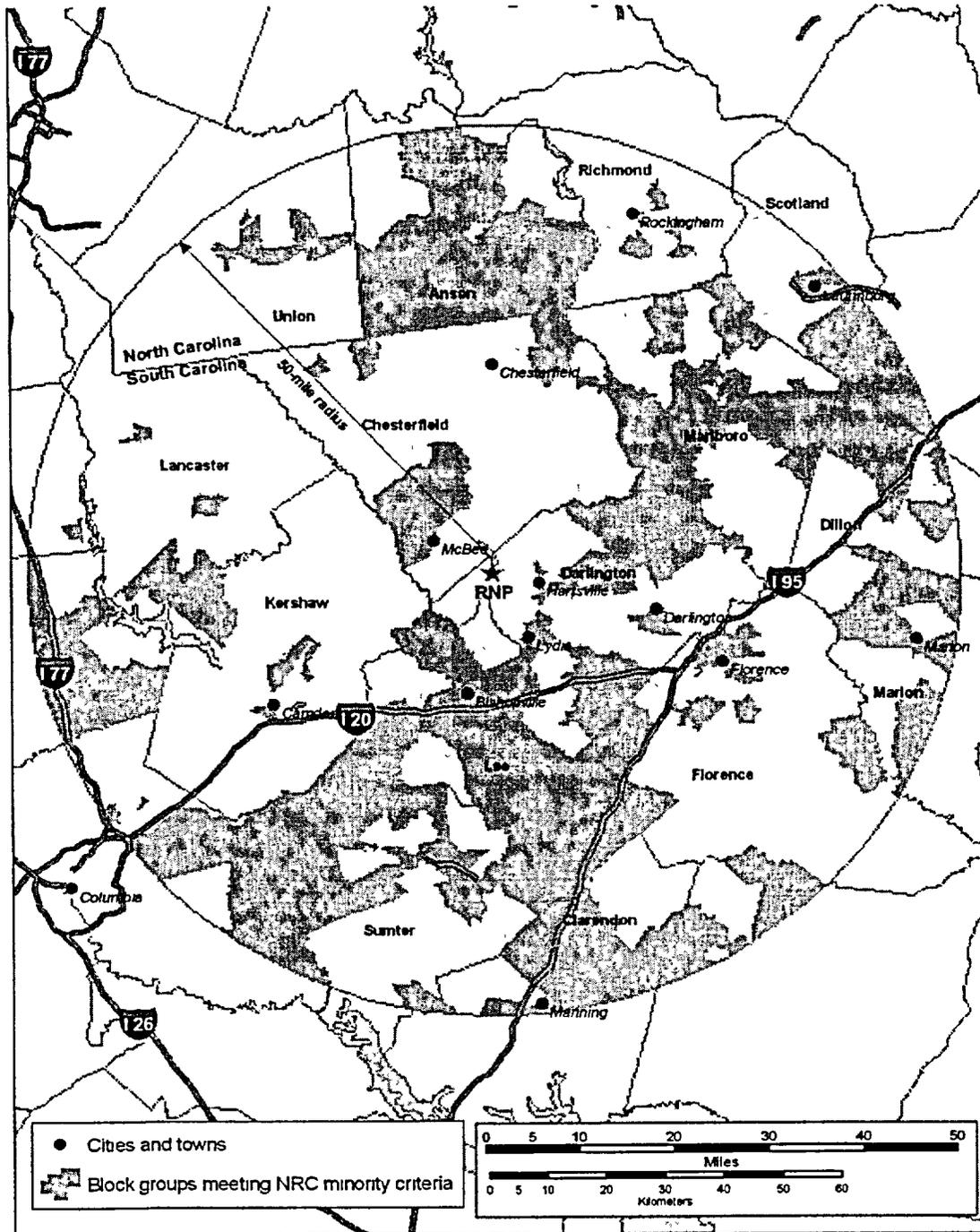
1 minorities within the census block group is at least 50 percent. A low-income population is
2 defined to exist if the percentage of low-income population within a census block group exceeds
3 the corresponding percentage of low-income population in the state of which it is a part by
4 20 percent, or if the corresponding percentage of low-income population within a census block
5 group is at least 50 percent. For census block groups within Darlington and Lee Counties, for
6 example, the percentage of minority and low-income populations is compared to the percentage
7 of minority and low-income populations in South Carolina. Both CP&L and the staff used the
8 2000 census block groups for identifying minority populations, but CP&L used the 1990 census
9 tracts to identify low-income populations because the 2000 census data on incomes were not
10 yet available for small geographic areas. The staff used the 2000 census block groups
11 because they became available in August 2002.

12
13 The scope of the review as defined in NRC guidance (NRC 2001) should include an analysis of
14 impacts on minority and low-income populations, the location and significance of any
15 environmental impacts during operations on populations that are particularly sensitive, and any
16 additional information pertaining to mitigation. The descriptions to be provided by this review
17 should state whether these impacts are likely to be disproportionately high and adverse, and to
18 evaluate the significance of such impacts.

19
20 CP&L conducted its analysis for minority and low-income populations using the convention of
21 including the census tracts if any of their area lay within 80 km (50 mi) of RNP (CP&L 2002).
22 Using this convention, the 80-km radius included 670 census block groups from the 2000
23 census and 189 census tracts from the 1990 census. The NRC staff used the census block
24 groups in the 2000 census, which resulted in a universe of 670 block groups, and followed its
25 latest guidance (NRC 2001) for designating minority categories, including "other" races and
26 multiple-race individuals. Figures 4-1 and 4-2 show the distribution of census block groups for
27 the minority and low-income populations, respectively.

28
29 Based on the NRC criteria, CP&L determined that Black minority populations exist in
30 237 census block groups: 194 in South Carolina, and 43 in North Carolina. Hispanic minority
31 populations exist in five block groups, all in North Carolina. Five North Carolina block groups
32 contain Native American minority populations. Staff analysis using the 2000 census confirmed
33 the relative numbers and locations of minority populations in the CP&L analysis. Figure 4-1
34 shows the locations of minority populations.

35
36 Black minority populations were scattered throughout the 80-km (50-mi) area, especially in
37 Darlington and the Bishopville-Camden-Sumter-Manning area.



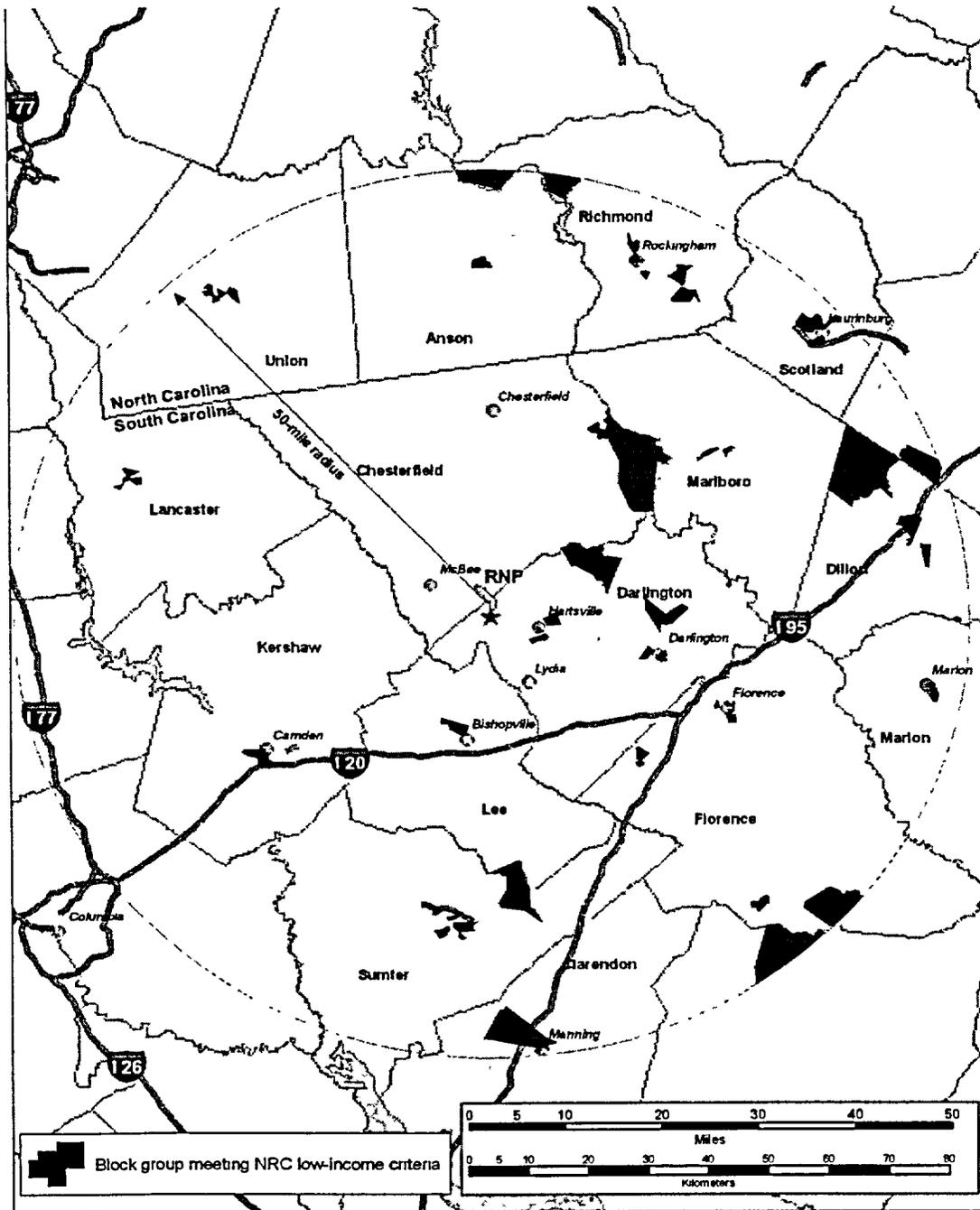
1 **Figure 4-1. Geographic Distribution of Minority Populations (shown in shaded areas) Within**
 2 **80 km (50 mi) of the RNP Site Based on 2000 Census Block Group Data**
 3

