NUREG-1437
Supplement 13

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 13

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

Final Report

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Abstract

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

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

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

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

The NRC staff's recommendation 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 Environmental Report submitted by CP&L; (3) consultation with 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.

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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 Plant*s (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. 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.

A draft SEIS was published for comment in May 2003. The staff held two public meetings in Hartsville, South Carolina, on June 25, 2003, to describe the results of the NRC environmental review and to answer questions in order to provide members of the public with information to assist them in formulating their comments on the draft SEIS. All of the comments received on the draft SEIS were considered by the staff in developing the final SEIS. These comments are addressed in Appendix A, Part II, of the SEIS.

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

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(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.

and mitigation measures for reducing or avoiding adverse effects. It also includes the staff's 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 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 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 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 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 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 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. CP&L is further evaluating these two SAMAs and has not made any commitment to implement them. NRC will further evaluate the need for implementation of these SAMAs as a current operating plant issue.

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 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.

Abbreviations/Acronyms

μCi	microcurie(s)
μCi/ml	microcuries per milliliter
μGy	microgray(s)
μm	micrometer(s)
μSv	microsieverts
ac	acre(s)
ACC	averted cleanup and decontamination costs
ADAMS	Agencywide Document Access and Management System
AEA	Atomic Energy Act of 1954
AEC	U.S. Atomic Energy Commission
AOC	averted offsite property damage costs
AOE	averted occupational exposure
AOSC	averted onsite costs
APE	present value of averted public exposure
AQCR	air quality control region
Bq	becquerel(s)
Btu	British thermal unit(s)
°C	degree Celsius
CCW	component cooling water
CDF	core damage frequency
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
Ci	curie(s)
cm	centimeter(s)
COE	cost of enhancement
COPC	chemicals of potential concern
CP&L	Carolina Power and Light Company
CVCS	chemical and volume control system
CWA	Clean Water Act
DBA	design-basis accident(s)
DOE	U.S. Department of Energy
DPR	demonstration project reactor
DSM	demand-side management
EIA	Energy Information Administration (of DOE)

EIS	environmental impact statement
ELF-EMF	extremely low frequency-electromagnetic field
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EQ	equipment qualification
ER	Environmental Report
ESA	Endangered Species Act
ESRP	Environmental Standard Review Plan, NUREG-1555, Supplement 1, Operating License Renewal
°F	degree Fahrenheit
FAA	U.S. Federal Aviation Administration
FES	final environmental statement
FR	Federal Register
FSAR	Final Safety Analysis Report
ft	foot/feet
FWPCA	Federal Water Pollution Control Act (also known as the Clean Water Act of 1977)
FWS	U.S. Fish and Wildlife Service
g/d	gallons per day
gal	gallon
GDC	general design criteria
GEIS	Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437
GIS	geographic information system
GL	Generic Letter
gpm	gallons per minute
GWPS	gaseous water processing system
ha	hectare(s)
HCLPF	high confidence of low probability of failure
HLW	high-level waste
hr	hour(s)
Hz	hertz
HIC	high-integrity container
IEEE	Institute of Electrical and Electronics Engineers, Inc.
in.	inch(es)
IPA	integrated plant assessment
IPE	individual plant examination

IPEEE	individual plant examination of external events
ISFSI	independent spent fuel storage installation
ISLOCA	interfacing systems loss-of-coolant accident
J	joule(s)
kg	kilogram(s)
km	kilometer(s)
kV	kilovolt(s)
kV/m	kilovolt per meter
kWh	kilowatt hour(s)
L	liter(s)
L/s	liters per second
lb	pound
LERF	large early release frequency
LLW	low-level waste
LNG	liquefied natural gas
LOCA	loss-of-coolant accident
LOOP	loss of offsite power
LWR	light-water reactor
m	meter(s)
m/s	meter(s) per second
m^3/d	cubic meters per day
m^3/s	cubic meter(s) per second
mA	milliampere(s)
MAB	maximum attainable benefit
MACCS2	MELCOR Accident Consequence Code System 2
MCC	motor control center
MGD	million gallons per day
mGy	milligray(s)
mi	mile(s)
mL	milliliter(s)
MOVs	motor-operated valves
mph	miles per hour
mrad	millirad(s)
mrem	millirem(s)
MSIV	main steam isolation valve
msl	mean sea level
mSv	millisievert(s)

MT	metric ton(s) (or tonne[s])
MTU	metric ton(s)-uranium
MW	megawatt(s)
MWd/MTU	megawatt-days per metric ton of uranium
MW(e)	megawatt(s) electric
MW(t)	megawatt(s) thermal
MWh	megawatt hour(s)
NA	not applicable
NAS	National Academy of Sciences
NCI	National Cancer Institute
NEPA	National Environmental Policy Act of 1969
NESC	National Electric Safety Code
ng/J	nanogram per joule
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NMFS	National Marine Fisheries Service, which has been renamed NOAA Fisheries
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxide(s)
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NWPPC	Northwest Power Planning Council
ODCM	Offsite Dose Calculation Manual
OL	operating license
PAME	primary amoebic meningoencephalitis
PDS	plant damage state
$PM_{2.5}$	particulate matter, 2.5 microns or less in diameter
PM_{10}	particulate matter, 10 microns or less in diameter
PORV	power-operated relief valve
ppt	parts per thousand
PRA	Probabilistic Risk Assessment
PSA	Probabilistic Safety Assessment
PSD	prevention of significant deterioration
PSW	plant service water
PWR	pressurized water reactor
RAI	request for additional information
RCP	reactor coolant pump
REMP	radiological environmental monitoring program

RHR	residual heat removal
RLE	review level earthquake
rms	root mean square
RNP	H.B. Robinson Steam Electric Plant, Unit 2
RPC	replacement-power cost
RRW	risk-reduction worth
RWST	Refueling Water Storage Tank
s	second(s)
SAMA	Severe Accident Mitigation Alternative
SAR	Safety Analysis Report
SBO	station blackout
SBLOCA	small break loss-of-coolant accident
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of National Resources
SCIAA	South Carolina Institute of Archaeology and Anthropology
SCR	selective catalytic reduction
SEIS	supplemental environmental impact statement
SER	Safety Evaluation Report
SGTR	steam generator tube rupture
SHPO	State Historic Preservation Officer
SMA	seismic margins analysis
SO_2	sulfur dioxide
SO_x	sulfur oxide(s)
SRT	seismic review team
SSEL	safe shutdown equipment list
SWPS	solid waste processing system
Sv	sievert(s), special unit of dose equivalent
TBq	terabecquerel
UFSAR	Updated Final Safety Analysis Report
U.S.	United States
USC	United States Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USGS	U.S. Geologic Survey
USI	Unresolved Safety Issue

| WHUT waste holdup tank

yr year

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 plant-specific supplement to the GEIS (the supplemental EIS [SEIS]) for the CP&L license-renewal application. This 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 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)

- GEIS environmental issues that are not applicable to RNP
- severe accident mitigation alternatives.

1.2 Background

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

1.2.1 Generic Environmental Impact Statement

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

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

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

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

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.

In the GEIS, the staff assigned a significance level to each environmental issue, assuming that ongoing mitigation measures would continue.

In the GEIS, the staff included 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 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 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 of Category 1, and therefore, additional plant-specific review for these issues is required.

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

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

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

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

The NRC prepares an independent analysis of the environmental impacts of license renewal and compares these impacts with the environmental impacts of alternatives. The evaluation of the CP&L license renewal application began with publication of a Notice of Acceptance for docketing and opportunity for a hearing in the *Federal Register* (FR) (67 FR 53626 [NRC 2002a]) on August 16, 2002. The staff published a Notice of Intent to prepare an EIS and conduct scoping (67 FR 54499 [NRC 2002b]) on August 22, 2002. Two public scoping

meetings were held on September 25, 2002, in Hartsville, South Carolina. Comments received during the 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.

The staff followed the review guidance contained in NUREG-1555, Supplement 1, in the *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 visited the RNP site on September 24 and 25, 2002, to gather information and to become familiar with the site and its environs. The staff also reviewed the comments received during scoping, and consulted with Federal, State, regional, and local agencies. A list of the organizations consulted is provided in Appendix D. Other documents related to RNP were reviewed and are referenced.

On May 14, 2003, the NRC published the Notice of Availability of the draft SEIS (68 FR 25907), beginning a 75-day comment period (NRC 2003b). During the comment period members of the public could comment on the preliminary results of the NRC staff's review. During this comment period, two public meetings were held near RNP on June 25, 2003. During these meetings, the staff described the preliminary results of the NRC environmental review and answered questions related to it to provide members of the public with information to assist them in formulating their comments. The comment period for the RNP draft SEIS ended July 30, 2003. Comments made during the 75-day comment period are presented in Part II of Appendix A. The NRC responses to these comments are also provided.

This SEIS presents the staff's analysis that considers and weighs the environmental effects of the proposed renewal of the OL for RNP, the environmental impacts of alternatives to license renewal, and mitigation measures available for avoiding adverse environmental effects. Chapter 9, "Summary and Conclusions," provides the NRC staff's recommendation to the Commission on 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.

1.3 The Proposed Federal Action

The proposed Federal action is renewal of the OL for RNP Unit 2 (as a coal-powered power plant, Robinson Unit 1 is outside the scope of this SEIS). RNP is located in northeastern South Carolina, approximately 8 km (5 mi) west-northwest of Hartsville, 88 km (55 mi) east-northeast of Columbia, and 144 km (90 mi) west of the Atlantic Ocean. RNP is a single nuclear unit equipped with a pressurized water reactor. The nuclear steam supply system is a three-loop

Westinghouse design and is rated at 2339 megawatts-thermal (MW[t]). It has a net electric generation rating of 710 megawatts-electric (MW[e]) (CP&L 2002). Plant cooling is provided by Lake Robinson, a 910-ha (2250-ac) impoundment that CP&L created by damming Black Creek. The current OL for RNP expires on July 31, 2010. By letter dated June 14, 2002, CP&L submitted an application to the NRC (CP&L 2002) to renew this OL for an additional 20 years of operation (i.e., until July 31, 2030).

1.4 The Purpose and Need for the Proposed Action

Although a licensee must have a renewed license to operate a reactor beyond the term of the existing OL, the possession of that license is just one of a number of conditions that must be met for the licensee to continue plant operation during the term of the renewed license. Once an OL is renewed, State regulatory agencies and the owners of the plant 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.

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

> 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.

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

1.5 Compliance and Consultations

CP&L is required to hold certain Federal, State, and local environmental permits, as well as meet relevant Federal and State statutory requirements. In its ER, CP&L provided a list of the authorizations from Federal, State, and local authorities for current operations as well as environmental approvals and consultations associated with RNP license renewal.

Authorizations and consultations relevant to the proposed OL renewal action are included in Appendix E.

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

1.6 References

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

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

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

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

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

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

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

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

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

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

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

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

U.S. Nuclear Regulatory Commission (NRC). 2003b. "Notice of Availability of the Draft Supplement 13 to the Generic Environmental Impact Statement and Public Meeting for the License Renewal of H.B. Robinson Steam Electric Plant, Unit 2." *Federal Register*. Vol. 68, 25907. May 14, 2003.

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 448 km^2 (173 mi^2) 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.