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1 By the NRC criteria (50 percent of population, or at least 20 percent greater than state), 61 of
2 the total 670 block groups from the 2000 census within 80 km (50 mi) of the site contain low-
3 income populations. The majority of census block groups containing low-income populations
4 are located in the Darlington, Florence, and Sumter areas. In North Carolina, low-income block
5 groups are concentrated in the Laurinburg area (which also contains a significant Native
6 American population), and north of Rockingham. Figure 4-2 shows the locations of the low-
7 income populations.

8
9 With the locations of minority and low-income populations identified, the staff proceeded to
10 evaluate whether any of the environmental impacts of the proposed action could affect these
11 populations in a disproportionate manner. Based on staff guidance (NRC 2001), air, land, and
12 water resources within about 80 km (50 mi) of the Robinson site were examined. Within that
13 area, a few potential environmental impacts could affect human populations; all of these were
14 considered SMALL for the general population.

15
16 The pathways through which the environmental impacts associated with RNP license renewal
17 can affect human populations are discussed in each associated section. The staff then
18 evaluated whether minority and low-income populations could be disproportionately affected by
19 these impacts. The staff found no unusual resource dependencies or practices, such as
20 subsistence agriculture, hunting, or fishing through which the populations could be
21 disproportionately affected. In addition, the staff did not identify any location-dependent
22 disproportionate impacts affecting these minority and low-income populations. The staff
23 concludes that offsite impacts to minority and low-income populations from relicensing RNP
24 would be SMALL, and no additional mitigation actions are warranted.



1 **Figure 4-2. Geographic Distribution of Low-Income Populations (shown in shaded areas)**
2 **Within 80 km (50 mi) of the Robinson Site Based on 2000 Census Block**
3 **Group Data**

4.5 Groundwater Use and Quality

There are no Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to RNP groundwater use and quality. Category 2 issues related to groundwater use and quality during the renewal term for RNP are discussed in the sections that follow. These issues, listed in Table 4-8, require plant-specific analysis.

Table 4-8. 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
GROUNDWATER USE AND QUALITY			
Groundwater-use conflicts (potable and service water, and dewatering; plants that use >100 gpm)	4.8.1.1 4.8.2.1	C	4.5.1
Groundwater-use conflicts (plants using cooling water towers or cooling ponds and withdrawing makeup water from a small river)	4.8.1.3 4.4.2.1	A	4.5.2
Groundwater quality degradation (cooling ponds at inland sites)			4.5.4

4.5.1 Groundwater-Use Conflicts (Plants that Use >100 gpm)

Units 1 and 2 of the H.B. Robinson Steam Electric Plant use water from five groundwater wells with an average combined yield of 52 L/s (825 gpm). These wells provide makeup water and sanitary water. The wells are completed into the Middendorf Formation underlying the site.

Well tests were performed in 1982 and reported in the *Updated Final Safety Analysis Report* (CP&L 2000). These tests estimated the transmissivity and coefficient of storage in the production aquifer to be 0.019 m/s (40,000 gpd/ft²) and 5 x 10⁻³, respectively. The increase in drawdown between the end of the current license and the end of the renewal period was estimated to be 0.3 m (1 ft) for a location ½ mile from the pumped well by using the equation for radial flow to a well in a confined, homogeneous, and isotropic aquifer (Maidment 1992).

No changes in pumpage and only minor changes in drawdown are expected during the renewal period from the current period. Therefore, based on its review of the CP&L ER and its

1 independent analysis, the staff concludes that the potential impacts of regional groundwater
2 supplies from continued pumping of RNP's wells are SMALL, and additional mitigation is not
3 warranted.

4
5 **4.5.2 Groundwater-Use Conflicts (Makeup Water from a Small River)**

6
7 The evaporative loss of water from Lake Robinson reduces the surface-water supply available
8 to recharge adjacent groundwater aquifers that may support riparian and aquatic ecosystems
9 around the lake and downstream of the impoundment. As described in Section 2.2.2, the
10 months of June through September are critical as a result of high evaporation rates and low
11 flow rates.

12
13 The rate that surface water in lakes and streams recharges adjacent aquifers is governed by
14 the surface elevation of the stream or lake. The elevation of Lake Robinson remains relatively
15 stable throughout the year, and therefore, groundwater recharge around the lake is not
16 impacted. However, Black Creek downstream of the impoundment will reflect the evaporative
17 losses at the lake. The average discharge from Lake Robinson during June through
18 September is 4.73 m³/s (167 cfs). Using the monthly evaporation data for Columbia, South
19 Carolina (van der Leeden et al. 1990) and assuming a conservative ratio of 2:1 for induced to
20 natural evaporation, the estimated average total evaporative loss during June through
21 September is 1.61 m³/s (57 cfs) or 34 percent of the flow. Based on the stage-flow
22 relationships for the streamflow gauge downstream of the impoundment, this reduction in flow
23 only results in a loss of about 15 cm (6 in.) in stage downstream.

24
25 The evaporation losses are not expected to change during the renewal period from the current
26 period. Therefore, based on its review of the CP&L ER and its independent analysis, the staff
27 concludes that the potential impacts to riparian and aquatic ecosystems from reduced surface
28 water available to recharge adjacent aquifers are SMALL, and additional mitigation is not
29 warranted.

30
31 **4.5.3 Groundwater Quality Degradation (Cooling Ponds at Inland Sites)**

32
33 Metals and other contaminants can be gradually concentrated in cooling ponds by repeated
34 cycles through the cooling system and by evaporation of pure water to the atmosphere. In
35 unlined cooling impoundments such contaminated water can migrate into adjacent aquifers and
36 potentially contaminate the regional groundwater supply.

37
38 Assuming Lake Robinson is perfectly mixed, the lake volume of 38 x 10⁶ m³ (31,000 ac ft) and
39 mean annual discharge of 6.31 m³/s (223 cfs) implies that the lake volume is flushed 5.2 times
40 a year. In the year of the lowest recorded mean annual discharge of 3.77 m³/s (133 cfs), the

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lake's flush rate was about 3.1 times per year. The average flow circulating through the cooling system is 2.48×10^6 m³/d (654 MGD). Therefore, lake water experiences 4.6 cycles through the cooling system in an average year and 7.6 cycles through the cooling system in the record low-flow year before being released downstream.

The water quality of the plant discharge is monitored and regulated before it returns to the lake. These water-quality requirements are not relative to the intake water-quality but are absolute. Therefore, the lake's water quality cannot decline below the water quality established by the SCDHEC for the discharge from the cooling system.

Because the quality of the cooling discharges is not expected to change during the renewal period, and the water quality being discharged into Lake Robinson must continue to comply with the NPDES permit issued by SCDHEC, the lake and any water migrating from it into the adjacent shallow groundwater aquifers are not expected to be impaired. Therefore, based on its review of the CP&L ER, water-quality monitoring data, and its independent analysis, the staff concludes that the potential impacts to the regional groundwater quality resulting from operation of the plant's cooling water system are SMALL, and additional mitigation is not warranted.

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 4-9.

Table 4-9. 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

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 the Robinson site is discussed in Sections 2.2.5 and 2.2.6.