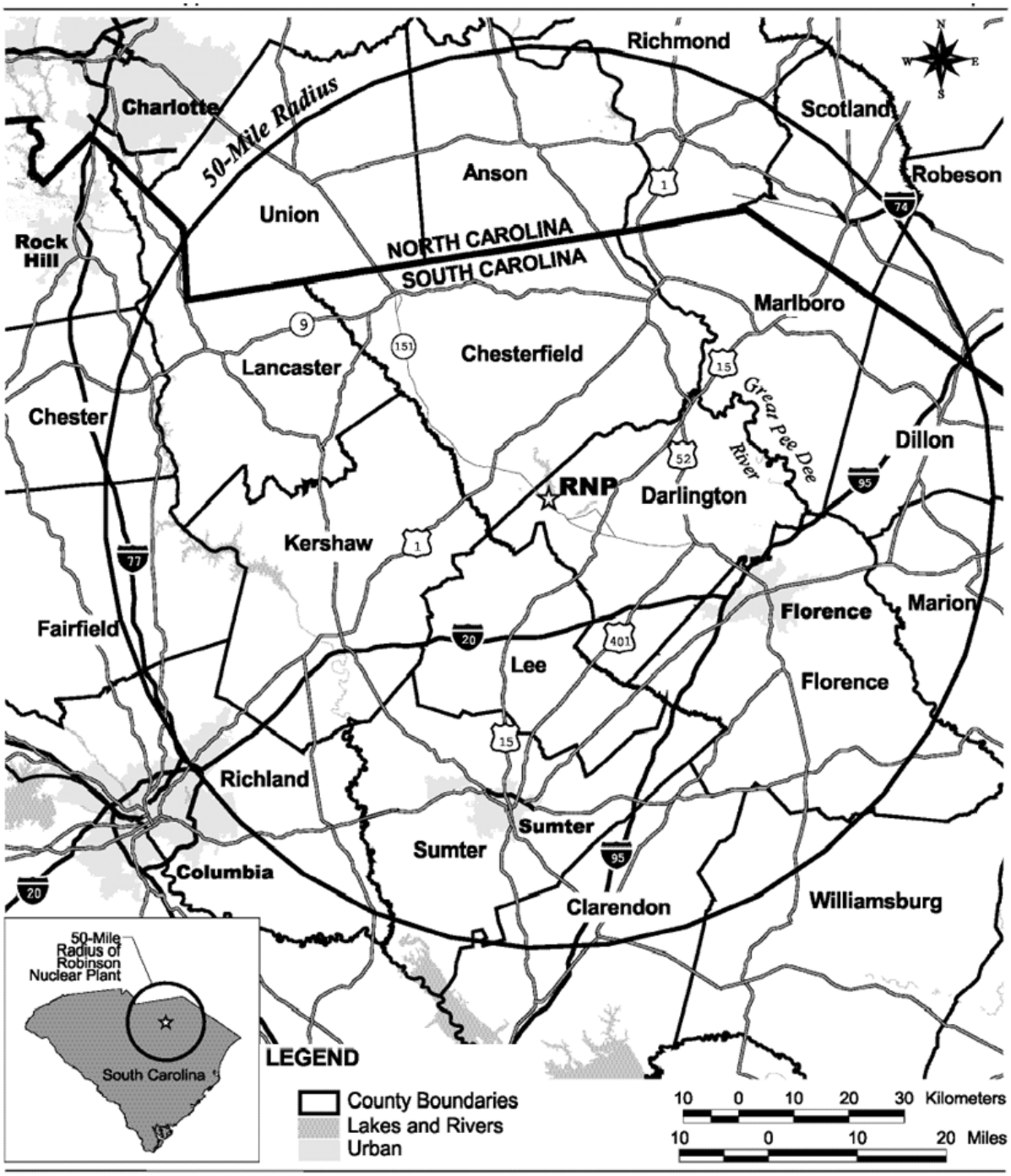

Figure 2-1. Location of RNP, 80-km (50-mi) Region

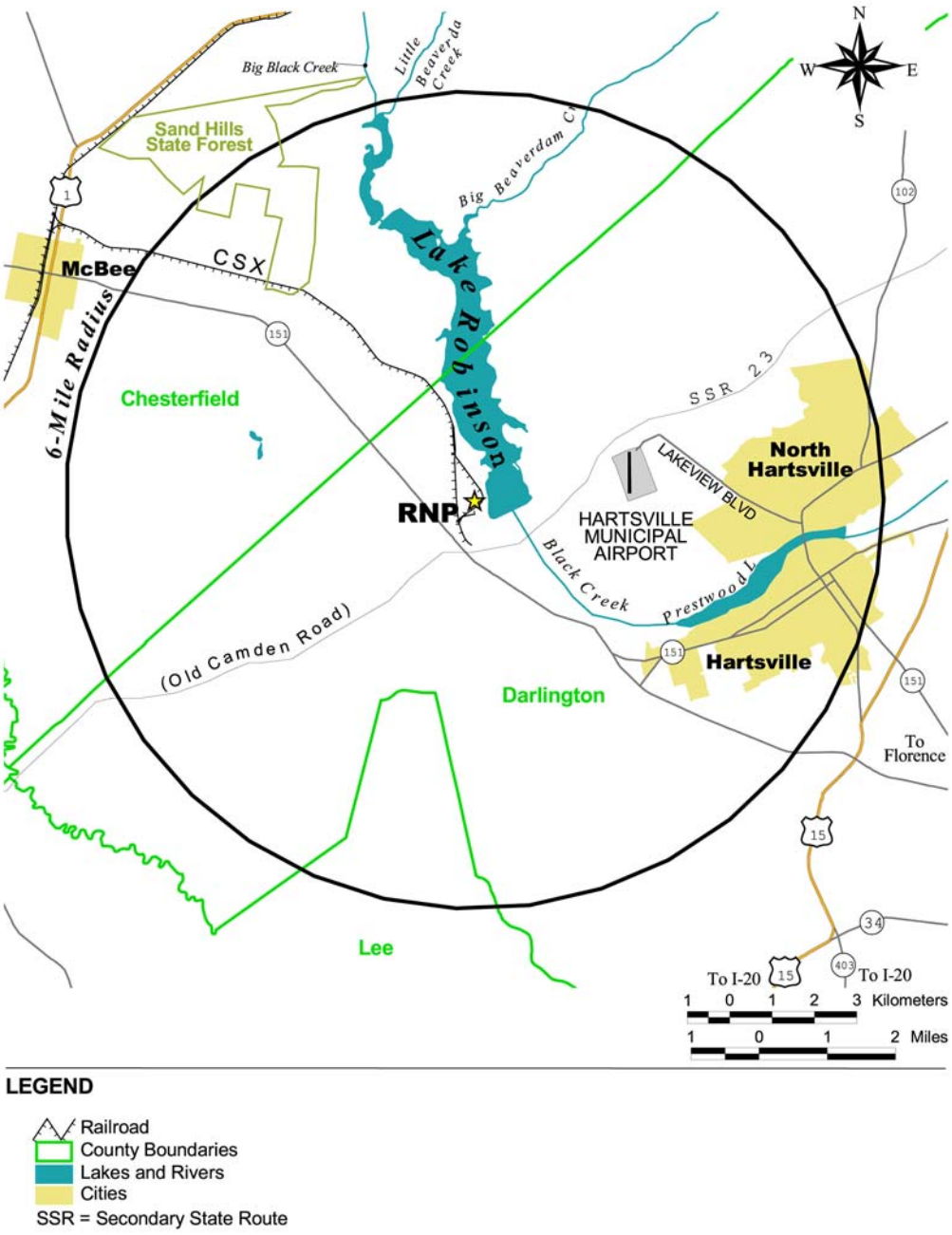

Figure 2-2. Location of RNP, 10-km (6-mi) Region

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

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

2.1.1 External Appearance and Setting

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

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

2.1.2 Reactor Systems

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

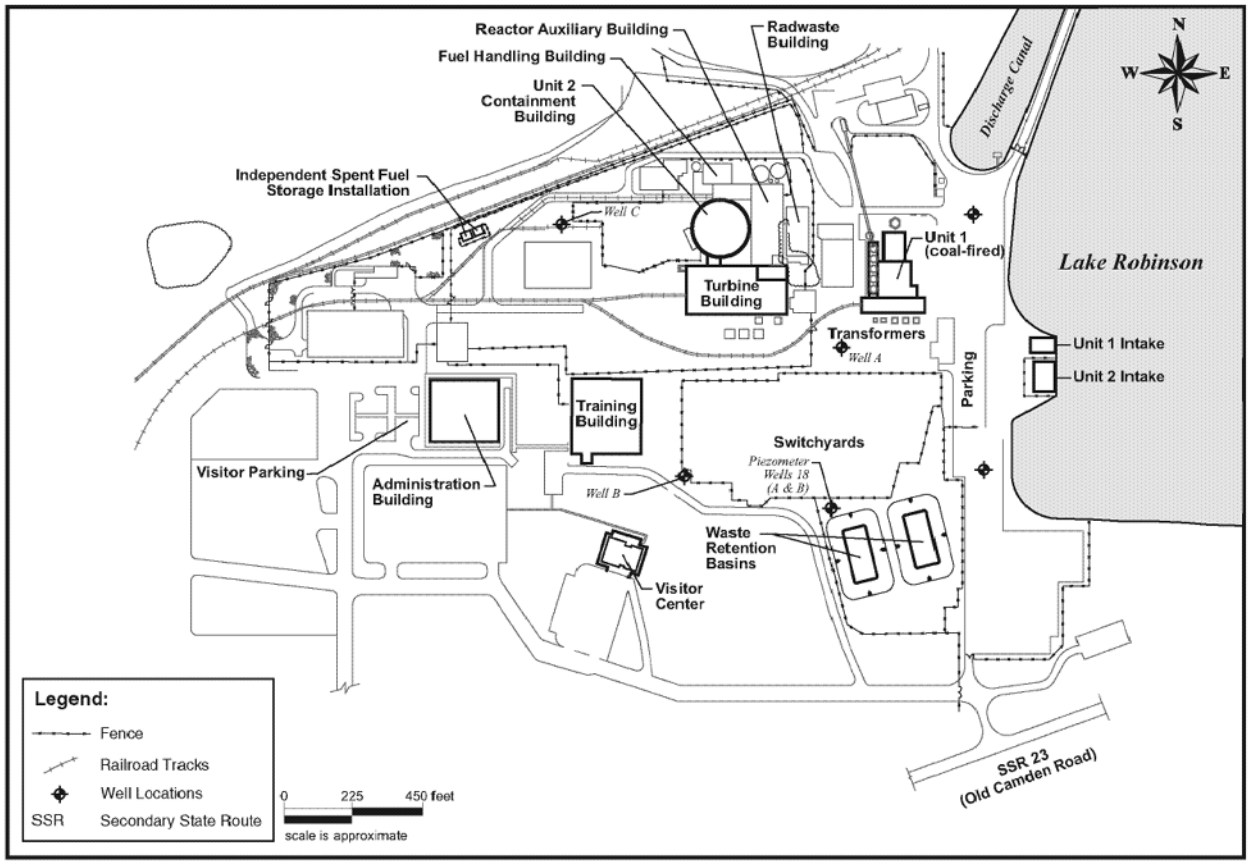

Figure 2-3. Intake Structures and Well Locations on the Robinson Site

contractor. On November 5, 2002, CP&L received approval from NRC for a maximum of 1.7 percent increase in licensed core thermal power for RNP (NRC 2002). As a result of this increase, the plant is now rated at 2339 megawatts-thermal (MW[t]) with a corresponding net electrical output of 710 MW(e). The reactor is housed within a dry, reinforced concrete, steel-lined containment structure. The unit was placed in service in 1970. RNP is licensed for a fuel that is slightly enriched uranium dioxide, up to 5.0 percent by weight of uranium-235. The plant operates with an average fuel assembly burnup of 60,000 megawatt days per metric ton uranium.

2.1.3 Cooling and Auxiliary Water Systems

RNP uses a three-loop cooling system for heat dissipation. The primary loop is a sealed system that carries heat from the reactor to the steam generators. The secondary loop, which is also sealed, carries heat from the steam generators through the turbines to the condensers.

The tertiary system carries heat from the condensers to a cooling canal that discharges to the recirculating cooling pond system, Lake Robinson. The cooling canal and Lake Robinson release heat to the environment.

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

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

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

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.

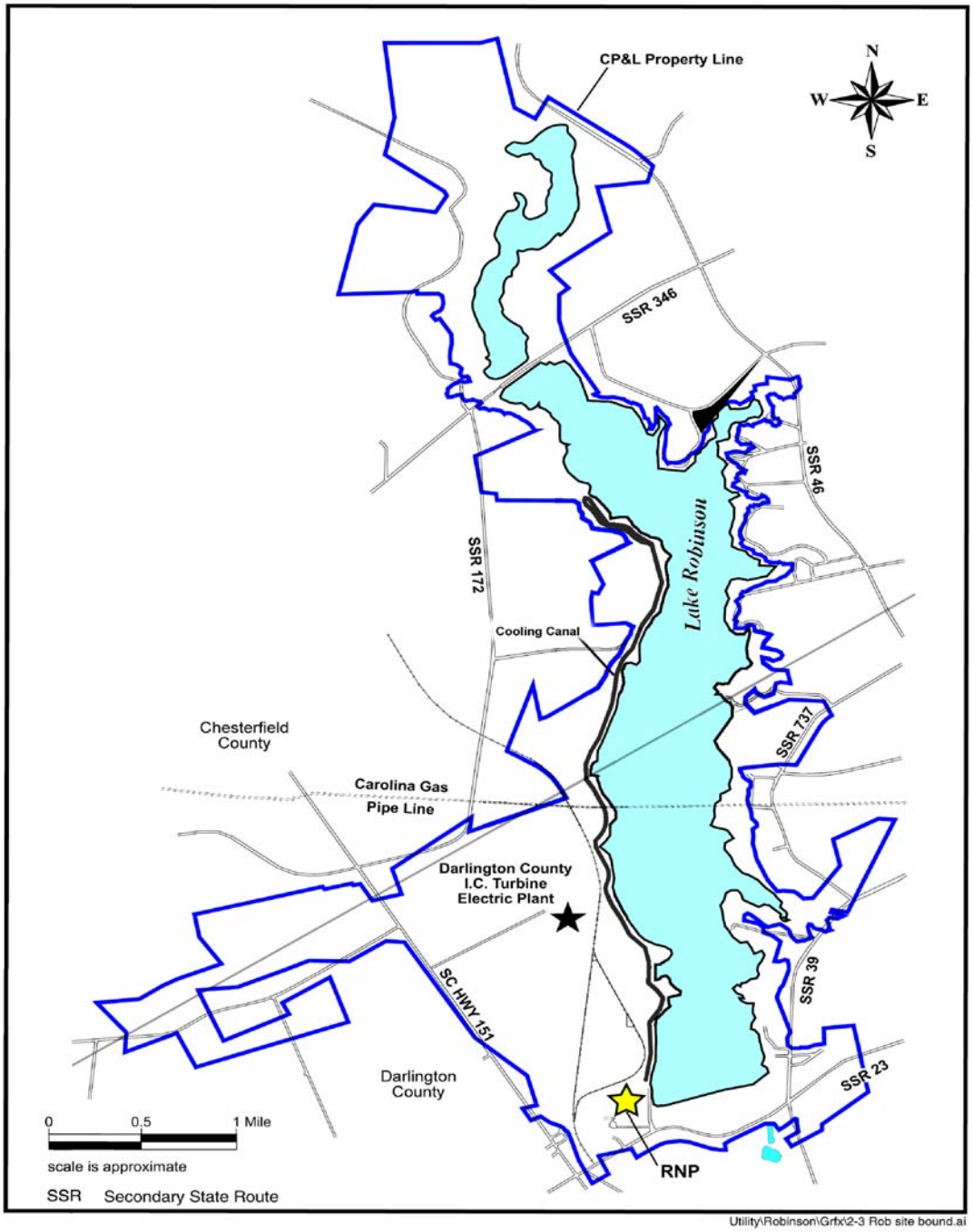

Figure 2-4. Location of RNP with Respect to Lake Robinson (CP&L 2002a)

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

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

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

On November 5, 2002, CP&L received approval from the NRC for a 1.7 percent increase in maximum thermal power. The NRC's safety evaluation supporting the approval concluded that there would be no significant increase in radiological effluents due to the 1.7 percent power increase (NRC 2002).

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

2.1.4.1 Liquid Waste Processing Systems and Effluent Controls

Radioactive liquids entering the waste disposal system are collected in sumps and tanks until the need for subsequent treatment can be determined. The waste is sampled and analyzed to determine the quantity and type of radioactivity. Before discharge, radioactive liquids are processed as necessary and then released under controlled conditions. The system design and operation is characteristically directed toward minimizing releases to unrestricted areas. Discharge streams are monitored, and safety features are incorporated to preclude releases in excess of the limits of 10 CFR Part 20. The bulk of radioactive liquids discharged from the reactor coolant system are processed and retained inside the plant by the chemical and volume

control system (CVCS) and waste water demineralization system. Processed wastes are stored until they can be shipped for offsite disposal.

The liquid waste processing system is capable of processing all wastes generated during routine continuous operation of the primary system. During normal plant operation, the waste disposal system processes liquids from the equipment drains and leakoffs, radioactive chemical laboratory drains, radioactive shower drains, decontamination area drains, and demineralizer regeneration (normally not used). The system also collects and transfers liquids from the following sources to the waste holdup tank (WHUT) or the CVCS for processing: reactor coolant loop drains, pressurizer relief tank, reactor coolant pump secondary seals, excess letdown during startup, accumulators, and reactor vessel flange leakoffs.