CP&L maintains contacts with agencies responsible for protected species and sensitive habitats to ensure compliance of its activities. Additionally, CP&L notified FWS and SCDNR of its intent to apply for renewal of their license and its desire to meet environmental protection

1 requirements (Fletcher 2001b, 2001c). FWS responded on June 7, 2001, with a list of species
2 (by county) based on information provided by CP&L (Gilbert 2001). SCDNR reported that its
3 database had no known occurrences of rare, threatened, or endangered species within 1.6 km
4 (1 mi) of the Robinson site (Holling 2001). The staff sent a letter dated December 9, 2002, to
5 FWS requesting an updated list of threatened, endangered, and proposed species, and critical
6 habitat (NRC 2002); the letter indicated that information for Chesterfield County, South
7 Carolina, should be included in the update. FWS responded by letter dated December 19,
8 2002, providing the updated information. The staff also contacted SCDNR and the National
9 Marine Fisheries Service (NMFS) by telephone to obtain information about threatened and
10 endangered species (NRC 2003b). All of this information was used to develop the site-specific
11 list of Federally listed species that are addressed in the biological assessment that was
12 submitted to the FWS and the National Oceanic and Atmospheric Administration Fisheries
13 (NOAA Fisheries) (previously NMFS) (NRC 2003c, 2003d).

14 15 **4.6.1 Aquatic Species**

16
17 No Federally listed aquatic species are known to occur at the Robinson site or along the
18 transmission line rights-of-way. Shortnose sturgeon are listed as endangered by FWS in
19 Chesterfield, Darlington, Florence, and Sumter Counties, and the Atlantic sturgeon is listed as a
20 candidate species for Federal listing in South Carolina. Candidate species are not protected
21 under the Endangered Species Act, but concerns about their status indicate that they may
22 warrant listing in the future. Neither sturgeon species is known to occur in Black Creek.
23 Typically, the first dam on a river marks the upstream limit of the sturgeon population's range
24 (Kynard 1997). Thus, it is assumed that the impoundments at Prestwood Lake and Lake
25 Robinson, which lack fish passage facilities, prevent sturgeon from accessing Lake Robinson
26 and from being impacted by RNP cooling water intake effects (e.g., impingement and
27 entrainment).

28
29 Because it is unlikely that shortnose or Atlantic sturgeon are present in Black Creek due to the
30 creek's small size and a lack of fish passage facilities at the Prestwood Lake or Lake Robinson
31 dams and because impacts from thermal and chemical discharges, surging, and operation of
32 the RNP cooling water intake system are expected to be minimal or non-existent, the NRC staff
33 has determined that impacts to sturgeon from the proposed license renewal would be SMALL.

34
35 The Carolina heelsplitter, a Federally and State-endangered freshwater mussel, was historically
36 known in South Carolina from the Pee Dee River system. In intensive FWS surveys (1987 to
37 1990), the population nearest the plant was found in the Lynches River (downstream from the
38 Black Creek/Pee Dee River junction) along the western boundary of Chesterfield County
39 (FWS 1993). During the FWS surveys, only two individuals were found in the Lynches River
40 (both found in 1990). Because the Carolina heelsplitter populations exist only in tributaries to

Environmental Impacts of Operation

1 the Pee Dee River and not in Black Creek, the NRC staff has determined that the impacts to
2 the Carolina heelsplitter from the proposed license renewal would be SMALL.

3
4 The staff has submitted its biological assessment to the FWS and the NOAA Fisheries that
5 evaluates the potential effects of license renewal on Federally listed threatened and
6 endangered species and candidates for Federal Protection (NRC 2003c, 2003d). The staff's
7 preliminary conclusion is that continued operation of RNP will have no effect on the Carolina
8 heelsplitter, the shortnose sturgeon, and the Atlantic sturgeon. Any response from FWS and
9 NOAA Fisheries will be included in the final SEIS.

10
11 In summary, the staff has reviewed the information provided by the applicant and has contacted
12 the FWS, NOAA Fisheries, and the SCDNR. Based on this information, these contacts, and
13 the site visit, the staff concludes that the potential impacts of an additional 20 years of operation
14 and maintenance of RNP on endangered, threatened, proposed, or candidate aquatic species
15 would be SMALL. During the course of its evaluation, the staff considered mitigation measures
16 for continued operation of RNP. Based on this evaluation, the staff expects that mitigation
17 measures in place are appropriate and no additional mitigation measures are warranted.

18 19 **4.6.2 Terrestrial Species**

20
21 The bald eagle is the only Federally listed terrestrial species known to occur at the Robinson
22 site or along the transmission line rights-of-way. Other Federally listed species with potential
23
24 habitat at the site include the red-cockaded woodpecker, chaffseed, rough-leaved loosestrife,
25 and Canby's dropwort. None of these species are known to occur at the Robinson site or along
26 the transmission line rights-of-way.

27
28 Two abandoned red-cockaded woodpecker cavity trees are located on the Robinson site near
29 the Darlington County Internal Combustion Turbine Electric Plant. Both of these cavity trees
30 have been abandoned for many years. CP&L conducted a field survey for the red-cockaded
31 woodpecker in 1999 throughout the Robinson site; the survey identified no active cavity trees
32 and no foraging habitat for this species. CP&L requires surveys to be conducted when there is
33 timber harvesting or clearing of pine trees at the site (CP&L 1998). In accordance with a Safe
34 Harbor Agreement with the State, CP&L manages the site to maintain and enhance habitat for
35 red-cockaded woodpeckers (CP&L 1999).

36
37 Transmission line rights-of-way maintenance activities help to maintain wildlife habitat
38 heterogeneity in this area. CP&L participates with the U.S. Department of Agriculture Natural
39 Resources Conservation Service, SCDNR, and other organizations in a wildlife management
40 program for transmission line rights-of-way.

1 The staff has submitted its biological assessment to the FWS and NOAA Fisheries that
2 evaluates the potential effects of license renewal on Federally listed threatened and
3 endangered species (NRC 2003c, 2003d). The staff's preliminary conclusion is that license
4 renewal will have no effect on the bald eagle. License renewal may affect, but is not likely to
5 adversely affect the red-cockaded woodpecker, Canby's dropwort, chaffseed, and rough-leaved
6 loosestrife. Any response from FWS and NOAA Fisheries will be included in the final SEIS.

7
8 The staff has reviewed the information provided by the applicant and has contacted the FWS
9 and the SCDNR. Based on this information, these contacts, and the site visit, the staff
10 concludes that the potential impacts of an additional 20 years of operation and maintenance of
11 RNP on endangered, threatened, proposed, or candidate terrestrial species would be SMALL.
12 During the course of its evaluation, the staff considered mitigation measures for continued
13 operation of RNP. Based on this evaluation, the staff expects that mitigation measures in place
14 are appropriate and no additional mitigation measures are warranted.
15

16 **4.7 Evaluation of Potential New and Significant Information** 17 **on Impacts of Operations During the Renewal Term**

18
19 The staff has not identified significant new information on environmental issues listed in 10 CFR
20 Part 51, Subpart A, Appendix B, Table B-1, related to operation during the renewal term. The
21 staff reviewed the discussion of environmental impacts associated with operation during the
22 renewal term in the GEIS and has conducted its own independent review, including public
23 scoping meetings, to identify issues with significant new information. Processes for
24 identification and evaluation of new information are described in Section 1.2.2, License
25 Evaluation Process.
26

27 **4.8 Summary of Impacts of Operations During the** 28 **Renewal Term**

29
30 Neither CP&L nor the staff is aware of information that is both new and significant related to any
31 of the applicable Category 1 issues associated with RNP operation during the renewal term.
32 Consequently, the staff concludes that the environmental impacts associated with these issues
33 are bounded by the impacts described in the GEIS. For each of these issues, the GEIS
34 concluded that the impacts would be SMALL and that additional plant-specific mitigation
35 measures are not likely to be sufficiently beneficial to warrant implementation.
36

37 Plant-specific environmental evaluations were conducted for 15 Category 2 issues applicable to
38 RNP operation during the renewal term and for environmental justice and chronic effects of
39 electromagnetic fields. For all 15 issues and environmental justice, the staff concluded that the

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1 potential environmental impact of renewal term operations of RNP would be of SMALL
2 significance in the context of the standards set forth in the GEIS and that additional mitigation
3 would not be warranted. In addition, the staff determined that a consensus has not been
4 reached by appropriate Federal health agencies regarding chronic adverse effects from
5 electromagnetic fields. Therefore, no evaluation of this issue is required.
6

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5.0 Environmental Impacts of Postulated Accidents

Environmental issues associated with postulated accidents are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).⁽¹⁾ The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures 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) 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 likely not 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 describes the environmental impacts from postulated accidents that might occur during the license renewal term.

5.1 Postulated Plant Accidents

Two classes of accidents are evaluated in the GEIS. These are design-basis accidents (DBAs) and severe accidents, as discussed below.

(1) 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 Addendum 1.

Postulated Accidents

5.1.1 Design-Basis Accidents

In order to receive NRC approval to operate a nuclear power facility, an applicant must submit a safety analysis report (SAR) as part of the application. The SAR presents the design criteria and design information for the proposed reactor and comprehensive data on the proposed site. The SAR also discusses various hypothetical accident situations and the safety features that are provided to prevent and mitigate accidents. The NRC staff reviews the application to determine whether the plant design meets the Commission's regulations and requirements and includes, in part, the nuclear plant design and its anticipated response to an accident.

DBAs are those accidents that both the licensee and the NRC staff evaluate to ensure that the plant can withstand normal and abnormal transients, and a broad spectrum of postulated accidents without undue hazard to the health and safety of the public. A number of these postulated accidents are not expected to occur during the life of the plant but are evaluated to establish the design basis for the preventive and mitigative safety systems of the facility. The acceptance criteria for DBAs are described in 10 CFR Part 50 and 10 CFR Part 100.

The environmental impacts of DBAs are evaluated during the initial licensing process, and the ability of the plant to withstand these accidents is demonstrated to be acceptable before issuance of the operating license (OL). The results of these evaluations are found in license documentation such as the staff's safety evaluation report (SER), the final environmental statement (FES), the licensee's updated final safety analysis report (UFSAR), and Section 5.1 of this supplemental environmental impact statement (SEIS). The licensee is required to maintain the acceptable design and performance criteria throughout the life of the plant, including any extended-life operation. The consequences for these events are evaluated for the hypothetical maximum exposed individual; as such, changes in the plant environment will not affect these evaluations. Because of the requirements that continuous acceptability of the consequences and aging management programs be in effect for license renewal, the environmental impacts as calculated for DBAs should not differ significantly from initial licensing assessments over the life of the plant, including the license renewal period. Accordingly, the design of the plant relative to DBAs during the extended period is considered to remain acceptable, and the environmental impacts of those accidents were not examined further in the GEIS.

The Commission has determined that the environmental impacts of DBAs are of SMALL significance for all plants because the plants were designed to successfully withstand these accidents. Therefore, for the purposes of license renewal, design-basis accidents are designated as a Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The early resolution of the DBAs make them a part of the current licensing basis of the plant; the current licensing basis of the plant is to be maintained by the licensee under its current license and, therefore, under the provisions of 10 CFR 54.30, is not subject to review under license renewal. This issue, applicable to H.B. Robinson Steam Electric Plant, Unit 2(RNP), is listed in Table 5-1.

Table 5-1. Category 1 Issue Applicable to Postulated Accidents During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
POSTULATED ACCIDENTS	
Design-basis accidents	5.3.2; 5.5.1

Based on information in the GEIS, the Commission found that

The NRC staff has concluded that the environmental impacts of design basis accidents are of small significance for all plants.

Carolina Power and Light Company (CP&L) stated in its Environmental Report (ER)(CP&L 2002) that it is not aware of any new and significant information associated with the renewal of the Robinson OL. The staff has not identified any significant new information during its independent review of the CP&L ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to this issue beyond those discussed in the GEIS.

5.1.2 Severe Accidents

Severe nuclear accidents are those that are more severe than DBAs because they could result in substantial damage to the reactor core, whether or not there are serious offsite consequences. The GEIS assessed the impacts of severe accidents during the license renewal period, using the results of existing analyses and site-specific information to conservatively predict the environmental impacts of severe accidents for each plant during the renewal period.

Based on information in the GEIS, the Commission found that

The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to ground water, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.

Therefore, the Commission has designated mitigation of severe accidents as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue, applicable to RNP is listed in Table 5-2.

Postulated Accidents

Table 5-2. Category 2 Issue Applicable to Postulated Accidents 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
POSTULATED ACCIDENTS			
Severe Accidents	5.3.3; 5.3.3.2; 5.3.3.3; 5.3.3.4; 5.3.3.5; 5.4; 5.5.2	L	5.2

The staff has not identified any significant new information with regard to the consequences from severe accidents during its independent review of the CP&L ER (CP&L 2002), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of severe accidents beyond those discussed in the GEIS. However, in accordance with 10 CFR 51.53(c)(3)(ii)(L), the staff has reviewed severe accident mitigation alternatives (SAMAs) for RNP. The results of the staff's review are discussed in Section 5.2.

5.2 Severe Accident Mitigation Alternatives (SAMAs)

10 CFR 51.53(c)(3)(ii)(L) requires that license renewal (LR) applicants consider alternatives to mitigate severe accidents if the staff has not previously evaluated SAMAs for the applicant's plant in an environmental impact statement (EIS) or related supplement or in an environmental assessment. The purpose of this consideration is to ensure that plant changes (i.e., hardware, procedures, and training) with the potential for improving severe accident safety performance are identified and evaluated. SAMAs have not been previously considered for RNP; therefore, the remainder of Chapter 5 addresses those alternatives.

5.2.1 Introduction

This section presents a summary of the SAMA evaluation for RNP conducted by CP&L and described in the ER (CP&L 2002) and of the NRC's review of that evaluation. The details of the review are described in the NRC staff evaluation that was prepared by the staff with contract assistance from Information Systems Laboratories, Inc. The entire evaluation is presented in Appendix G.

The SAMA evaluation for RNP was a four step process. In the first step, CP&L quantified the level of risk associated with potential reactor accidents using the plant-specific probabilistic safety assessment (PSA) and other risk models.

The second step was the examination of the major risk contributors to identify areas where plant improvements might have the greatest chance to reduce risk. Then possible ways of

1 reducing those risks were identified. Common ways of reducing risk are changes to
2 components, systems, procedures, and training. CP&L identified 266 potential SAMAs. Using
3 a set of screening criteria, the number of SAMAs requiring further consideration was reduced to
4 48. Preliminary cost estimates were made for these 48 SAMAs, and any SAMAs costing more
5 than the maximum attainable benefit (discussed in Section 5.2.3) were removed from further
6 consideration.

7
8 In the third step, the benefits and costs for the remaining 10 candidate SAMAs were estimated.
9 Estimates were made of how much each proposed SAMA could reduce risk. Those estimates
10 were developed in terms of dollars in accordance with NRC guidance for performing regulatory
11 analyses (NRC 1997). The costs of implementing the proposed SAMAs were also estimated.

12
13 Finally in the fourth step, the costs and benefits of each of the 10 final SAMAs were compared
14 to determine whether the SAMA was cost-beneficial, meaning the benefits of the SAMA were
15 greater than the costs (a positive cost-benefit). In the final analysis, none of these 266 SAMAs
16 were determined to be cost-beneficial for RNP. However, the staff identified two additional
17 SAMAs that are cost-beneficial.

18
19 Each of these four steps is discussed in more detail in the sections that follow.

20 21 **5.2.2 Estimate of Risk**

22
23 CP&L submitted an assessment of SAMAs for RNP as part of the ER (CP&L 2002). This
24 assessment was based on the most recent Robinson Probabilistic Safety Analysis (PSA)
25 (including the Level 1 and 2 analyses), a plant-specific offsite consequence analysis performed
26 using the MELCOR Accident Consequence Code System (MACCS2)(essentially a Level 3 PSA
27 model), and the Robinson Individual Plant Examination of External Events (IPEEE)(CP&L
28 1995). The most recent PSA is a refinement of the plant-specific PSA presented in the
29 Robinson Individual Plant Examination (IPE)(CP&L 1992). The baseline core damage
30 frequency (CDF) for RNP is approximately 4.3×10^{-5} per year, based on internally-initiated
31 events. CP&L did not include the contribution to CDF from external events in these estimates.
32 CP&L concluded that the existing IPEEE and fire evaluations had adequately identified potential
33 plant improvements to address external events. The breakdown of CDF by initiating
34 event/accident class is summarized in Table 5-3. Transients and loss of offsite power events
35 are the dominant contributors to the CDF.
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Postulated Accidents

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Table 5-3. RNP Core Damage Frequency

Initiating Event/Accident Class	CDF (Per Year)	% Contribution to CDF
Loss of Offsite Power (LOOP)	1.04x10 ⁻⁵	24
Transients	1.99x10 ⁻⁵	46
Loss-of-Coolant Accident (LOCA)	4.75x10 ⁻⁶	11
Steam Generator Tube Rupture (SGTR)	3.46x10 ⁻⁶	8
Interfacing Systems LOCA (ISLOCA)	1.30x10 ⁻⁶	3
Others	3.46x10 ⁻⁶	8
Total CDF (from internal events)	4.32x10⁻⁵	100

Table 5-4. Breakdown of Population Dose by Containment Release Mode

Containment Release Mode	Population Dose (Person-Rem ^a Per Year)	% Contribution
SGTR	2.33	22
Interfacing Systems LOCAs	3.20	30
Early containment failure	0.40	4
Late containment failure	4.65	43
No containment failure	0.10	1
Total	10.68	100

^a One person-Rem = 0.01 person-Sv

CP&L estimated the dose from all postulated accidents to the population within 80 km (50 mi) of the Robinson site to be approximately 0.107 person-Sv (10.7 person-rem). The breakdown of the population dose by containment release mode is summarized in Table 5-4. Bypass events (interfacing system LOCA and SGTR) and late containment failures dominate the population dose.