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

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

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

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

Batch releases occur during normal operation when the radioactivity content of each batch is verified to be in compliance with 10 CFR Part 20 requirements prior to release. During 2001, there were 98 batch releases plus continuous releases of liquid effluents with a total volume of 6.15×10^7 L (1.62×10^7 gal) prior to dilution. In this liquid waste, there was a total fission and activation product activity of 0.0026 TBq (0.070 Ci) and a total tritium activity of 12.4 TBq (336 Ci). These volumes and activities are typical of past years. The composition of the liquid waste generated is reported in the *Annual Radioactive Effluent Release Report for 2001* (CP&L 2002c). See Section 2.2.7 for a discussion of the theoretical doses to the maximally exposed individual as a result of these releases.

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

2.1.4.2 Gaseous Waste Processing Systems and Effluent Controls

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

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

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

During 2001, there were 117 batch releases of gaseous effluents. The total gaseous release of fission and activation product activity was 0.014 TBq (0.38 Ci), and the total tritium activity was 0.42 TBq (11.4 Ci). The total activity of iodine-131 was 32 kBq (0.87 μCi), and the total activity

of particulates with half-lives greater than 8 days was 300 kBq (8.2 μCi). These activities are typical of past years. The details of these radioactive gaseous releases are reported in the *Annual Radioactive Effluent Release Report for 2001* (CP&L 2002c). See Section 2.2.7 for a discussion of the theoretical doses to the maximally exposed individual as a result of these releases.

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

2.1.4.3 Solid Waste Processing

Solid radioactive waste from RNP consists of spent resin, filter cartridges, bags, and miscellaneous materials such as paper and glassware (CP&L 2000). Solid wastes are packaged in approved containers such as 0.21-m^3 (55-gal) drums, liners, high-integrity containers (HIC), and boxes, for removal to a processing or burial facility. The solid waste processing system (SWPS) is designed so that all radioactive solid waste is processed, packaged, and stored to control the discharge of effluents and offsite shipments in accordance with appropriate Federal and State standards and in compliance with 49 CFR Parts 170-179, 10 CFR Part 20, 10 CFR Part 50, and 10 CFR Part 61.

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

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

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

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

2.1.5 Nonradioactive Waste Systems

Nonradioactive solid wastes from RNP are collected and disposed of or recycled based on waste type. Hazardous waste is collected in 0.21-m^3 (55-gal) drums, transferred to a central storage facility, and shipped as small quantity waste to a disposal vendor. Storm water runoff is collected in the waste settling ponds where oil skimmers remove oil, and the water is monitored for pH and oil before being discharged to the canal. Additionally, permitted direct outfalls to Black Creek discharge storm water runoff from parking lots and exterior plant drains.

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

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

Sanitary wastes are treated in two onsite wastewater treatment plants using extended aeration, and the treated effluents are discharged to the cooling-water discharge canal in accordance with National Pollutant Discharge Elimination System (NPDES) outfall limits.

2.1.6 Plant Operation and Maintenance

Routine maintenance performed on plant systems and components is necessary for safe and reliable operation. Maintenance activities conducted at RNP include inspection, testing, and surveillance to maintain the current licensing basis of the plant and to ensure compliance with environmental and safety requirements. Certain activities can be performed while the reactor is operating, but others require that the plant be shut down. Long-term outages are scheduled for refueling and for certain types of repairs or maintenance, such as replacement of major

components. CP&L refuels RNP about every 18 months. Each outage is typically scheduled to last approximately 30 to 40 days, and about one-third of the core is replaced at each refueling. Approximately 950 to 1050 additional workers are onsite during a typical reactor outage.

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

2.1.7 Power Transmission System

Four transmission lines were constructed for the specific purpose of connecting RNP to the transmission system. The final environmental statement (FES) for RNP operation (NRC 1975) and the CP&L ER (CP&L 2002a) describe these four lines. Prior to construction of RNP, a transmission line existed between Rockingham, North Carolina, and Florence, South Carolina. In 1970, CP&L constructed two lines from RNP to the Rockingham-Florence line near Society Hill, South Carolina. At that point, CP&L tapped into the Rockingham-Florence line and connected one RNP line to each segment, creating the RNP-Society Hill portions of the RNP-Rockingham and RNP-Florence-North lines. The rights-of-way for the Rockingham, Florence-North, Sumter, and Florence-South lines range in width from 30 to 103 m (100 to 340 ft) and in length from 29 to 62 km (18 to 39 mi) and cover a total of approximately 613 ha (1517 ac). The transmission line rights-of-way are depicted in Figure 2-5. The dimensions of the rights-of-way for the lines are presented in Table 2-1 and are described below.

- Rockingham – The RNP-Society Hill portion of the RNP-Rockingham line is a 230-kilovolt (kV) line that shares the entire 29-km (18-mi) right-of-way with the RNP-Society Hill portion of the RNP-Florence-North line. The right-of-way width is 103 m (340 ft).

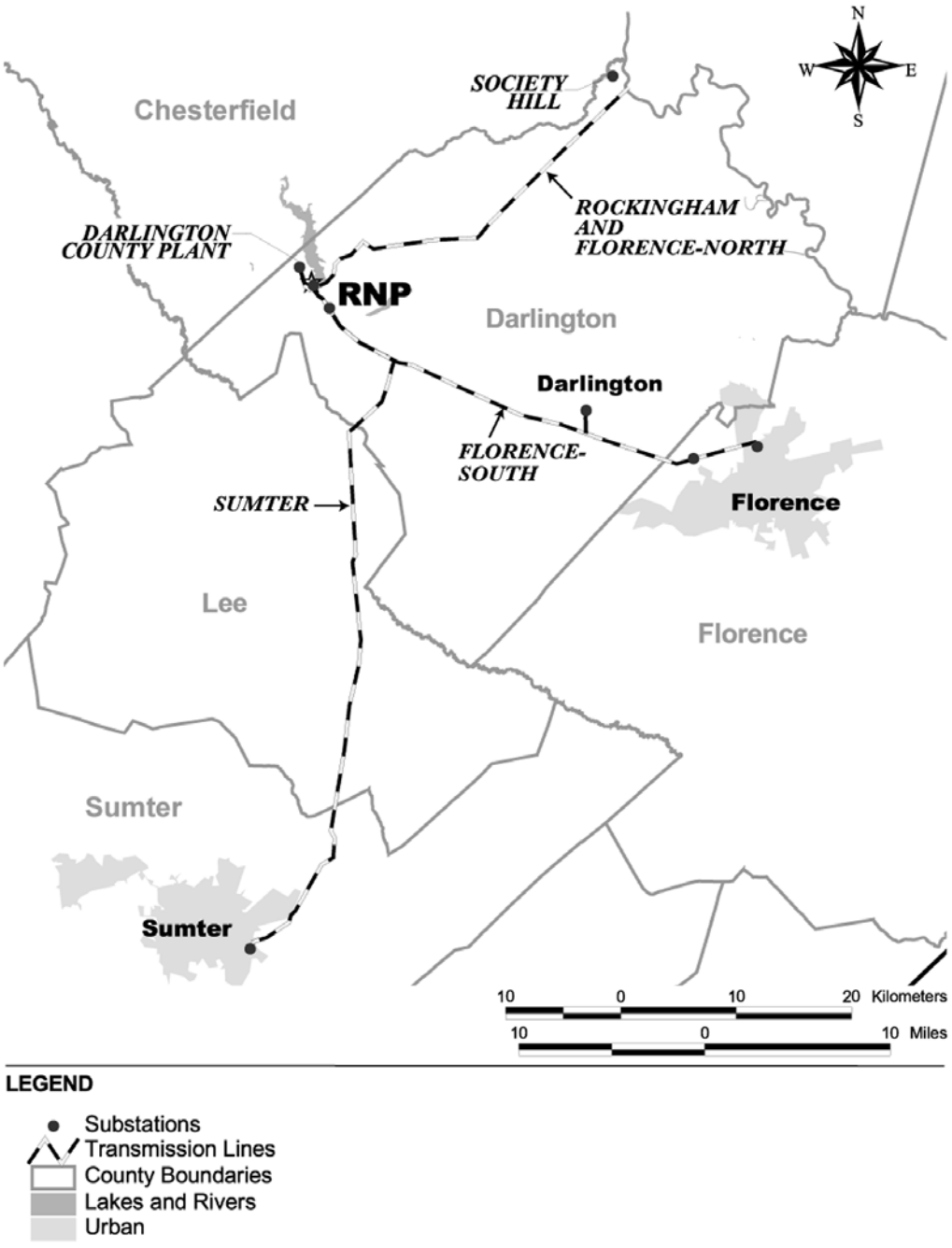

Figure 2-5. RNP Transmission Line Rights-of-Way

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

		Length		Width		Area	
Substation	**kV**	**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).

- Florence-North – The RNP-Society Hill portion of the RNP-Florence line is a 230-kV line. It shares the entire 29-km (18-mi) right-of-way with the RNP-Society Hill portion of the RNP-Rockingham line. The right-of-way width is 103 m (340 ft).

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

2.2 Plant Interaction with the Environment

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

2.2.1 Land Use

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

The total Robinson site occupies approximately 2435 ha (6020 ac), which includes 910 ha (2250 ac) Lake Robinson. In addition to Unit 2 (RNP), the Robinson plant site includes Unit 1, a coal-fired plant with a nameplate generator capacity of 206 MW, and the natural-gas and oil-fired Darlington County Internal Combustion Turbine Electric Plant, which has a generator nameplate capacity of 1046 MW (DOE/EIA 2002).

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

2.2.2 Water Use

The water-use requirements of Units 1 and 2 of the H.B. Robinson Steam Electric Plant are provided by surface water from Lake Robinson and groundwater from local wells. Lake Robinson is a 910 ha (2250 ac) impoundment with a storage capacity of 3.8×10^7 m^3 (31,000 ac-ft). Evaporation losses of water from Lake Robinson and groundwater pumping are both consumptive uses of water that reduce the water supply available regionally. The water supply infrastructure components (cooling-water system and groundwater wells) are shared by both Units 1 and 2, and therefore, the water-use impacts are also shared.

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

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

Evaporative losses can be divided into three components: natural evaporation, induced evaporation from Unit 1, and 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) report an annual reservoir evaporation for Columbia, South Carolina, of 130 cm (51 in.) with 48 percent of this annual evaporation occurring in the 4-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 4-month period of June through September making this the critical period for water use.

Five groundwater production wells supply Units 1 and 2 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.

2.2.3 Water Quality

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

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

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

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

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

2.2.4 Air Quality

The Robinson site is located in the transition zone delineating the Piedmont and Coastal Plain of South Carolina and, therefore, has a temperate climatic regime. There are relatively few breaks in the heat during the summer, which typically has about 6 days with temperatures that exceed 38°C (100°F). A majority of the annual rainfall occurs during the summer, creating some periods of high humid conditions. The Robinson site experiences an occasional entry of very cold arctic air masses during the winter. During these periods, temperatures can fall well below freezing for up to several days. Temperatures in the region of the site rarely exceed 35°C (95°F) or fall below -12°C (10°F). The best available long-term extreme temperature data for the region indicates the highest recorded temperature of 42°C (108°F) at Columbia, South Carolina, in August 1983, with the lowest reported temperature of -23°C (-9°F) at Raleigh-Durham airport in North Carolina in January 1985.

Thunderstorms occur occasionally in the site region, with a normal occurrence of about 52 per year (NOAA 2001). A vast majority of these storms occur during the months of May through September (41 of the 52). The most recent severe weather events to affect the site area in terms of strong winds and rain were associated with Hurricanes Hugo (September 1989) and Hazel (October 1954). Based on statistics for the 30 years from 1954 through 1983 (Ramsdell and Andrews 1986), on the average, only nine tornadoes are expected to occur in South Carolina during the course of a year. The probability of a tornado striking the site is expected to be about 1×10^{-4} per year.

The wind energy resource in the vicinity of the site is limited, with the annual average wind power rated as 1 on a scale of 1 to 7 (Elliott et al. 1986). Wind turbines are economical for wind power classes 4 through 7 that have average wind speeds of 5.6 to 9.4 m/s (12.5 to 21.1 mph) (DOE 2001). Areas suitable for wind turbine application (rated class 3 or higher) in South Carolina are limited to the ridges along the Blue Ridge Mountains in the extreme northwest corner of the state.

The Robinson site is located within the Florence Intrastate Air Quality Control Region (AQCR) (40 CFR 81.109). Currently, all counties in this AQCR are designated as being in attainment for all criteria pollutants (40 CFR 81.341). The site will also be subjected to a more stringent 8-hr ozone standard that was promulgated by EPA in 1997 (62 FR 38856). In 1997, EPA issued new ambient air standards for $PM_{2.5}$ (4CFR 50.7) and an 8-hr standard for ozone (40 CFR 50.10). $PM_{2.5}$ is an acronym for fine particulates with an aerodynamic diameter less than or equal to 2.5 micrometers. The 8-hr ozone standard is based on the 3-year average of the annual fourth highest daily maximum 8-hr ozone concentrations. After several years of litigation, the $PM_{2.5}$ and 8-hr ozone standards have recently been upheld. EPA is currently in the process of implementing the standards, but it has not yet designated any areas as non-attainment for either the $PM_{2.5}$ or 8-hr ozone standard. A portion of the AQCR, which includes

the Robinson site, could be at risk of being classified as non-attainment regarding ozone in the future pending implementation of a new 8-hr standard in late 2004. The State only has one area, the Cape Romain Wildlife Refuge, designated in 40 CFR 81.426 as a mandatory Class 1 Federal area in which visibility is an important value. There are more Class 1 areas located in North Carolina (40 CFR 81.422), but a vast majority are located in the region of the North Carolina-Tennessee border in the Smoky Mountains. None of these areas are located within 80 km (50 mi) of the Robinson site.