The staff has reviewed CP&L's data and evaluation methods and concludes that the quality of the risk analyses is adequate to support an assessment of the risk reduction potential for the candidate SAMAs. Accordingly, the staff based its assessment of offsite risk on the CDF and offsite doses provided by CP&L.

5.2.3 Potential Plant Improvements

Once the most risk significant parts of the plant design and operation were identified, CP&L searched for ways to reduce those risks. To identify potential plant improvements, CP&L reviewed improvements identified in the Robinson IPE and IPEEE processes, SAMA analyses submitted for other nuclear power plants, and NRC and industry documents discussing potential plant improvements. CP&L identified 266 potential risk-reducing improvements to plant components, systems, procedures, and training (SAMAs).

All but 48 of these SAMAs were removed from further consideration because: (1) the SAMA was not applicable at RNP due to design differences, (2) the SAMA had already been implemented at RNP, (3) the SAMA was sufficiently similar to other SAMAs and was combined with another SAMA, or (4) the SAMA would not provide a significant safety benefit. A preliminary cost estimate was prepared for each of the remaining 48 SAMAs.

The preliminary cost estimate of each of these 48 remaining SAMAs was compared to the maximum attainable benefit (MAB) of 1.1 million dollars. The MAB is the dollar value of the benefit that would be achieved if the plant risk and population dose from postulated accidents could be reduced to zero. If the cost of a SAMA exceeded the MAB, it could not be cost-beneficial because no single SAMA could eliminate all the risk. Using this comparison, all but nine of the candidate SAMAs were removed from further consideration. One additional SAMA was identified by CP&L as a result of a model correction made while responding to a staff request for additional information; therefore, a total of 10 SAMAs were identified for further evaluation (CP&L 2003).

The staff reviewed CP&L's screening methods and results and concluded that they were systematic and comprehensive. However, based on a review of the seismic and fire risk vulnerabilities identified in the Robinson IPEEE, the staff identified two new SAMAs not previously identified by CP&L that are cost-beneficial: (1) replacement of the cast-iron yokes on two RHR valves and (2) installation of a radiant heat shield on the electrical conduit to the shutdown diesel generator. CP&L had taken action to resolve these vulnerabilities when they were identified in the IPEEE; therefore, CP&L did not attempt to identify additional SAMAs for these vulnerabilities during this evaluation.

5.2.4 Evaluation of Risk Reduction and Costs of Improvements

CP&L performed bounding calculations of the potential risk reduction for the remaining 10 SAMAs. Such bounding calculations overestimate the benefit and are conservative. The benefits - the estimated dollar value of these risk reductions - were developed by calculating and adding the averted public exposure, offsite property damage, occupational exposure, and onsite costs associated with each SAMA.

Postulated Accidents

1 The staff reviewed CP&L's bounding calculations of the potential risk reduction and concluded
2 that they are reasonable and conservative. Therefore, the staff based its estimates of averted
3 risk for the SAMAs on CP&L's risk reduction estimates.
4

5 For three of the remaining SAMAs, the costs were based on previous detailed analyses by
6 other power plant licensees. For three of the SAMAs, no cost estimate was made because it
7 was determined that there was no calculated benefit. For the last four SAMAs, site-specific
8 cost estimates were developed.
9

10 In response to staff requests for additional information, CP&L provided cost and benefit
11 estimates for replacement of the cast-iron RHR valve yokes and installation of a radiant heat
12 shield on the electrical conduit to the shutdown diesel generator (NRC 2003).
13

14 The staff reviewed the cost estimates and concluded that they are sufficient and appropriate for
15 use in the SAMA evaluation.
16

17 5.2.5 Cost-Benefit Comparison

18
19 Based on the more detailed evaluations of potential risk reduction and cost discussed above,
20 CP&L determined that none of the 10 remaining SAMAs were cost-beneficial. CP&L performed
21 additional analyses to determine the impact of certain parameter choices such as the discount
22 rate on the calculations. CP&L also evaluated the level of uncertainty in the calculations. If the
23 95th percentile values of the CDF were utilized in the cost-benefit analysis instead of the best-
24 estimate CDF values, the estimated benefits of the SAMAs would increase by about a factor of
25 2.5. CP&L revisited the set of SAMAs screened out in the first part of the evaluation and
26 identified 11 additional SAMAs that could be cost-beneficial using the 95th percentile values of
27 the CDF. However, all 11 SAMAs were found to have implementation costs greater than their
28 averted cost-risk (benefit), and thus, were eliminated from further consideration. Therefore,
29 CP&L's final conclusion was that there were no cost-beneficial SAMAs.
30

31 The staff reviewed CP&L's calculation methods and logic arguments in the final cost-benefit
32 comparisons and agreed with CP&L's conclusion that none of the original 266 SAMAs are cost-
33 beneficial. However, based on a review of the seismic and fire risk vulnerabilities identified in
34 the Robinson IPEEE, the staff identified two new SAMAs that are cost-beneficial: (1)
35 replacement of the cast-iron yokes on two RHR valves and (2) installation of a radiant heat
36 shield on the electrical conduit to the shutdown diesel generator.
37

38 CP&L estimated the cost of replacing the cast-iron RHR valve yokes (to increase their seismic
39 capacity) to be \$105K with additional replacement power costs of \$240K to \$1.2M depending
40 on the particular outage in which the replacement is performed. CP&L concluded that
41 replacement of the cast-iron RHR valve yokes was not cost-beneficial because the benefits of
42 averted offsite economic costs would be approximately \$40K based on the seismic hazard
43 estimates provided in EPRI NP6395-D (NRC 2003). The staff estimated the potential
44 contribution to CDF and large early release frequency (LERF) from seismically-induced failure

1 of the valves to be about 2×10^{-5} per year based on Livermore seismic hazard estimates for the
2 Robinson site reported in NUREG-1488 (NRC 1993), and estimates that elimination of the
3 offsite costs associated with such a failure would have a benefit of approximately \$1M. Both the
4 EPRI and Livermore hazard estimates are considered by the staff to be useful for decision
5 making. The staff concludes that modification of the RHR valves to increase their seismic
6 capacity would be cost-beneficial depending on the assumed seismic hazard estimates and the
7 particular outage during which the modification would be implemented.

8
9 CP&L's preliminary evaluation of the radiant heat shield on the electrical conduit to the
10 shutdown diesel generator showed a benefit of over \$150K and a cost of under \$50K. CP&L is
11 evaluating possible designs for the radiant heat shield. The staff concludes that installation of
12 the heat shield would be cost-beneficial.

13 14 **5.2.6 Conclusions**

15
16 The staff reviewed the CP&L SAMA analysis and concluded that the methods used and the
17 implementation of those methods were sound. The treatment of SAMA benefits and costs, the
18 generally large negative net benefits, and the inherently small baseline risks support the
19 general conclusion that the SAMA evaluations performed by CP&L are reasonable and
20 sufficient for the license renewal submittal. However, the staff identified two cost-beneficial
21 SAMAs - modification of RHR valve yokes to reduce the risk from seismically-induced ISLOCAs
22 and installation of a radiant heat shield on the dedicated shutdown diesel generator electrical
23 conduit to reduce the risk from fire-induced SBO events.

24
25 Based on its review of the CP&L SAMA analysis, the staff concludes that none of the candidate
26 SAMAs are cost-beneficial, except as noted above for the RHR valves and dedicated shutdown
27 diesel generator conduit heat shield. This is based on conservative treatment of costs and
28 benefits. This conclusion is consistent with the low residual level of risk indicated in the
29 Robinson PSA and the fact that RNP has already implemented many plant improvements
30 identified from the IPE and IPEEE process. The staff concludes that installation of the heat
31 shield would be cost-beneficial, and that modification of the RHR valves to increase their
32 seismic capacity would also be cost-beneficial depending on the assumed seismic hazard
33 estimates and the particular outage during which the modification would be implemented.
34 However, these SAMAs do not relate to adequately managing the effects of aging during the
35 period of extended operation. Therefore, they need not be implemented as part of license
36 renewal pursuant to 10 CFR Part 54. CP&L is further evaluating these two SAMAs and has not
37 made any commitment to implement them.

38 39 **5.3 References**

40
41 10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental
42 Protection Regulations for Domestic Licensing and Related Regulatory Functions"

Postulated Accidents

1 Carolina Power & Light Company (CP&L). 1992. Letter from R. B. Starkey, Jr. (CP&L) to
2 United States Nuclear Regulatory Commission Document Control Desk. Submittal of the RNP
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6 Carolina Power & Light Company (CP&L). 1995. Letter from R. M. Krich (CP&L) to Document
7 Control Desk (NRC). Subject: Response to Generic Letter 88-20, "Individual Plant Examination
8 of External Events (IPEEE) for Severe Accident Vulnerabilities," Supplement 4", June 30, 1995.

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11 *License Renewal Stage, H. B. Robinson Steam Electric Plant Unit 2*. Carolina Power & Light
12 Company, Hartsville, South Carolina. June 2002.

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16 Additional Information Regarding Severe Accident Mitigation Alternatives Analysis, January 2,
17 2003.

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19 U.S. Nuclear Regulatory Commission. 1993. *Revised Livermore Seismic Hazard Estimates for*
20 *69 Nuclear Power Plant Sites East of the Rocky Mountains*. NUREG-1488, Washington, D.C.,
21 1993.

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24 *License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C., 1996.

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26 U.S. Nuclear Regulatory Commission. 1997. *Regulatory Analysis Technical Evaluation*
27 *Handbook*. NUREG/BR-0184, Washington, D.C., 1997.

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29 U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement*
30 *for License Renewal of Nuclear Plants, Main Report*, "Section 6.3 – Transportation, Table 9.1,
31 Summary of findings on NEPA issues for license renewal of nuclear power plants, Final
32 Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C., 1999.

33
34 U.S. Nuclear Regulatory Commission (NRC). 2003. Note to File from Richard Emch, U.S.
35 NRC. Docket Information in Support of the Staff's Review of the H. B. Robinson, Unit 2 License
36 Renewal Application, April 15, 2003.

6.0 Environmental Impacts of the Uranium Fuel Cycle and Solid Waste Management

Environmental issues associated with the uranium fuel cycle and solid waste management 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 issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues were 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 [HLW] 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 likely not 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 that are related to the uranium fuel cycle and solid waste management during the license-renewal term that are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, and are applicable to the H.B. Robinson Steam Electric Plant, Unit No. 2 (RNP). The generic potential impacts of the radiological and nonradiological environmental impacts of the uranium fuel cycle and transportation of nuclear fuel and wastes are described in detail in the GEIS based, in part, on the generic impacts provided in 10 CFR

(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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1 51.51(b), Table S-3, "Table of Uranium Fuel Cycle Environmental Data," and in 10 CFR
2 51.52(c), Table S-4, "Environmental Impact of Transportation of Fuel and Waste to and from
3 One Light-Water-Cooled Nuclear Power Reactor." The staff also addresses the impacts from
4 radon-222 and technetium-99 in the GEIS.
5

6.1 The Uranium Fuel Cycle

6
7
8 Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to
9 RNP from the uranium fuel cycle and solid waste management are listed in Table 6-1.
10

11 **Table 6-1. Category 1 Issues Applicable to the Uranium Fuel Cycle and Solid Waste**
12 **Management During the Renewal Term**
13

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
URANIUM FUEL CYCLE AND WASTE MANAGEMENT	
Offsite radiological impacts (individual effects from other than the disposal of spent fuel and HLW)	6.1; 6.2.1; 6.2.2.1; 6.2.2.3; 6.2.3; 6.2.4; 6.6
Offsite radiological impacts (collective effects)	6.1; 6.2.2.1; 6.2.3; 6.2.4; 6.6
Offsite radiological impacts (spent fuel and HLW disposal)	6.1; 6.2.2.1; 6.2.3; 6.2.4; 6.6
Nonradiological impacts of the uranium fuel cycle	6.1; 6.2.2.6; 6.2.2.7; 6.2.2.8; 6.2.2.9; 6.2.3; 6.2.4; 6.6
Low-level waste (LLW) storage and disposal	6.1; 6.2.2.2; 6.4.2; 6.4.3; 6.4.3.1; 6.4.3.2; 6.4.3.3; 6.4.4; 6.4.4.1; 6.4.4.2; 6.4.4.3; 6.4.4.4; 6.4.4.5; 6.4.4.5.1; 6.4.4.5.2; 6.4.4.5.3; 6.4.4.5.4; 6.4.4.6; 6.6
Mixed waste storage and disposal	6.4.5.1; 6.4.5.2; 6.4.5.3; 6.4.5.4; 6.4.5.5; 6.4.5.6; 6.4.5.6.1; 6.4.5.6.2; 6.4.5.6.3; 6.4.5.6.4; 6.6
Onsite spent fuel	6.1; 6.4.6; 6.4.6.1; 6.4.6.2; 6.4.6.3; 6.4.6.4; 6.4.6.5; 6.4.6.6; 6.4.6.7; 6.6
Nonradiological waste	6.1; 6.5; 6.5.1; 6.5.2; 6.5.3; 6.6
Transportation	6.1; 6.3.1; 6.3.2.3; 6.3.3; 6.3.4; 6.6, Addendum 1

1 Carolina Power and Light Company (CP&L) stated in its Environmental Report (ER) (CP&L
2 2002) that it is not aware of any new and significant information associated with the renewal of
3 the RNP operating license (OL). The staff has not identified any significant new information
4 during its independent review of the RNP ER, the staff's site visit, the scoping process, or its
5 evaluation of other available information. Therefore, the staff concludes that there are no
6 impacts related to these issues beyond those discussed in the GEIS. For these issues, the
7 staff concluded in the GEIS that the impacts are SMALL except for the collective offsite
8 radiological impacts from the fuel cycle and from HLW and spent fuel disposal, as discussed
9 below, and that additional plant-specific mitigation measures are not likely to be sufficiently
10 beneficial to be warranted.

11
12 A brief description of the staff review and the GEIS conclusions, as codified in Table B-1,
13 10 CFR Part 51, for each of these issues follows:

- 14
15 • Offsite radiological impacts (individual effects from other than the disposal of spent fuel
16 and HLW). Based on information in the GEIS, the Commission found that

17
18 Off-site impacts of the uranium fuel cycle have been considered by the
19 Commission in Table S-3 of this part [10 CFR 51.51(b)]. Based on information
20 in the GEIS, impacts on individuals from radioactive gaseous and liquid releases
21 including radon-222 and technetium-99 are small.

22
23 The staff has not identified any new and significant information during its independent
24 review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other
25 available information. Therefore, the staff concludes that there are no offsite radiological
26 impacts of the uranium fuel cycle during the renewal term beyond those discussed in the
27 GEIS.

- 28
29 • Offsite radiological impacts (collective effects). In the GEIS, the staff concluded that

30
31 The 100 year environmental dose commitment to the U.S. population from the
32 fuel cycle, high level waste and spent fuel disposal excepted, is calculated to be
33 about 14,800 person rem [148 person Sv], or 12 cancer fatalities, for each
34 additional 20-year power reactor operating term. Much of this, especially the
35 contribution of radon releases from mines and tailing piles, consists of tiny doses
36 summed over large populations. This same dose calculation can theoretically be
37 extended to include many tiny doses over additional thousands of years as well
38 as doses outside the U. S. The result of such a calculation would be thousands
39 of cancer fatalities from the fuel cycle, but this result assumes that even tiny
40 doses have some statistical adverse health effect which will not ever be
41 mitigated (for example no cancer cure in the next thousand years), and that
42 these doses projected over thousands of years are meaningful. However, these

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1 assumptions are questionable. In particular, science cannot rule out the
2 possibility that there will be no cancer fatalities from these tiny doses. For
3 perspective, the doses are very small fractions of regulatory limits, and even
4 smaller fractions of natural background exposure to the same populations.
5

6 Nevertheless, despite all the uncertainty, some judgement as to the regulatory
7 NEPA [National Environmental Policy Act] implications of these matters should
8 be made and it makes no sense to repeat the same judgement in every case.
9 Even taking the uncertainties into account, the Commission concludes that these
10 impacts are acceptable in that these impacts would not be sufficiently large to
11 require the NEPA conclusion, for any plant, that the option of extended operation
12 under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission
13 has not assigned a single level of significance for the collective effects of the fuel
14 cycle, this issue is considered Category 1.
15

16 The staff has not identified any new and significant information during its independent review of
17 the RNP ER, the staff's site visit, the scoping process, or its evaluation of other available
18 information. Therefore, the staff concludes that there are no offsite radiological impacts
19 (collective effects) from the uranium fuel cycle during the renewal term beyond those discussed
20 in the GEIS.
21

- 22 • Offsite radiological impacts (spent fuel and HLW disposal). Based on information in the
23 GEIS, the Commission found that
24

25 For the high level waste and spent fuel disposal component of the fuel cycle,
26 there are no current regulatory limits for offsite releases of radionuclides for the
27 current candidate repository site. However, if we assume that limits are
28 developed along the lines of the 1995 National Academy of Sciences (NAS)
29 report, "Technical Bases for Yucca Mountain Standards," and that in accordance
30 with the Commission's Waste Confidence Decision, 10 CFR 51.23, a repository
31 can and likely will be developed at some site which will comply with such limits,
32 peak doses to virtually all individuals will be 100 millirem [1 mSv] per year or
33 less. However, while the Commission has reasonable confidence that these
34 assumptions will prove correct, there is considerable uncertainty since the limits
35 are yet to be developed, no repository application has been completed or
36 reviewed, and uncertainty is inherent in the models used to evaluate possible
37 pathways to the human environment. The NAS report indicated that 100 millirem
38 [1 mSv] per year should be considered as a starting point for limits for individual

1 doses, but notes that some measure of consensus exists among national and
2 international bodies that the limits should be a fraction of the 100 millirem [1
3 mSv] per year. The lifetime individual risk from 100 millirem [1 mSv] annual dose
4 limit is about 3×10^{-3} .