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

2.2.5 Aquatic Resources

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

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

Black Creek below the impoundment was listed in 2002 as “impaired” for aquatic life. Causes for the listings were elevated copper at a sampling site located 1.6 km (1 mi) north-northeast of Hartsville and elevated zinc at a sampling site 9 km (5.5 mi) southeast of Darlington (SCDHEC 2002b). Water bodies are listed as impaired for such pollutants if any acute aquatic life criterion is exceeded more than once in 5 years. In addition, high levels of methyl mercury in fish across eastern South Carolina have prompted fish consumption advisories (SCDHEC 2002b). Mercury, a naturally occurring metal, can be present due to air deposition from coal-burning facilities and incinerators. Advisories for Black Creek propose placing no restrictions on bluegill *(Lepomis macrochirus)*, redbreast sunfish *(L. auritus)*, or redear sunfish *(L. microlophus)*. These advisories recommend limiting largemouth bass *(Micropterus salmoides)* to one meal per week and limiting bowfin *(Amia calva)* to one meal per month. Advisories for

Lake Robinson propose no restrictions on bluegill or redear sunfish, limiting largemouth bass to one meal per month, and suggest that people do not eat any bowfin.

Fish commonly observed in Lake Robinson include a variety of minnows, suckers, catfish, sunfish, and perch. This is typical of other blackwater lakes in South Carolina and North Carolina (CP&L 1976). Fifty-five fish species were captured in Lake Robinson using a variety of methods (electrofishing, rotenone, fyke nets) during CP&L studies conducted between 1974 and 1993 (CP&L 1999a). More recent surveys have employed only electrofishing and rotenone as sampling techniques. Between 1994 and 1998, such surveys recorded 32 fish species from the lake, averaging 23 species observed per year (CP&L 1999a). In 1998 (the most recent survey on record), bluegill were the dominant species (74 percent of total fish sampled by electrofishing and 58 percent to 74 percent of the total fish densities sampled with rotenone). Warmouth *(L. gulosus)*, largemouth bass, and an unidentified sunfish species were the next most abundant species captured when electrofishing and cove rotenone sampling. Warmouth are especially prevalent along the western shore where riprap was installed to build the levy for the discharge canal. Anecdotally, local sport fisherman have recently attempted to stock the lake with white perch *(Morone americana)*. These fish are not native to the region and may compete with indigenous largemouth bass for food and habitat.

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

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

Benthic invertebrates sampled in 1998 included 75 taxa. This number of taxa and community composition is similar to collections between 1994 and 1997. Naidid worms (oligochaetes, primarily *Pristina aequiseta*) and midge larvae (primarily *Zalutschia* spp. and *Parakiefferiella)* represent the majority of benthic macroinvertebrates throughout the lake (CP&L 1999a). Taxa richness and diversity are significantly less at the discharge than at upper and lower impoundment sample sites; however, the population in the discharge region has not significantly changed during the past 20 years, and there appears to have been little long-term effect on the ecological structure of the benthic invertebrate community in the lake as a whole. Monitoring for aquatic nuisance species, specifically Asiatic clams *(Corbicula fluminea)* and zebra mussels *(Dreissena polymorpha)*, is performed by CP&L on an annual basis. To date, neither species has been found in Lake Robinson or in Black Creek.

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

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

Of the eleven protected species identified, only the Carolina heelsplitter *(Lasmigona decorata)* and shortnose sturgeon *(Acipenser brevirostrum)* are on the Federal list of endangered species. One species, the Atlantic sturgeon (*Acipenser oxyrinchus*), is a candidate for Federal listing.

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)]
Acipenser brevirostrum	shortnose sturgeon	E	E
Acipenser oxyrinchus	Atlantic sturgeon	C	---
Etheostoma flabellare	fantail darter	---	SC
Notropis chiliticus	redlip shiner	---	SC
Semotilus lumbee	sandhills chub	---	SC
Elliptio congaraea	Carolina slabshell	—	SC
Elliptio lanceolata	yellow lance	---	SC
Lasmigona decorata	Carolina heelsplitter	E	E
Pyganodon cataracta	Eastern floater	---	SC
Villosa constricta	notched rainbow	---	SC
Villosa delumbis	Eastern creekshell	---	SC

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

Prior to a 1987 FWS survey (FWS 1993), the Carolina heelsplitter had not been found since the mid-19th century. This Federally endangered freshwater mussel was historically found in South Carolina in the Pee Dee River system. The FWS conducted intensive surveys between 1987 and 1990 and found only two surviving populations of the Carolina heelsplitter in the Pee Dee River system – the Goose Creek and Lynches River/Flat Creek populations. The 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.

2.2.6 Terrestrial Resources

CP&L's ER described the terrestrial resources as follows (CP&L 2002a). The primary terrestrial plant community in the vicinity of the site is the pine-turkey oak-wire grass community typical of the Sandhills (Barry 1980). This community is characterized by longleaf (*Pinus palustris*) and loblolly (*P. taeda*) pines with a mid-story of oaks, chiefly turkey oak (Q*uercas laevis*), along with blackjack oak (*Q. marilandica*), upland willow oak (*Q. incana*), and post oak (*Q. stellata*). Most of the upland CP&L property west of Lake Robinson and south of Secondary State Route 346 consists of forest from which timber has been harvested in recent years. After timber is removed, areas are replanted with tree species appropriate to the terrain, soils, and drainage characteristics of a site. Harvested areas are usually replanted in loblolly pine, slash pine (*P. elliottii*), or longleaf pine. CP&L property north of Secondary State Route 346 (approximately 419 ha [1036 ac]) is leased to and managed by South Carolina Department of National Resources (SCDNR) as a wildlife management area for activities such as public hunting and fishing.

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

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

The transmission corridors are situated within the Carolina Sandhills and Upper Coastal Plain physiographic regions. The principal land-use categories traversed by the transmission line rights-of-way are row crops, pasture, and forest. Wooded habitats along transmission line rights-of-way consist of pine forest, pine-hardwood forest, and bottomland hardwood forest. No areas designated by the FWS as critical habitat for endangered species exist on the Robinson

site or adjacent to associated transmission lines. The transmission line rights-of-way also do not cross any State or Federal parks, wildlife refuges, or wildlife management areas.

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

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

Scientific Name	Common Name	Federal Status[(a)]	State Status[(a)]
Birds			
Haliaeetus leucocephalus	bald eagle	T	E
Picoides borealis	red-cockaded woodpecker	E	E
Mammals			
Corynorhinus rafinesquii	Rafinesque's big-eared bat	-	E
Amphibians			
Hyla andersonii	pine barrens treefrog	-	T
Plants			
Schwalbea americana	chaffseed	E	E
Lysimachia asperulifolia	rough-leaved loosestrife	E	E
Oxypolis canbyi	Canby's dropwort	E	E

(a) E = endangered, T = threatened.
Source: SCDNR 2001b

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

Red-cockaded woodpeckers *(Picoides borealis*), Federally and State-listed as endangered, are known to occur in Darlington, Chesterfield, Lee, Sumter, and Florence Counties (SCDNR 2001b). Active nest cavities of this cooperative breeder occur in open, mature pine stands with sparse midstory vegetation (FWS 2001). An active red-cockaded woodpecker colony is located in Sandhills State Forest, approximately 8.4 km (5.2 mi) northwest of RNP (SCDNR 2001a). Two abandoned red-cockaded woodpecker cavity trees are located on the Robinson site near the Darlington County Internal Combustion Turbine Electric Plant. Both of these cavity trees have been abandoned for many years. CP&L conducted a field survey for the red-cockaded woodpecker in 1999 throughout the Robinson site; the survey identified no active cavity trees and no foraging habitat for this species. CP&L requires surveys to be conducted when there is timber harvesting or clearing of pine trees at the site (CP&L 1998b). In accordance with a Safe Harbor Agreement with the State of South Carolina, CP&L manages the site to maintain and enhance habitat for red-cockaded woodpeckers (CP&L 1999b). There are no known active or abandoned cavity trees adjacent to RNP-associated transmission line rights-of-way (SCDNR 2001a).

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

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

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

Rough-leaved loosestrife *(Lysimachia asperulifolia*) is Federally and State-listed as endangered. Habitat for this perennial herb consists of Carolina bays and the ecotones between longleaf pine uplands and pond pine pocosins, an upland swamp community type

(FWS 2001). The species has been recorded in Darlington County (SCDNR 2001b), but there are no recorded occurrences on the Robinson site or along the transmission line rights-of-way associated with RNP (SCDNR 2001a).

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

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

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

2.2.7 Radiological Impacts

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

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

Requirements for the REMP are established in the ODCM (CP&L 2002b). Radiological releases are summarized in the annual reports (CP&L 2002c). The limits for all radiological releases are specified in the ODCM, and these limits are designed to meet Federal standards and requirements. The REMP includes monitoring of the air, direct radiation, surface water,

drinking water, groundwater, shoreline sediment, aquatic vegetation, bottom sediment, milk, fish, broadleaf vegetation, and food products within about a 16 km (10 mi) radius of the plant.

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

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

- Total body dose from liquid effluent-based estimates was 7.04×10^{-6} mSv (7.04×10^{-4} mrem), which is less than 0.01 percent of the 0.03-mSv (3-mrem) dose limit specified in 10 CFR Part 50, Appendix I. The maximum total organ dose for the liquid effluent-based estimates was 8.31×10^{-6} mSv (8.31×10^{-4} mrem) to the adult gastrointestinal tract-lower large intestine. This estimate is less than 0.01 percent of the 0.10-mSv (10-mrem) dose limit (CP&L 2002c).

- The air dose due to noble gases in gaseous effluents was 2.38×10^{-5} mGy (2.38×10^{-3} mrad) beta and 4.94×10^{-5} mGy (4.94×10^{-3} mrad) gamma. These estimates are less than 0.03 percent of the dose limits (CP&L 2002c).

- The critical organ dose from gaseous effluents due to iodine-131, iodine-133, tritium, and particulates with half-lives greater than 8 days is 1.57×10^{-3} mSv (0.157 mrem) to the adult lung, which is approximately 1 percent of the 0.15-mSv (15-mrem) dose limit (CP&L 2002c).

- The maximum individual dose estimated from consumption of fish contaminated by tritium is 6.0×10^{-5} mSv/yr (6.0×10^{-3} mrem/yr), which is 0.02 percent of the dose limit (CP&L 2002c).

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

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

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 2003

employees. Given the predominance of CP&L employees living in Darlington and Florence Counties and the small possibility of significant socioeconomic effects in other locations, the focus of the analyses undertaken in this SEIS is on these two counties.

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

Table 2-5 provides the number of housing units and housing unit vacancies for Darlington and Florence Counties for 1990 and 2000. Both the number and percentage vacant grew in both counties during the period. Both Darlington County and Florence County have urban development boundaries within which development is to take place. Land-use planning for each county addresses several issues with respect to successful co-existence of mixed land uses. The major areas of concern, as detailed in the Darlington County Comprehensive Plan, include efforts to reduce strip development, diminish incompatible mixed land uses, protect prime farmland, and accommodate urban/residential growth (Darlington County 1998, 1999). Urban residential growth is encouraged where infrastructure exists, and maximized utilization of these facilities will spur the construction of additional facilities. Great deliberation is expected when determining whether or not prime agricultural land would be converted to urban/residential land in the future. The Florence County Comprehensive Plan details mitigative measures that County officials have put into place (Florence County 1999). New residential development will

Table 2-5. Housing Units and Housing Units Vacant (Available) by County During 1990 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%

(a) USCB 2000a, 2000b

be guided (by zoning) to promote clusters and infill existing urban areas, to protect prime farmland, to expand future infrastructure on an as-needed basis, and to govern the locations of potentially incompatible land uses by zoning regulations.

2.2.8.2 Public Services

- **Water Supply**

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

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

Water Supplier	Average Daily Use m^3/day (MGD)	Maximum Daily Capacity m^3/day (MGD)
Darlington County		
Darlington County Water and Sewer Authority	16,500 (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

Source: SCDHEC 2000

Long-term pumping has caused a 61-m (200-ft) reduction of the groundwater level in some locations throughout much of the five-county surrounding area. The aquifer cannot be continually pumped at the current rate of demand, so an alternative water source must be developed to satisfy demand for the next 10 years. The most apparent solution would be the creation of a surface water treatment facility located on the Great Pee Dee River. Based upon initial investigation, this water source would be able to supply water for both domestic and industrial needs for many years. The project is expected to be an expensive undertaking and would require the collaboration of surrounding counties and municipalities (Darlington County 1998,1999).

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

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

- **Transportation**

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

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

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

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

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

AADT = Annual Average Daily Traffic volumes – all for 1999.
SSR = Secondary State Route.
S.C. = State primary road.
(a) South Carolina Department of Transportation 2001a.
(b) South Carolina Department of Transportation 2001b.

2.2.8.3 Offsite Land Use

RNP is located at the southern end of Lake Robinson in an unincorporated portion of Darlington County, South Carolina. Darlington County is situated in the northeast quadrant of South Carolina about 130 km (80 mi) northwest of Myrtle Beach and 126 km (78 mi) northeast of Columbia. The counties surrounding and adjacent to Darlington County are Chesterfield, Marlboro, Florence, and Lee Counties. Darlington County has three major surface water resources: Black Creek, the Great Pee Dee River, and Lynches River. Darlington County covers an area of 1467 km^2 (566.7 mi^2) and has a population of approximately 65,000. The terrain is slightly rolling and the soil is mostly well-drained, sandy loam. The City of Darlington,

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

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

2.2.8.4 Demography

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

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

Using USCB 2000 census information, CP&L estimated that 90,408 people lived within 32 km (20 mi) of RNP. The NRC staff arrived at the slightly larger value of 91,800. Applying the GEIS sparseness measures, Robinson has a population density of 29 persons/km^2 within 32 km (73 persons/mi^2 within 20 mi) and falls into a less sparse category, Category 3 (having 60 to 120 persons per square mi or less than 60 persons per square mi with at least one community with 25,000 or more persons within 20 mi).

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

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

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

- 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 2-8. Regional Population Growth

Population and Average Annual Growth Rate (as a Percent) During the Previous Decade				
	Darlington County		Florence County	
Year	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[c]	69,900	0.3	142,800	0.7
2030[d]	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.

Table 2-9. Year 2000 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 be unavailable for counting by census takers. If this occurs, they would be "under-represented" in census minority and low-income population counts.

  There are 346 farms in Darlington County and 615 in Florence County (USDA 1997a). Around 1870 farm workers are present at some time during the year in Florence County (about 1470 for less than 150 days per year) and 1330 in Darlington County (1010 for less than 150 days per year) (USDA 1997a, 1997b). Both counties are entirely within the 80-km

(50-mi) radius of the Robinson site. However, almost all of the laborers on farms in the area are believed to reside in the area. Migrant labor plays little or no role and is not expected to distort the minority and low-income statistics.

2.2.8.5 Economy and Taxes

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

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

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

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

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 2003

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

2.2.9 Historic and Archaeological Resources

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

2.2.9.1 Cultural Background

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

- Prehistoric Period

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

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

- Native American Historic Period

  Early documentation is sparse for the region around Robinson, but the Pee Dee, Wateree, and Cheraw were the major inhabitants at the time of European contact. Initial contact with explorers occurred in the first half of the 16th century, however extensive contact with colonies is not recorded until the end of the 17th century. The first half of the 18th century was marked by wars in which tribes both allied with and battled against colonists as well as wars between different tribes. In the latter half of the 18th century some of the Pee Dee and Cheraw, and the majority of the Wateree joined with the Catawba Tribe near present day York County. Today, the Catawba Tribe is the only Federally recognized tribe in South

Carolina. Although some of the Cheraw joined with the Catawba, many migrated north into Robinson County, North Carolina and eventually formed the Lumbee Tribe, currently a North Carolina State recognized tribe. Some of the Pee Dee went with the Catawba and some also went with the Cheraw, but a large number stayed in the area of Marlboro and Dillon Counties located east of Darlington County (South Carolina Information Highway 2003). The Pee Dee tribe formally reunited under a state charter in 1974 as an Indian Association (Spivey 2000) and filed a letter of intent with the Bureau of Indian Affairs to petition for Federal recognition in 1995.[(a)]

- Euro-American Historic Period

RNP is located approximately 8 km (5 mi) west-northwest of Hartsville in Darlington County. The Darlington County area was originally part of the Cheraws District, one of seven Judicial Districts created by South Carolina's colonial General Assembly in 1769. In 1785, following the Revolutionary War, Darlington County became one of the original counties in the newly created state of South Carolina; however, it continued to be a part of the Cheraws District until 1798 (the Lewis families 2003). Darlington County did not appear independently in the 1790 census, but in the 1800 census, the County had a population of just over 7600 (Inter-University Consortium for Political and Social Research 2003). Agriculture dominated the economy and land-use patterns of the County and many advanced techniques in the scientific breeding of crops were developed just west of Hartsville at the Coker Experimental Farms. Although agriculture continued to be significant, other industries began to grow in the latter part of the 19th century. During the period of 1889 through 1911, two rail lines were connected to Hartsville and at least a half-dozen separate industries were started in the town. One of the most significant companies created in the Hartsville area during this time was the Southern Novelty Company, predecessor to the Sonoco Company, a Fortune 500 company that manufactures industrial and consumer packaging products. Also during this period the town of Hartsville was chartered and the population increased from 300 to 2400 (Ervin and Rudisill 1964; Rudisill 1986).

An important event in the history of Hartsville and Darlington County was the impoundment of Black Creek to construct Lake Robinson in 1958. The newly formed Lake Robinson was impounded to provide cooling for a coal-fired plant and future power generating facilities.

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

2.2.9.2 Historic and Archaeological Resources

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

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

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

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

Examination of historical records such as plat records and historic maps reveal the potential presence of historic properties either close to or within the plant site boundaries. Copies of these documents are located at the South Carolina Department of Archives and History. One document examined was the 1840 Wiley Warren Plat for 223 Acres on Black Creek, Darlington District. This plat, shows the location of the 90-ha (223-ac) Wiley Warren family farm located

on what is now the Robinson site. Any structures that were part of the farm have been destroyed. There reportedly was a family cemetery located on the same knoll as the RNP visitor center.[(a)]

The Segars Farm complex is located on private land 3.2 km (2 mi) south and east of RNP. This complex was a resort area in the early 20th century. In 2003, this complex was determined eligible for the National Register of Historic Places (South Carolina State Historic Preservation Office 2003). Secondary State Route 23, the Old Camden Road, passes east-west to the south of the site; this road was called the Road to Camden on historical maps and is also of historical value.

2.2.10 Related Federal Project Activities and Consultations

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

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

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

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

(a) Personal communication with Horace Fraser Rudisill, Darlington County Historian, September 25, 2002.

2.3 References

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

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

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

10 CFR 61. Code of Federal Regulations, Title 10, *Energy*, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."

40 CFR 50. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 50, "National Primary and Secondary Air Quality Standards."

40 CFR 81. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 81, "Designation of Areas for Air Quality Planning Purposes."

40 CFR 190. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operation."

49 CFR 170-179. Code of Federal Regulations, Title 49, *Transportation of Radioactive Materials*, Part 170.

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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.

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 of 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 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)]

(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.

3.1 References

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

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

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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.

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

4.1 Cooling System

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to the RNP cooling system operation during the renewal term are listed in Table 4-1. 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 RNP operating license (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 these issues beyond those discussed in the GEIS. For all of the issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

Table 4-1. Category 1 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
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. (contd)

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

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

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

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, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of altered thermal stratification of lakes during the renewal term beyond those discussed in the GEIS.

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

  > These effects have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  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 temperature effects on sediment transport capacity during the renewal term beyond those discussed in the GEIS.

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

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

  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 scouring caused by discharged cooling water during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the CP&L ER, the staff's site visit, the scoping process, its review of monitoring programs,

or its evaluation of other available information including plant monitoring data and technical reports. Therefore, the staff concludes that there are no impacts of eutrophication during the renewal term beyond those discussed in the GEIS.

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

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

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

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

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

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

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

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

  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 including the NPDES permit for RNP, or discussion with the NPDES compliance

office (SCDHEC). Therefore, the staff concludes that there are no impacts of discharges of other metals in wastewater during the renewal term beyond those discussed in the GEIS.

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

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

  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 available information. Therefore, the staff concludes that there are no impacts of accumulation of contaminants in sediments or biota during the renewal term beyond those discussed in the GEIS.

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

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

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

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

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

  The staff has not identified any significant new information during its independent review of the 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 cold shock during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the 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 thermal plume barriers to migrating fish during the renewal term beyond those discussed in the GEIS.

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

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

  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, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on the distributions of aquatic organisms during the renewal term beyond those discussed in the GEIS.

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

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

  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 premature emergence of aquatic insects during the renewal term beyond those discussed in the GEIS.

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

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

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 gas supersaturation during the renewal term beyond those discussed in the GEIS.

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

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

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

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

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

The staff has not identified any significant new information during its independent review of the 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 losses from predation, parasitism, and disease among organisms exposed to sublethal stresses during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the 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 regarding stimulation of nuisance organisms during the renewal term beyond those discussed in the GEIS.

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

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

  The staff has not identified any significant new information during its independent review of the 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 cooling pond impacts on terrestrial resources during the renewal term beyond those discussed in the GEIS.

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

  > Noise has not been found to be a problem at operating plants and is not expected to be a problem at any plant during the license renewal term.

  The staff has not identified any significant new information during its independent review of the 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 km^2 (108 mi^2) of Black Creek. A second gauge exists just downstream from the impoundment's discharge. This gauge monitors the drainage from the upper 448 km^2 (173 mi^2) 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.

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

4.1.2 Entrainment of Fish and Shellfish in Early Life Stages

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

The staff independently reviewed the RNP ER, visited the site, and reviewed NPDES Permit No. SC0002925, which was issued September 29, 1997, by the SCDHEC (SCDHEC 1997).

The staff also reviewed CP&L's application for renewal of the NPDES permit, which was granted January 16, 2003 (SCDHEC 2003).

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

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

Predicted intake water velocities for Unit 2 (modeled as part of the original 316(b) 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 flow calculations indicated an average flow of 0.5 m/s (1.65 ft/s) within each bay, and measured velocities reportedly compared reasonably with this estimate (CP&L 1976b).

There are no ongoing studies monitoring entrainment of fish or shellfish at RNP. In the original 316(b) demonstration, entrainment of ichthyoplankton was addressed based on studies conducted on a weekly basis between March 1975 and February 1976. Duplicate samples were collected during day and night using plankton nets. During the study period, no fish eggs were collected, though larval fish were collected during every month but January. Of all the fish collected, 93.8 percent were percids (perch and darters). Other larval fish entrained included 2.6 percent centrarchids (sunfish) and 0.3 percent catastomids (chubsuckers). The remaining fish (3.3 percent) could not be identified to family. None of the species entrained are known to prefer pelagic areas (e.g., near the intake structure) for spawning. However, based on early CP&L ichthyoplankton sampling conducted in the lower impoundment and discharge areas, there is evidence that darters may move into pelagic areas soon after spawning (CP&L 1976a). The continued presence and abundance of darters in the lake during the early studies (4 years

after initial Unit 2 operation) suggested that the effects of entrainment on their population were negligible (CP&L 1976a). More recent declines in the darter population are attributed to other habitat changes, non-native species introductions, and competitive interactions that have increased since the 1982 replacement of brass condenser tubes with tubes that reduced copper concentrations in the lake (CP&L 2002).

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

4.1.3 Impingement of Fish and Shellfish

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

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

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

There are no ongoing studies monitoring impingement of fish or shellfish at RNP. In the original 316(b) demonstration, impingement of fish was addressed based on studies conducted on a monthly basis (48-hr samples) between December 1973 and July 1975. Sampling continued on a weekly basis (24-hr samples) from July 1975 through December 1975. An initial screen washing was followed every 12 hr by additional screen washes. Fish washed from the screens were identified, weighed, and measured. Impingement of fish at the Unit 2 intake averaged 866 fish per day in 1974 and 291 fish per day in 1975. Of these, bluegill made up 74 percent and 57 percent of the biomass in 1974 and 1975, respectively. Most bluegill impinged were less than 115 mm (4.5 in.) in length. Chain pickerel *(Esox niger)* were the next

most common species impinged, comprising 14 percent and 28 percent of the biomass in 1974 and 1975, respectively. Maximum impingement occurred during the summer, and minimum impingement occurred during the winter. Fewer fish were impinged on Unit 1 intake screens than on those of Unit 2 because Unit 1 draws less water through the intake pumps. The continued abundance of bluegill in the lake indicates that there are no significant impacts to the fish population from impingement on the intake screens.

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

4.1.4 Heat Shock

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

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

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

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

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

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

Heated effluent from the plant affects aquatic organisms in the vicinity of the discharge. Low abundance of benthic organisms and low species diversity in the discharge region may create an unstable food supply for some fish species, including bluegill, especially during the summer when thermal effluents are at their highest (CP&L 1976b, 1996b, 1996c). During the warmest months of the year, zooplankton numbers also decline in the discharge. CP&L studies indicate, however, that zooplankton populations recover to previous levels, generally by the month of October (CP&L 1996b). At temperatures exceeding 32°C (90°F) for long periods of time, a stress on the phytoplankton population was indicated (CP&L 1976b). The population composition and total abundance were not altered as a result of this stress, so it can be concluded that the population is stable and can recover from periodic stresses rapidly when conditions are more favorable. In general, over the course of the year, the phytoplankton standing crop and primary productivity may be enhanced in the discharge and lower impoundment as a result of the plant's thermal input (CP&L 1976b).

Around the discharge, the thermal effluent restricts growth of aquatic plants in protected eastern shores opposite the discharge canal and in the cove directly north of the discharge canal (CP&L 1976a). These areas have habitat characteristics that would normally support aquatic plant growth. In other areas of the lake, turbulence, substrate, and physiographic and

man-made features are the primary reasons for reduced abundance of aquatic vegetation, not temperature. The limited areas where thermal effects are apparent do not pose a threat to the aquatic plant population of the lake as a whole.

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

Fishery studies required by the NPDES permit were conducted in 1994 and 1995 by CP&L using radiotelemetry, littoral rotenone, electrofishing, hydroacoustics surveys, and angler creel surveys (CP&L 1996b). Results indicated that while certain minor fish species were temporarily reduced in number near the discharge during summer, these species rapidly recolonized the area as water temperatures cooled in the fall (CP&L 1996b). In summary, the study concluded that fish in Lake Robinson have sufficient suitable habitat containing cooler, oxygenated water available to them in the critical hotter months beneath the upper layer of the thermal plume, even in the discharge area (CP&L 1996b).

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

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

4.1.5 Microbiological Organisms (Public Health)

RNP has a cooling pond heat-dissipation system that utilizes water from Black Creek as the cooling source. Black Creek, which was impounded to form Lake Robinson adjacent to the site, has an average annual flow rate of 1.42×10^8 m^3/yr (5.01×10^9 ft^3/yr). This flow rate is

below the 9 x 10^{10} m^3/yr (3.15 x 10^{12} ft^3/yr) that 10 CFR 51.53 (c)(3)(ii)(G) sets as the threshold below which an evaluation of potentially harmful thermophilic (heat-loving) microorganisms on human health is required. The concern is that the low flow rate could increase the potential for waters passing from the condenser cooling system to retain heat and create conditions conducive to growth of thermophilic organisms, such as *Naegleria fowleri.* This free-living amoeba causes a rare, acute, and almost invariably fatal condition called primary amoebic meningoencephalitis (PAME). The disease usually affects children and young adults. In almost all cases, the victims contact the amoebas by swimming in infected fresh water. Other microbiological organisms of concern to the public include the enteric pathogens *Salmonella* and *Shigella,* the *Pseudomonas aeruginosa* bacterium, thermophilic Actinomycetes ("fungi"), and the many species of *Legionella* bacteria.

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

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

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

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

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

4.2 Transmission Lines

The Robinson plant has four transmission lines for the specific purpose of connecting RNP to the transmission system (CP&L 2002, NRC 1975). The rights-of-way for the Rockingham, Florence-North, Sumter, and Florence-South lines range in width from 30 m to 103 m (100 to 340 ft) and in length from 29 km to 62 km (18 mi to 39 mi) for a total area of approximately 613 ha (1517 ac) and a total length of 162 km (102 mi) (see Table 2-1). The transmission line rights-of-way are maintained by mowing and trimming undesirable vegetation, and by use of "non-restricted use" herbicides. Under normal circumstances, the mowing and herbicide schedule follows a 3-year cycle. Aerial patrols 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, 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 crossed by transmission lines to convert transmission line rights-of-way into productive habitat for 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.

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

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

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

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

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

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 information. Therefore, the staff concludes that there are no impacts of electromagnetic fields on flora and fauna during the renewal term beyond those discussed in the GEIS.

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

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

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 SCDNR, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of power line rights-of-way on flood plains and wetlands during the renewal term beyond those discussed in the GEIS.