5
6 Estimating cumulative doses to populations over thousands of years is more
7 problematic. The likelihood and consequences of events that could seriously
8 compromise the integrity of a deep geologic repository were evaluated by the
9 Department of Energy in the "Final Environmental Impact Statement:
10 Management of Commercially Generated Radioactive Waste," October 1980
11 [DOE 1980]. The evaluation estimated the 70-year whole-body dose
12 commitment to the maximum individual and to the regional population resulting
13 from several modes of breaching a reference repository in the year of closure,
14 after 1,000 years, after 100,000 years, and after 100,000,000 years. Subse-
15 quently, the NRC and other federal agencies have expended considerable effort
16 to develop models for the design and for the licensing of a high level waste
17 repository, especially for the candidate repository at Yucca Mountain. More
18 meaningful estimates of doses to population may be possible in the future as
19 more is understood about the performance of the proposed Yucca Mountain
20 repository. Such estimates would involve very great uncertainty, especially with
21 respect to cumulative population doses over thousands of years. The standard
22 proposed by the NAS is a limit on maximum individual dose. The relationship of
23 potential new regulatory requirements, based on the NAS report, and cumulative
24 population impacts has not been determined, although the report articulates the
25 view that protection of individuals will adequately protect the population for a
26 repository at Yucca Mountain. However, EPA's generic repository standards in
27 40 CFR part 191 generally provide an indication of the order of magnitude of
28 cumulative risk to population that could result from the licensing of a Yucca
29 Mountain repository, assuming the ultimate standards will be within the range of
30 standards now under consideration. The standards in 40 CFR part 191 protect
31 the population by imposing "containment requirements" that limit the cumulative
32 amount of radioactive material released over 10,000 years. Reporting
33 performance standards that will be required by EPA are expected to result in
34 releases and associated health consequences in the range between 10 and
35 100 premature cancer deaths with an upper limit of 1,000 premature cancer
36 deaths world-wide for a 100,000 metric tonne (MTHM) repository.

37
38 Nevertheless, despite all the uncertainty, some judgement as to the regulatory
39 NEPA implications of these matters should be made and it makes no sense to
40 repeat the same judgement in every case. Even taking the uncertainties into
41 account, the Commission concludes that these impacts are acceptable in that
42 these impacts would not be sufficiently large to require the NEPA conclusion, for

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1 any plant, that the option of extended operation under 10 CFR part 54 should be
2 eliminated. Accordingly, while the Commission has not assigned a single level of
3 significance for the impacts of spent fuel and high level waste disposal, this issue
4 is considered Category 1.
5

6 Since the GEIS was originally issued in 1996, the EPA has published radiation protection
7 standards for Yucca Mountain, Nevada, at 40 CFR Part 197, "Public Health and
8 Environmental Radiation Protection Standards for Yucca Mountain, Nevada," on June 13,
9 2001 (66 FR 32132). The Energy Policy Act of 1992 (42 USC 10101, et seq.) directs that
10 the NRC adopt these standards into its regulations for reviewing and licensing the
11 repository. The Commission published its regulations at 10 CFR Part 63, "Disposal of High-
12 Level Radioactive Waste in a Geologic Repository at Yucca Mountain, Nevada," on
13 November 2, 2001 (66 FR 55792). These standards include the following: (1) 0.15
14 mSv/year (15 mrem/year) dose limit for members of the public during the storage period
15 prior to repository closure, (2) 0.15 mSv/year (15 mrem/year) dose limit for the reasonably
16 maximally exposed individual for 10,000 years following disposal, (3) 0.15 mSv/year
17 (15 mrem/year) dose limit for the reasonably maximally exposed individual as a result of a
18 human intrusion at or before 10,000 years after disposal, and (4) a groundwater protection
19 standard that states for 10,000 years of undisturbed performance after disposal,
20 radioactivity in a representative volume of groundwater will not exceed (a) 0.2 Bq/L (5 pCi/L)
21 (radium-226 and radium-228), (b) 0.56 Bq/L (15 pCi/L) (gross alpha activity), and (c) 0.04
22 mSv/year (4 mrem/year) to the whole body or any organ (from combined beta and photon
23 emitting radionuclides.
24

25 On February 15, 2002, subsequent to the receipt of a recommendation by the Secretary,
26 Department of Energy, the President recommended the Yucca Mountain site for the
27 development of a repository for the geologic disposal of spent nuclear fuel and high-level
28 nuclear waste. The U.S. Congress approved this recommendation on July 9, 2002. On
29 July 23, 2002, the President signed into law House Joint Resolution 87 designating Yucca
30 Mountain as the repository for spent nuclear waste. This development does not represent
31 new and significant information with respect to the offsite radiological impacts related to
32 spent fuel and HLW disposal during the renewal term.
33

34 The staff has not identified any new and significant information during its independent
35 review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other
36 available information. Therefore, the staff concludes that there are no offsite radiological
37 impacts related to spent fuel and HLW disposal during the renewal term beyond those
38 discussed in the GEIS.
39

- 1 • Nonradiological impacts of the uranium fuel cycle. Based on information in the GEIS,
2 the Commission found that

3
4 The nonradiological impacts of the uranium fuel cycle resulting from the renewal
5 of an operating license for any plant are found to be small.

6
7 The staff has not identified any new and significant information during its independent
8 review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other
9 available information. Therefore, the staff concludes that there are no nonradiological
10 impacts of the uranium fuel cycle during the renewal term beyond those discussed in the
11 GEIS.

- 12
13 • Low-level waste storage and disposal. Based on information in the GEIS, the
14 Commission found that

15
16 The comprehensive regulatory controls that are in place and the low public
17 doses being achieved at reactors ensure that the radiological impacts to the
18 environment will remain small during the term of a renewed license. The
19 maximum additional on-site land that may be required for low-level waste
20 storage during the term of a renewed license and associated impacts will be
21 small. Nonradiological impacts on air and water will be negligible. The
22 radiological and nonradiological environmental impacts of long-term disposal of
23 low-level waste from any individual plant at licensed sites are small. In addition,
24 the Commission concludes that there is reasonable assurance that sufficient low-
25 level waste disposal capacity will be made available when needed for facilities to
26 be decommissioned consistent with NRC decommissioning requirements.

27
28 The staff has not identified any new and significant information during its independent
29 review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other
30 available information. Therefore, the staff concludes that there are no impacts of LLW
31 storage and disposal associated with the renewal term beyond those discussed in the GEIS.

- 32
33 • Mixed waste storage and disposal. Based on information in the GEIS, the Commission
34 found that

35
36 The comprehensive regulatory controls and the facilities and procedures that are
37 in place ensure proper handling and storage, as well as negligible doses and
38 exposure to toxic materials for the public and the environment at all plants.
39 License renewal will not increase the small, continuing risk to human health and
40 the environment posed by mixed waste at all plants. The radiological and
41 nonradiological environmental impacts of long-term disposal of mixed waste from
42 any individual plant at licensed sites are small. In addition, the Commission

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1 concludes that there is reasonable assurance that sufficient mixed waste
2 disposal capacity will be made available when needed for facilities to be
3 decommissioned consistent with NRC decommissioning requirements.
4

5 The staff has not identified any new and significant information during its independent
6 review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other
7 available information. Therefore, the staff concludes that there are no impacts of mixed
8 waste storage and disposal associated with the renewal term beyond those discussed in the
9 GEIS.