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

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

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 information. Therefore, the staff concludes that there are no air quality impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

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

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

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

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

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

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

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

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 limiting vertical clearance from the line sag and profile of each of the 230-kV transmission lines for all spans. The computer code AC/DCLINE (EPRI 1991) was then used to calculate electric field strength and induced current for each line. The input parameters for these analyses included requirements established by NESC for conductor temperature and maximum vehicle size under the lines. The results for each line indicate the limiting case induced electrostatic current would be significantly below the limit of 5 mA that has been established by NESC. Upon review of the information provided by the utility, the staff concluded the assessment was adequate to meet 10 CFR 51.53. The staff concludes that 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.

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

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

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

4.3 Radiological Impacts of Normal Operations

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to RNP in regard to radiological impacts are listed in Table 4-5. CP&L stated in its ER that it is not aware of any new and significant information associated with the renewal of the RNP OL. No significant new information has been identified by the staff during its independent review. 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 GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

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

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

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

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

  The staff has not identified any 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 radiation exposures to the public during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the 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 occupational radiation exposures during the renewal term beyond those discussed in the GEIS.

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

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

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to socioeconomic impacts during the renewal term are listed in Table 4-6. CP&L stated in its ER that it is not aware of any new and significant information associated with the renewal of the RNP 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 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.

- 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).

For the year 2000, the staff estimated that population living within 32 km (20 mi) of RNP was approximately 91,800. This translates to around 29 persons/km^2 (73 persons/mi^2) 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/km^2 [60 to 120 persons/mi^2]).

The staff estimate of population within 80 km (50 mi) of the site using the 2000 census was about 814,200, or 40 persons/km^2 (104 persons/mi^2), 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/km^2 [190 persons/mi^2]) 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).

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

4.4.2 Public Services: Public Utility Impacts During Operations

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

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

CP&L assumed no increase of employees during license renewal, which would create no impacts from plant-related population increases and no additional demand for potable water (CP&L 2002). The current potable water demand is within the residual capacity of the existing water system that services Darlington County. The current approximate average daily demand for the Darlington County Water and Sewer Authority is 16,500 m^3/day (4.36 MGD), of which the Robinson site nominal demand, based on the NPDES permit, is only 27 m^3/day (7200 g/d or 5 gpm) (NRC 2003a). Five wells on the Robinson site yield an average 4500 m^3/day (1.18 MGD). Long-term pumping in the five-county region has caused a 61-m (200-ft) reduction in the groundwater level in the source aquifer, so a new source (probably the Great Pee Dee River) will need to be tapped in the next 10 years. This source is expected to be adequate to serve future demands of the region. CP&L notes that no increase in plant work force or demand on water systems from the plant is expected, so the incremental impact of relicensing the plant on either the public water system or the regional groundwater situation is minimal. As a result, the staff concludes that the impact on water use is SMALL and mitigation is not warranted.

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/km^2 (60 persons/mi^2), 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) or has not provided adequate public services to support and guide development in the past, especially infrastructure that would allow industrial development. If the plant's tax payments are projected to be a dominant source of the community's total revenue, new tax-driven land-use changes would be LARGE. This would be especially true where the community has no pre-established pattern of development or has not provided adequate public services to support and guide development in the past.

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

4.4.4 Public Services: Transportation Impacts During Operations

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

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

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

4.4.5 Historic and Archaeological Resources

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

The staff conducted Section 106 consultation, with the South Carolina SHPO (CP&L 2001a, South Carolina SHPO 2001, 2003a,b). The consultation correspondence is contained in Appendix E.

As discussed in Section 2.2.9, the NRC also contacted eight Native American tribes or groups. These tribes or groups did not identify cultural resources of concern or potential cultural resources near RNP.

As part of the Section 106 consultation, an area of potential effect was defined for this proposed license renewal action. The area of potential effect is confined to the area at the

power plant site and its immediate environs. This includes the cooling water intake structures, the cooling canal, and the shoreline of Lake Robinson between the intake structures and the discharge outfall.

Much of the defined area of potential effect has been extensively disturbed by construction of RNP and associated facilities such as the visitor's center. The area of potential effect has also been paved over in places and landscaped with grass and walkways. Due to this extensive disturbance, it is unlikely that subsurface archaeological remains associated with the Wiley Warren Farm are intact or eligible for listing on the National Register of Historic Places. However, it is possible that evidence of the Wiley Warren family cemetery (exact location unknown) is still present in the vicinity of the RNP visitor's center.

Since the proposed license renewal will entail minimal ground disturbance associated with routine maintenance and operations, this project will have no effect on the Wiley Warren Farm or on any other unidentified subsurface archaeological resources. By letter dated November 12, 2003, CP&L committed to amend the Environmental Compliance Manual used at RNP to institute requirements and guidance for the preservation of historic, cultural, and archaeological resources (CP&L 2003). The staff has discussed the elements of this amendment with representatives of the South Carolina SHPO's office (NRC 2003e), and the staff believes the amendment will resolve concerns expressed by the SHPO's office regarding the protection of unidentified historic, cultural, and archaeological resources at the RNP site in a letter dated August 18, 2003 (South Carolina SHPO 2003b). By letter dated November 17, 2003, the staff provided a revised cultural resources report narrative to the SHPO's office; this letter confirms the staff's conclusion that the potential impacts on historic and archaeological resources are SMALL (NRC 2003f).

Major refurbishment of RNP is not expected nor is it anticipated that there will be a need to use the few currently undeveloped portions of the RNP site for operations during the proposed license-renewal period.

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

4.4.6 Environmental Justice

Environmental justice refers to a Federal policy that requires 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,b) 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

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(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).

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

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

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

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

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

By the NRC criteria (50 percent of population, or at least 20 percent greater than state), 61 of the total 670 block groups from the 2000 census within 80 km (50 mi) of the site contain low-income populations. The majority of census block groups containing low-income populations

are located in the Darlington, Florence, and Sumter areas. In North Carolina, low-income block groups are concentrated in the Laurinburg area (which also contains a significant Native American population), and north of Rockingham. Figure 4-2 shows the locations of the low-income populations.

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

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

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.

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/ft^2) and 5 x 10^{-3}, respectively. The increase in

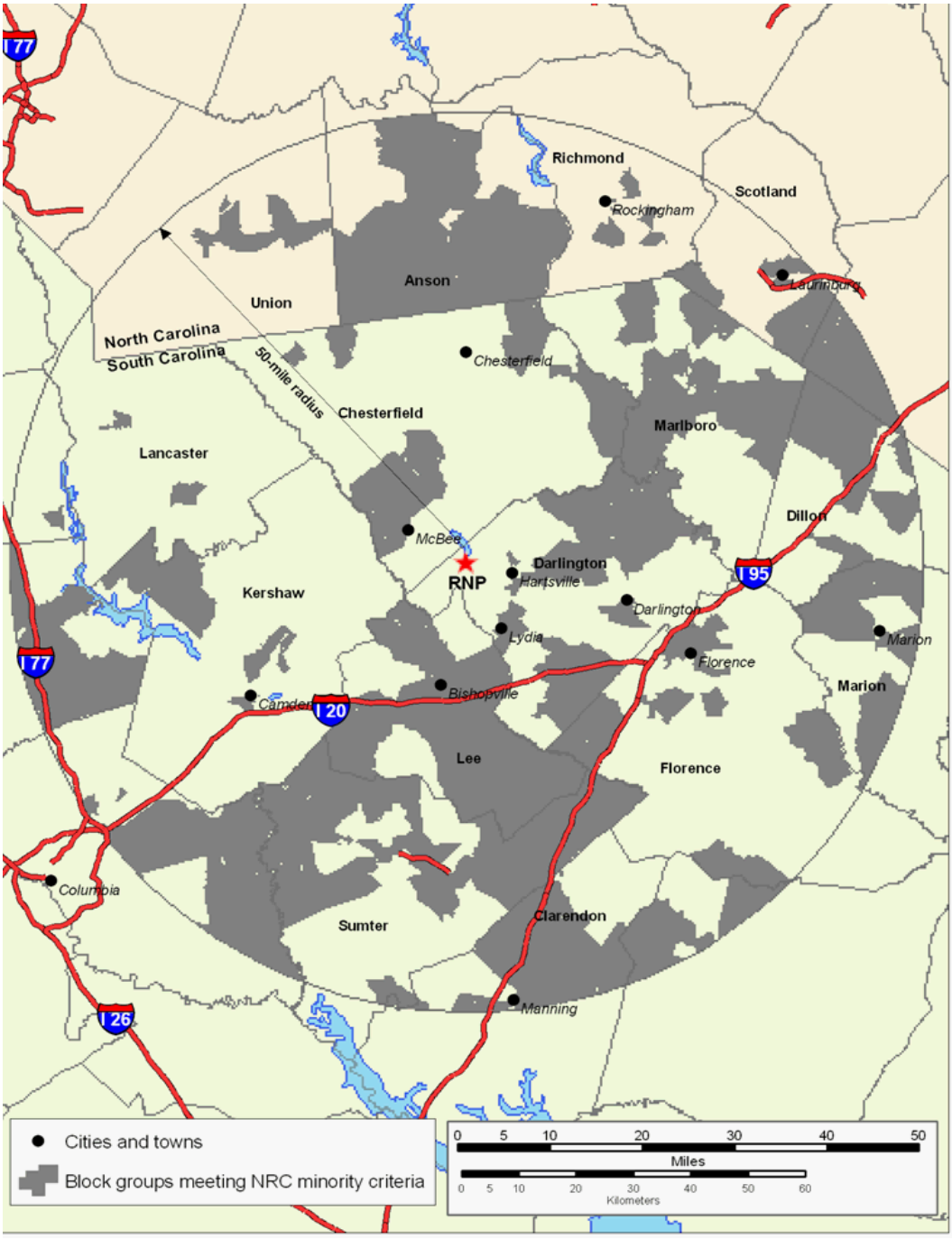

Figure 4-1. Geographic Distribution of Minority Populations (shown in shaded areas) Within 80 km (50 mi) of the Robinson Site Based on 2000 Census Block Group Data

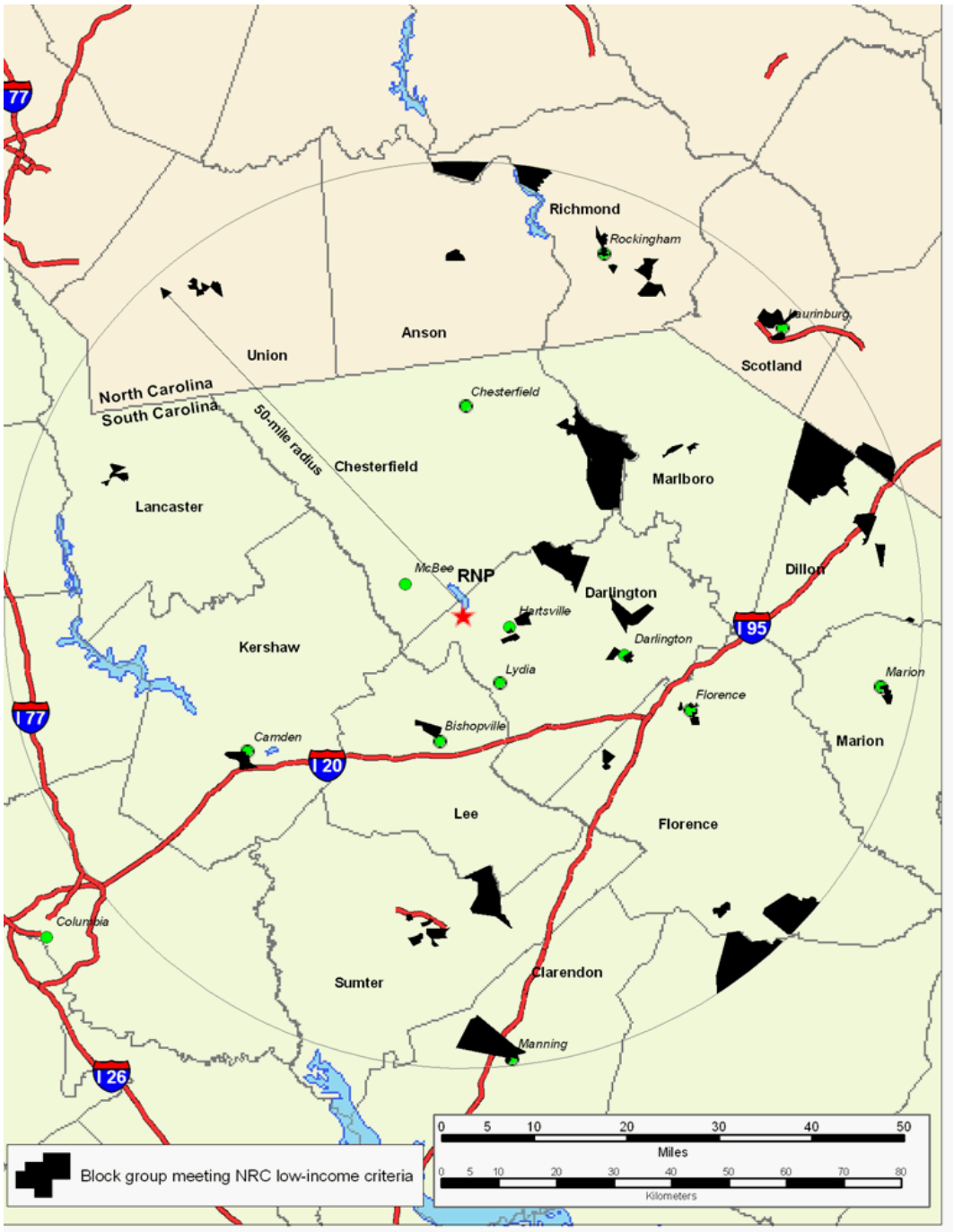

Figure 4-2. Geographic Distribution of Low-Income Populations (shown in shaded areas) Within 80 km (50 mi) of the Robinson Site Based on 2000 Census Block Group Data

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

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 0.8 km (0.5 mi) 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 independent analysis, the staff concludes that the potential impacts of regional groundwater supplies from continued pumping of RNP's wells are SMALL, and additional mitigation is not warranted.