- 10
- 11 • Onsite spent fuel. Based on information in the GEIS, the Commission found that

12

13 The expected increase in the volume of spent fuel from an additional 20 years of
14 operation can be safely accommodated on site with small environmental effects
15 through dry or pool storage at all plants if a permanent repository or monitored
16 retrievable storage is not available.
17

18 The staff has not identified any new and significant information during its independent
19 review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other
20 available information. Therefore, the staff concludes that there are no impacts of onsite
21 spent fuel associated with license renewal beyond those discussed in the GEIS.
22

- 23 • Nonradiological waste. Based on information in the GEIS, the Commission found that

24

25 No changes to generating systems are anticipated for license renewal. Facilities
26 and procedures are in place to ensure continued proper handling and disposal at
27 all plants.
28

29 The staff has not identified any new and significant information during its independent
30 review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other
31 available information. Therefore, the staff concludes that there are no nonradiological
32 waste impacts during the renewal term beyond those discussed in the GEIS.
33

- 34 • Transportation. Based on information contained in the GEIS, the Commission found
35 that

36

37 The impacts of transporting spent fuel enriched up to 5 percent uranium-235 with
38 average burnup for the peak rod to current levels approved by NRC up to
39 62,000 MWd/MTU and the cumulative impacts of transporting high-level waste to
40 a single repository, such as Yucca Mountain, Nevada are found to be consistent

1 with the impact values contained in 10 CFR 51.52(c), Summary Table S-4-
2 Environmental Impact of Transportation of Fuel and Waste to and from One
3 Light-Water-Cooled Nuclear Power Reactor. If fuel enrichment or burnup
4 conditions are not met, the applicant must submit an assessment of the
5 implications for the environmental impact values reported in § 51.52.
6

7 RNP meets the fuel-enrichment and burnup conditions set forth in Addendum 1 to the GEIS.
8 The staff has not identified any new and significant information during its independent
9 review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other
10 available information. Therefore, the staff concludes that there are no impacts of
11 transportation associated with license renewal beyond those discussed in the GEIS.
12

13 There are no Category 2 issues for the uranium fuel cycle and solid waste management.
14

15 6.2 References

16
17 10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental
18 Protection Regulations for Domestic Licensing and Related Regulatory Functions."
19

20 10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for
21 Renewal of Operating Licenses for Nuclear Power Plants."
22

23 10 CFR Part 63. Code of Federal Regulations, Title 10, *Energy*, Part 63, "Disposal of High-
24 Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada."
25

26 40 CFR Part 191. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 191,
27 "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear
28 Fuel, High-Level and Transuranic Radioactive Waste."
29

30 40 CFR Part 197. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 197,
31 "Public Health and Environmental Radiation Protection Standards for Management and
32 Disposal at Yucca Mountain, Nevada."
33

34 66 FR 32132. "Public Health and Environmental Radiation Protection Standards for Yucca,
35 Mountain, Nevada." *Federal Register*. Vol. 66, No. 114. June 13, 2001.
36

37 66 FR 55792. "Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository
38 at Yucca Mountain, Nevada." *Federal Register*. Vol. 66, No. 213. November 2, 2001.
39

40 Energy Policy Act of 1992. 42 USC 10101, et seq.
41

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- 1 Carolina Power and Light Company (CP&L). 2002. *Applicant's Environmental Report –*
2 *Operating License Renewal Stage, H.B. Robinson Steam Electric Plant, Unit No. 2.* Docket No.
3 50-261, License No. DPR, Hartsville, South Carolina.
4
- 5 National Academy of Sciences (NAS). 1995. *Technical Bases for Yucca Mountain Standards.*
6 Washington, D.C.
7
- 8 National Environmental Protection Act (NEPA) of 1969. 42 USC 4123, et seq.
9
- 10 U.S. Department of Energy (DOE). 1980. *Final Environmental Impact Statement:*
11 *Management of Commercially Generated Radioactive Waste.* DOE/EIS-0046F,
12 Washington, D.C.
13
- 14 U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement*
15 *for License Renewal of Nuclear Plants.* NUREG-1437, Volumes 1 and 2, Washington, D.C.
16
- 17 U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement*
18 *for License Renewal of Nuclear Plants Main Report, "Section 6.3 – Transportation, Table 9.1,*
19 *Summary of findings on NEPA issues for license renewal of nuclear power plants, Final*
20 *Report."* NUREG-1437, Volume 1, Addendum 1, Washington, D.C.
21
22

7.0 Environmental Impacts of Decommissioning

Environmental issues associated with decommissioning, which result from continued plant operation 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 issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues were 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 likely not 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. There are no Category 2 issues related to decommissioning.

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to the decommissioning of the H.B. Robinson Steam Electric Plant, Unit No. 2 (RNP), following the renewal term are listed in Table 7-1. Carolina Power and Light Company (CP&L) stated in its Environmental Report (ER) (CP&L 2002) that it is aware of no new and significant information regarding the environmental impacts of RNP license renewal. The staff has not identified any significant new information during its independent review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in

(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.

Environmental Impacts of Decommissioning

the GEIS. For all of these issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 7-1. Category 1 Issues Applicable to the Decommissioning of RNP Following the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
DECOMMISSIONING	
Radiation Doses	7.3.1; 7.4
Waste Management	7.3.2; 7.4
Air Quality	7.3.3; 7.4
Water Quality	7.3.4; 7.4
Ecological Resources	7.3.5; 7.4
Socioeconomic Impacts	7.3.7; 7.4

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

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

Doses to the public will be well below applicable regulatory standards regardless of which decommissioning method is used. Occupational doses would increase no more than 1 man-rem [0.01 person-Sv] caused by buildup of long-lived radionuclides during the license renewal term.

The staff has not identified any new and significant information during its independent review of the RNP ER, the staff’s site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no radiation doses associated with decommissioning following license-renewal beyond those discussed in the GEIS.

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

Decommissioning at the end of a 20-year license renewal period would generate no more solid wastes than at the end of the current license term. No increase in the quantities of Class C or greater than Class C wastes would be expected.

Environmental Impacts of Decommissioning

1 The staff has not identified any new and significant information during its independent
2 review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other
3 available information. Therefore, the staff concludes that there are no impacts of solid
4 waste associated with decommissioning following the license renewal term beyond those
5 discussed in the GEIS.

- 6 • Air quality. Based on information in the GEIS, the Commission found that

7
8 Air quality impacts of decommissioning are expected to be negligible either at
9 the end of the current operating term or at the end of the license renewal term.

10
11 The staff has not identified any new and significant information during its independent
12 review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other
13 available information. Therefore, the staff concludes that there are no impacts of license-
14 renewal on air quality during decommissioning beyond those discussed in the GEIS.

- 15 • Water quality. Based on information in the GEIS, the Commission found that

16
17 The potential for significant water quality impacts from erosion or spills is no
18 greater whether decommissioning occurs after a 20-year license renewal period
19 or after the original 40-year operation period, and measures are readily available
20 to avoid such impacts.

21
22 The staff has not identified any new and significant information during its independent
23 review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other
24 available information. Therefore, the staff concludes that there are no impacts of the
25 license-renewal term on water quality during decommissioning beyond those discussed in
26 the GEIS.

- 27 • Ecological resources. Based on information in the GEIS, the Commission found that

28
29 Decommissioning after either the initial operating period or after a 20-year
30 license renewal period is not expected to have any direct ecological impacts.

31
32 The staff has not identified any new and significant information during its independent
33 review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other
34 available information. Therefore, the staff concludes that there are no impacts of the
35 license-renewal term on ecological resources during decommissioning beyond those
36 discussed in the GEIS.

Environmental Impacts of Decommissioning

- 1 • Socioeconomic Impacts. Based on information in the GEIS, the Commission found that
2
3 Decommissioning would have some short-term socioeconomic impacts. The
4 impacts would not be increased by delaying decommissioning until the end of a
5 20-year relicensing period, but they might be decreased by population and
6 economic growth.
7

8 The staff has not identified any new and significant information during its independent
9 review of the RNP ER, the staff's site visit, the scoping process, or its evaluation of other
10 available information. Therefore, the staff concludes that there are no impacts of license-
11 renewal on the socioeconomic impacts of decommissioning beyond those discussed in the
12 GEIS.
13

14 7.1 References

15
16 10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental
17 Protection Regulations for Domestic Licensing and Related Regulatory Functions."
18

19 Carolina Power and Light Company (CP&L). 2002. *Applicant's Environmental Report –*
20 *Operating License Renewal Stage, H.B. Robinson Steam Electric Plant, Hartsville,*
21 *South Carolina.*
22

23 U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement*
24 *for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C.
25

26 U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement*
27 *for License Renewal of Nuclear Plants Main Report*, "Section 6.3 – Transportation, Table 9.1,
28 Summary of findings on NEPA issues for license renewal of nuclear power plants, Final
29 Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C.
30
31