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

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

The rate that surface water in lakes and streams recharges adjacent aquifers is governed by the surface elevation of the stream or lake. The elevation of Lake Robinson remains relatively stable throughout the year, and therefore, groundwater recharge around the lake is not impacted. However, Black Creek downstream of the impoundment will reflect the evaporative losses at the lake. The average discharge from Lake Robinson during June through September is 4.73 m^3/s (167 cfs). Using the monthly evaporation data for Columbia, South

Carolina (van der Leeden et al. 1990) and assuming a conservative ratio of 2:1 for induced to natural evaporation, the estimated average total evaporative loss during June through September is 1.61 m^3/s (57 cfs) or 34 percent of the flow. Based on the stage-flow relationships for the streamflow gauge downstream of the impoundment, this reduction in flow only results in a loss of about 15 cm (6 in.) in stage downstream. The evaporation losses are not expected to change during the renewal period from the current period. Therefore, based on its review of the CP&L ER and its independent analysis, the staff concludes that the potential impacts to riparian and aquatic ecosystems from reduced surface water available to recharge adjacent aquifers are SMALL, and additional mitigation is not warranted.

4.5.3 Groundwater Quality Degradation (Cooling Ponds at Inland Sites)

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

Assuming Lake Robinson is perfectly mixed, the lake volume of 38 x 10^6 m^3 (31,000 ac ft) and mean annual discharge of 6.31 m^3/s (223 cfs) implies that the lake volume is flushed 5.2 times a year. In the year of the lowest recorded mean annual discharge of 3.77 m^3/s (133 cfs), the lake's flush rate was about 3.1 times per year. The average flow circulating through the cooling system is 2.48 x 10^6 m^3/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. 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

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

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

4.6.1 Aquatic Species

No Federally listed aquatic species are known to occur at the Robinson site or along the transmission line rights-of-way. Shortnose sturgeon are listed as endangered by FWS in Chesterfield, Darlington, Florence, and Sumter Counties, and the Atlantic sturgeon is listed as a candidate species for Federal listing in South Carolina. Candidate species are not protected

under the Endangered Species Act, but concerns about their status indicate that they may warrant listing in the future. Neither sturgeon species is known to occur in Black Creek. Typically, the first dam on a river marks the upstream limit of the sturgeon population's range (Kynard 1997). Thus, it is assumed that the impoundments at Prestwood Lake and Lake Robinson, which lack fish passage facilities, prevent sturgeon from accessing Lake Robinson and from being impacted by RNP cooling water intake effects (e.g., impingement and entrainment).

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

The Carolina heelsplitter, a Federally and State-endangered freshwater mussel, was historically known in South Carolina from the Pee Dee River system. In intensive FWS surveys (1987 to 1990), the 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, only two individuals were found in the Lynches River (both found in 1990). Because Carolina heelsplitter populations have not been found in Black Creek (a tributary of the Pee Dee River) or in the Lake Robinson impoundment, the NRC staff has determined that the impacts to the Carolina heelsplitter from the proposed license renewal would be SMALL.

The staff has submitted its biological assessment to the FWS and the NOAA Fisheries that evaluates the potential effects of license renewal on Federally listed threatened and endangered species and candidates for Federal protection (NRC 2003c, 2003d). The staff concluded that continued operation of RNP will have no effect on the Carolina heelsplitter, the shortnose sturgeon, and the Atlantic sturgeon. By letter dated October 17, 2003, FWS concurred with the staff's conclusion (FWS 2003). By letter dated October 7, 2003, NOAA Fisheries concurred with the staff's conclusion (NMFS 2003). Copies of these correspondence are provided in Appendix E.

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

4.6.2 Terrestrial Species

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

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

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

The staff has submitted its biological assessment to the FWS that evaluates the potential effects of license renewal on Federally listed threatened and endangered species (NRC 2003c). The staff concluded that continued operation of RNP during the license renewal period will have no effect on the bald eagle, and may affect, but is not likely to adversely affect the red-cockaded woodpecker, Canby's dropwort, chaffseed, and rough-leaved loosestrife. By letter dated October 17, 2003, FWS concurred with the staff's conclusion (FWS 2003). Copies of these correspondence are provided in Appendix E.

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

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

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

4.8 Summary of Impacts of Operations During the Renewal Term

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

Plant-specific environmental evaluations were conducted for 15 Category 2 issues applicable to RNP operation during the renewal term and for environmental justice and chronic effects of electromagnetic fields. For all 15 issues and environmental justice, the staff concluded that the potential environmental impact of renewal term operations of RNP would be of SMALL significance in the context of the standards set forth in the GEIS and that additional mitigation would not be warranted. In addition, the staff determined that a consensus has not been reached by appropriate Federal health agencies regarding chronic adverse effects from electromagnetic fields. Therefore, no evaluation of this issue is required.

4.9 References

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

36 CFR 800. Code of Federal Regulations, Title 36, *Parks, Forest, and Public Property*, Part 800, "Protection of Historic and Cultural Resources."

59 FR 7629. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations." *Federal Register*. Vol. 59, No. 32. February 16, 1994.

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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). 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.

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.

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

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

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

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

5.2.2 Estimate of Risk

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

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.

Table 5-3. RNP Core Damage Frequency

Initiating Event/Accident Class	CDF (Per Year)	% Contribution to CDF
Loss of Offsite Power (LOOP)	1.0×10^{-5}	24
Transients	1.99×10^{-5}	46
Loss-of-Coolant Accident (LOCA)	4.75×10^{-6}	11
Steam Generator Tube Rupture (SGTR)	3.46×10^{-6}	8
Interfacing Systems LOCA (ISLOCA)	1.30×10^{-6}	3
Others	3.46×10^{-6}	8
Total CDF (from internal events)	4.32×10^{-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

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.

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

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

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

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

5.2.5 Cost-Benefit Comparison

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

The staff reviewed CP&L's calculation methods and logic arguments in the final cost-benefit comparisons and agreed with CP&L's conclusion that none of the original 266 SAMAs are cost-beneficial. However, based on a review of the seismic and fire risk vulnerabilities identified in the Robinson IPEEE, the staff identified two new SAMAs 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 estimated the cost of replacing the cast-iron RHR valve yokes (to increase their seismic capacity) to be $105K with additional replacement power costs of $240K to $1.2M depending on the particular outage in which the replacement is performed. CP&L concluded that replacement of the cast-iron RHR valve yokes was not cost-beneficial because the benefits of averted offsite economic costs would be approximately $40K based on the seismic hazard estimates provided in EPRI NP6395-D (NRC 2003). The staff estimated the potential contribution to CDF and large early release frequency (LERF) from seismically-induced failure of the valves to be about 2×10^{-5} per year based on Livermore seismic hazard estimates for the Robinson site reported in NUREG-1488 (NRC 1993), and estimates that elimination of the offsite costs associated with such a failure would have a benefit of approximately $1M. Both the EPRI and Livermore hazard estimates are considered by the staff to be useful for decision making. The staff concludes that modification of the RHR valves to increase their seismic capacity would be cost-beneficial depending on the assumed seismic hazard estimates and the particular outage during which the modification would be implemented.

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

5.2.6 Conclusions

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

Based on its review of the CP&L SAMA analysis, the staff concludes that none of the candidate SAMAs are cost-beneficial, except as noted above for the RHR valves and dedicated shutdown diesel generator conduit heat shield. This is based on conservative treatment of costs and benefits. This conclusion is consistent with the low residual level of risk indicated in the Robinson PSA and the fact that RNP has already implemented many plant improvements identified from the IPE and IPEEE process. The staff concludes that installation of the heat shield would be cost-beneficial, and that modification of the RHR valves to increase their seismic capacity would also be cost-beneficial depending on the assumed seismic hazard estimates and the particular outage during which the modification would be implemented.

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. CP&L is further evaluating these two SAMAs and has not made any commitment to implement them. NRC will further evaluate the need for implementation of these SAMAs as a current operating plant issue.

5.3 References

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

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

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

10 CFR 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

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Carolina Power & Light Company (CP&L). 1995. Letter from R. M. Krich (CP&L) to Document Control Desk (NRC). Subject: Response to Generic Letter 88-20, "Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities," Supplement 4," June 30, 1995.

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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 51.51(b), Table S-3, “Table of Uranium Fuel Cycle Environmental Data,” and in 10 CFR 51.52(c), Table S-4,

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(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 Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor." The staff also addresses the impacts from radon-222 and technetium-99 in the GEIS.

6.1 The Uranium Fuel Cycle

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

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

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

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 RNP operating license (OL). 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 the GEIS. For these issues, the staff concluded in the GEIS that the impacts are SMALL except for the collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, as discussed below, and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

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

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

  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 offsite radiological impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

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

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

> assumptions are questionable. In particular, science cannot rule out the possibility that there will be no cancer fatalities from these tiny doses. For perspective, the doses are very small fractions of regulatory limits, and even smaller fractions of natural background exposure to the same populations.
>
> Nevertheless, despite all the uncertainty, some judgement as to the regulatory NEPA [National Environmental Policy Act] implications of these matters should be made and it makes no sense to repeat the same judgement in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the collective effects of the fuel cycle, this issue is considered Category 1.

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 offsite radiological impacts (collective effects) from the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

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

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

international bodies that the limits should be a fraction of the 100 millirem [1 mSv] per year. The lifetime individual risk from 100 millirem [1 mSv] annual dose limit is about 3×10^{-3}.

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

Nevertheless, despite all the uncertainty, some judgement as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgement in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR part 54 should be

eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent fuel and high level waste disposal, this issue is considered Category 1.

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

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

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

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

  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 nonradiological impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

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

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

  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 impacts of LLW storage and disposal associated with the renewal term beyond those discussed in the GEIS.

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

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

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

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 impacts of mixed waste storage and disposal associated with the renewal term beyond those discussed in the GEIS.

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

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

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 impacts of onsite spent fuel associated with license renewal beyond those discussed in the GEIS.

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

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

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 nonradiological waste impacts during the renewal term beyond those discussed in the GEIS.

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

> The impacts of transporting spent fuel enriched up to 5 percent uranium-235 with average burnup for the peak rod to current levels approved by NRC up to 62,000 MWd/MTU and the cumulative impacts of transporting high-level waste to a single repository, such as Yucca Mountain, Nevada are found to be consistent with the impact values contained in 10 CFR 51.52(c), Summary Table S–4–

> Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor. If fuel enrichment or burnup conditions are not met, the applicant must submit an assessment of the implications for the environmental impact values reported in § 51.52.

RNP meets the fuel-enrichment and burnup conditions set forth in Addendum 1 to the GEIS. 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 impacts of transportation associated with license renewal beyond those discussed in the GEIS.

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

6.2 References

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

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

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

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

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

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

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

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

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

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

National Academy of Sciences (NAS). 1995. *Technical Bases for Yucca Mountain Standards*. Washington, D.C.

U.S. Department of Energy (DOE). 1980. *Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste*. DOE/EIS-0046F, Washington, D.C.

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

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

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,

(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.

the staff concludes that there are no impacts related to these issues beyond those discussed in 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 Sections
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.

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 impacts of solid waste associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

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

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

  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 impacts of license-renewal on air quality during decommissioning beyond those discussed in the GEIS.

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

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

  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 impacts of the license-renewal term on water quality during decommissioning beyond those discussed in the GEIS.

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

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

  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 impacts of the license-renewal term on ecological resources during decommissioning beyond those discussed in the GEIS.

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

  > Decommissioning would have some short-term socioeconomic impacts. The impacts would not be increased by delaying decommissioning until the end of a 20-year relicense period, but they might be decreased by population and economic growth.

  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 impacts of license renewal on the socioeconomic impacts of decommissioning beyond those discussed in the GEIS.

7.1 References

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

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

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

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

8.0 Environmental Impacts of Alternatives to License Renewal

This chapter examines the potential environmental impacts associated with denying the renewal of the operating license (OL) (i.e., the no-action alternative); the potential environmental impacts from electric generating sources other than H.B. Robinson Steam Electric Plant, Unit 2 (RNP); the possibility of purchasing electric power from other sources to replace power generated by RNP and the associated environmental impacts; the potential environmental impacts from a combination of generating and conservation measures; and other generation alternatives that were deemed unsuitable for replacement of power generated by RNP. The environmental impacts are evaluated using the U.S. Nuclear Regulatory Commission's (NRC) three-level standard of significance – SMALL, MODERATE, or LARGE – developed using the Council on Environmental Quality guidelines and set forth in the footnotes to Table B-1 of 10 CFR 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.

The impact categories evaluated in this chapter are the same as those used in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999)[(a)] with the additional impact categories of environmental justice and transportation.

8.1 No-Action Alternative

The NRC's regulations [10 CFR Part 51, Subpart A, Appendix A(4)] implementing the National Environmental Policy Act (NEPA) specify that the no-action alternative be discussed in an NRC environmental impact statement (EIS). For license renewal, the no-action alternative refers to a scenario in which the NRC would not renew the OL for RNP, and Carolina Power and Light Company (CP&L) would then decommission RNP when plant operations cease.

(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.

CP&L will be required to comply with NRC decommissioning requirements whether or not the OL is renewed. If the RNP OL is renewed, decommissioning activities may be postponed for up to an additional 20 years. If the OL is not renewed, CP&L would conduct decommissioning activities according to the requirements in 10 CFR 50.82.

The environmental impacts associated with decommissioning under both license renewal and the no-action alternative would be bounded by the discussion of impacts in Chapter 7 of the GEIS, Chapter 7 of this supplemental environmental impact statement (SEIS), and Supplement 1 to the *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities* (NRC 2002). The impacts of decommissioning after 60 years of operation are not expected to be significantly different from those occurring after 40 years of operation.

The environmental impacts of the no-action alternative are summarized in Table 8-1 and are discussed in the following paragraphs. Implementation of the no-action alternative would also have certain positive impacts in that adverse environmental impacts associated with current operation of RNP (e.g., solid waste impacts and adverse impacts on aquatic life) would be eliminated.

The no-action alternative is a conceptual alternative resulting in a net reduction in power production, but with no environmental impacts assumed for replacement power. In actual practice, the power lost by not renewing the RNP OL would likely be replaced by (1) demand-side management (DSM) and energy conservation, (2) power purchased from other electricity providers, (3) generating alternatives other than RNP, or (4) some combination of these options. This replacement power would produce additional environmental impacts as discussed in Section 8.2.

- **Land Use**

Temporary changes in onsite land use could occur during decommissioning. Temporary changes may include addition or expansion of staging and laydown areas or construction of temporary buildings and parking areas. No offsite land-use changes are expected as a result of decommissioning. Following decommissioning, the land occupied by RNP would likely be retained by CP&L for other corporate purposes, especially since the coal-fired Robinson Unit 1 is located adjacent to Unit 2. Eventual sale or transfer of the land occupied by Unit 2, however, could result in changes to land use. Notwithstanding this possibility, the impacts of the no-action alternative on land use are considered SMALL.

Table 8-1. Summary of Environmental Impacts of the No-Action Alternative

Impact Category	Impact	Comment
Land Use	SMALL	Onsite impacts expected to be temporary. No offsite impacts expected.
Ecology	SMALL	Impacts to ecology are expected to be temporary and largely mitigatable using best management practices.
Water Use and Quality	SMALL	Water use will decrease. Water quality unlikely to be adversely affected.
Air Quality	SMALL	Greatest impact is likely to be from fugitive dust; impact can be mitigated by good management practices.
Waste	SMALL	Low-Level radioactive waste (LLW) will be disposed of in licensed facilities. A permanent disposal facility for high-level radioactive waste (HLW) is not currently available.
Human Health	SMALL	Radiological doses to workers and members of the public are expected to be within regulatory limits and comparable to, or lower than, doses from operating plants. Occupational injuries are possible, but injury rates at nuclear power plants are below the U.S. average industrial rate.
Socioeconomics	MODERATE	Decrease in employment in Darlington and surrounding counties and tax revenues in Darlington County.
Aesthetics	SMALL	Positive impact from eventual removal of buildings and structures. Some noise impact during decommissioning operations.
Historic and Archaeological Resources	SMALL	Minimal impact on land utilized during plant operations. Land occupied by RNP would likely be retained by CP&L for other corporate purposes.
Environmental Justice	MODERATE	Some loss of employment opportunities and social programs is expected.

- **Ecology**

At the Robinson site, impacts on aquatic ecology could result from removal of in-water pipes and structures or the filling of the intake and discharge canals. However, coal-fired Robinson Unit 1 shares the pipes and canals with Unit 2, so impacts would not necessarily occur under the no-action alternative. Any impacts to aquatic ecology would likely be short-term and could be mitigated. The aquatic environment is expected to recover naturally. Impacts on terrestrial ecology could occur as a result of land disturbance for additional laydown yards, stockpiles, and support facilities. Land disturbance is expected to be minimal and to result in relatively short-term impacts that can be mitigated using best management practices. The land is

expected to recover naturally. Overall, the ecological impacts associated with the no-action alternative are considered SMALL.

- **Water Use and Quality**

Cessation of plant operations would result in a significant reduction in water use because reactor cooling will no longer be required. As plant staff size decreases, the demand for potable water is expected to also decrease. Overall, water use and quality impacts of the no-action alternative are considered SMALL.

- **Air Quality**

Decommissioning activities that can adversely affect air quality include dismantlement of systems and equipment, demolition of buildings and structures, and the operation of internal combustion engines. The most likely adverse impact would be the generation of fugitive dust. Best management practices, such as seeding and wetting, can be used to minimize the generation of fugitive dust. Overall, air quality impacts associated with the no-action alternative are considered SMALL.

- **Waste**

Decommissioning activities would result in the generation of radioactive and nonradioactive waste. The volume of low-level waste (LLW) is related to the type and size of the plant, the length of time it operated, the decommissioning option chosen, and the waste treatment and volume reduction procedures used. LLW must be disposed of in a facility licensed by NRC or a state with authority delegated by NRC. Recent advances in volume reduction and waste processing have significantly reduced waste volumes. A permanent repository for high-level waste (HLW) is not currently available. The NRC has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent spent fuel storage installations [10 CFR 51.23(a)]. Disposal of nonradioactive waste would be at onsite and offsite licensed disposal facilities. Overall, waste impacts associated with the no-action alternative are considered SMALL.

- **Human Health**

Radiological doses to occupational workers during decommissioning activities are estimated to average approximately 5 percent of the dose limits in 10 CFR Part 20, and to be similar to, or lower than, the doses experienced by workers in operating nuclear power plants. Collective doses to members of the public and to the maximally exposed individual as a result of

decommissioning activities are estimated to be well below the limits in 10 CFR Part 20, and to be similar to, or lower than, the doses received from operating nuclear power plants. Occupational injuries to workers engaged in decommissioning activities are possible. However, historical injury and fatality rates at nuclear power plants have been lower than the average U.S. industrial rates. Overall, the human health impacts associated with the no-action alternative are considered SMALL.

- **Socioeconomics**

If RNP ceased operation at the end of its current OL, there would be a decrease in employment and tax revenues associated with the closure. Employment (primary and secondary) impacts and impacts on population would occur over a wide area. Employees working at RNP reside in a number of South Carolina counties; however, approximately 83 percent of employees live in Darlington and Florence Counties (CP&L 2002a). The no-action alternative would result in the loss of plant payrolls 20 years earlier than if the OL were renewed.

Tax-related impacts would occur in Darlington County and to a much lesser extent in Chesterfield County. Property tax payments made by CP&L to Darlington County for RNP constitute slightly less than 20 percent of the county's total property tax revenue (CP&L 2002a). The comparable percentage for Chesterfield County is less than 0.5 percent. The no-action alternative would result in the loss of the taxes attributable to RNP. There could also be an adverse impact on housing values and the local nearby economy if RNP were to cease operations.

Both Chapter 7 of the GEIS and Supplement 1 to NUREG-0586 (NRC 2002) note that socioeconomic impacts would be expected as a result of the decision to close a nuclear power plant, and that the direction and extent of the overall impacts would depend on the state of the economy, the net change in work force at the plant, and the changes in local government tax receipts. The socioeconomic impacts of decommissioning activities themselves is expected to be SMALL. Appendix J of Supplement 1 to NUREG-0586 (NRC 2002) shows that the overall socioeconomic impact of plant closure plus decommissioning could be greater than SMALL.

The staff has concluded that when the property tax revenue from a nuclear power plant comprises 10 to 20 percent of the tax revenue of a local jurisdiction, the socioeconomic impacts associated with the loss of the plant's tax revenue as a result of plant closure is considered MODERATE. The property taxes that CP&L pays for RNP comprises slightly less than 20 percent of total revenue of Darlington County; consequently, the socioeconomic impacts resulting from loss of this revenue are considered MODERATE.

CP&L employees working at RNP currently contribute time and money toward community involvement, including school, churches, charities, and other civic activities. It is likely that, with

a reduced presence in the community following decommissioning, community involvement efforts by CP&L and its employees in the region would be less.

- **Aesthetics**

Decommissioning would result in the eventual dismantlement of buildings and structures at the RNP site resulting in a positive aesthetic impact. Noise that may be detectable offsite would be generated during decommissioning operations; however, the impact is unlikely to be of large significance. Overall, the aesthetic impacts associated with the no-action alternative are considered SMALL.

- **Historic and Archaeological Resources**

The amount of undisturbed land needed to support the decommissioning process will be relatively small. Activities conducted within operational areas are not expected to have a detectable effect on important cultural resources because these areas have been impacted during the operating life of the plant. Minimal disturbance of land outside the licensee's operational area for decommissioning activities is expected. Historic and archaeological resources on undisturbed portions of the site are not expected to be adversely affected. Since CP&L has other generating plants at the Robinson site, the site would likely be retained by CP&L following decommissioning. Eventual sale or transfer of the site, however, could result in adverse impacts to cultural resources if the land-use pattern changes dramatically. Notwithstanding this possibility, the impacts of the no-action alternative on historic and archaeological resources are considered SMALL.

- **Environmental Justice**

Current operations at RNP have no disproportionate impacts on the minority and low-income populations of Darlington County and the surrounding counties, and no environmental pathways have been identified that would cause disproportionate impacts. Closure of RNP would result in decreased employment opportunities and tax revenues in Darlington County and the surrounding counties, with possible negative and disproportionate impacts on minority or low-income populations. The environmental justice impacts under the no-action alternative are considered MODERATE.

8.2 Alternative Energy Sources

This section discusses the environmental impacts associated with alternative sources of electric power to replace the power generated by RNP assuming that the OL is not renewed. The order of presentation of alternative energy sources in Section 8.2 does not imply which alternative

would be most likely to occur or to have the least environmental impacts. The following generation alternatives are considered in detail:

- coal-fired generation at the Robinson site and at an alternate greenfield[(a)] site (Section 8.2.1)
- natural-gas-fired generation at the Robinson site and at an alternate greenfield site (Section 8.2.2)
- nuclear generation at the Robinson site and at an alternate greenfield site (Section 8.2.3).

The alternative of purchasing power from other sources to replace power generated at RNP is discussed in Section 8.2.4. Other power generation alternatives and conservation alternatives considered by the staff and found not to be reasonable replacements for RNP are discussed in Section 8.2.5. Section 8.2.6 discusses the environmental impacts of a combination of generation and conservation alternatives.

Each year, the Energy Information Administration (EIA), a component of the U.S. Department of Energy (DOE), issues an Annual Energy Outlook. In its *Annual Energy Outlook 2002 with Projections to 2020,* EIA projects that combined-cycle[(b)] or combustion turbine technology fueled by natural gas is likely to account for approximately 88 percent of new electric generating capacity through the year 2020 (DOE/EIA 2001a). Both technologies are designed primarily to supply peak and intermediate capacity, but combined-cycle technology can also be used to meet baseload[(c)] requirements. Coal-fired plants are projected by EIA to account for approximately 9 percent of new capacity during this period. Coal-fired plants are generally used to meet baseload requirements. Renewable energy sources, primarily wind, geothermal, and municipal solid waste units, are projected by EIA to account for the remaining 3 percent of capacity additions. EIA's projections are based on the assumption that providers of new generating capacity will seek to minimize cost while meeting applicable environmental requirements. Combined-cycle plants are projected by EIA to have the lowest generation cost in 2005 and 2020, followed by coal-fired plants and then wind generation (DOE/EIA 2001a).

(a) A greenfield site is assumed to be an undeveloped site with no previous construction.
(b) In the combined-cycle unit, hot combustion gases in a combustion turbine rotate the turbine to generate electricity. Waste combustion heat from the combustion turbine is routed through a heat-recovery boiler to make steam to generate additional electricity.
(c) A baseload plant normally operates to supply all or part of the minimum continuous load of a system and consequently produces electricity at an essentially constant rate. Nuclear power plants are commonly used for baseload generation (i.e., these units generally run near full load).

DOE/EIA projects that oil-fired plants will account for very little new generation capacity in the United States through the year 2020 because of higher fuel costs and lower efficiencies (DOE/EIA 2001a).

It also projects that new nuclear power plants will not account for any new generation capacity in the United States through the year 2020 because natural gas and coal-fired plants are projected to be more economical (DOE/EIA 2001a). In spite of this projection, a new nuclear plant alternative for replacing power generated by RNP is considered for reasons stated in Section 8.2.3. NRC established a New Reactor Licensing Program Office in 2001 to prepare for and manage future reactor and site licensing applications (NRC 2001).

If an alternative generating technology were selected to replace power generated by RNP, the unit would be decommissioned. Environmental impacts associated with decommissioning are discussed in Section 8.1 and are not otherwise addressed in Section 8.2.

8.2.1 Coal-Fired Generation

The coal-fired alternative is analyzed for both the Robinson site and an alternate greenfield site. The staff assumed construction of a 585 megawatt electric (MW[e]) unit, which is consistent with CP&L's Environmental Report (ER) for RNP (CP&L 2002a).[(a)] This assumption will understate the impacts of replacing the 710 MW(e) from RNP by approximately 18 percent.

Unless otherwise indicated, the assumptions and numerical values used in Section 8.2.1 are from the CP&L ER. The staff reviewed this information and compared it to environmental impact information in the GEIS. Although the OL renewal period is only 20 years, the impact of operating the coal-fired alternative for 40 years is considered (as a reasonable projection of the operating life of a coal-fired plant).

The staff assumed that coal and lime or limestone for a coal-fired plant sited at the Robinson site would be delivered by railroad (CP&L 2002a). The Robinson site is served by an existing rail line that is used to deliver coal and lime to Robinson Unit 1. Lime or limestone is used in the scrubbing process for control of sulfur dioxide (SO_2)emissions.[(b)] Rail delivery would also be the most likely option for delivering coal and lime/limestone to an alternate greenfield site for the coal-fired plant. Barge delivery of coal and lime/limestone is potentially feasible for a

(a) The unit would have a rating of 608 gross MW and 585 net MW. The difference between "gross" and "net" is electricity consumed on the plant site.

(b) In a typical wet scrubber, lime (calcium hydroxide) or limestone (calcium carbonate) is injected as a slurry into the hot effluent combustion gases to remove entrained sulfur dioxide. The lime-based scrubbing solution reacts with sulfur dioxide to form calcium sulfite, which precipitates and is removed in sludge form.

coastal site or a site on a navigable river. A coal slurry pipeline is also a technically feasible delivery option; however, the associated cost and environmental impacts make a slurry pipeline an unlikely transportation alternative. Construction at an alternate site could necessitate the construction of a new transmission line to connect to existing lines and a rail spur to the plant site.

The coal-fired plant is assumed to utilize tangentially fired, dry-bottom boilers and to consume bituminous, pulverized coal with an ash content of approximately 8.7 percent by weight (CP&L 2002a). Annual coal consumption would be approximately 1.67 million MT/yr (1.84 million tons/yr) (CP&L 2002a). In its ER, CP&L assumed a heat rate[(a)] of 3 J fuel/J electricity (10,200 Btu/kWh) and a capacity factor[(b)] of 0.85. After combustion, 99.9 percent of the ash (approximately 145,000 MT/yr [160,000 tons/yr]) would be collected and disposed of at the plant site. In addition, approximately 101,000 MT/yr (111,000 tons/yr) of scrubber sludge would be disposed of at the plant site (CP&L 2002a).

8.2.1.1 Once-Through Cooling System

For purposes of this SEIS, the staff assumed that a coal-fired plant located at the Robinson site would use the existing Lake Robinson cooling-pond/impoundment as a source of cooling. An alternate greenfield site could use either a closed-cycle or a once-through cooling system. The overall impacts are discussed in the following sections and summarized in Table 8-2. The extent of impacts at an alternate site would depend on the location of the particular site.

- **Land Use**

  The existing facilities and infrastructure at the Robinson site would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, the staff assumed that the coal-fired replacement plant alternative would use the existing once-through cooling system, switchyard, offices, and transmission line rights-of-way.

  Construction of the powerblock and coal storage area would impact approximately 50 ha (120 ac). Disposal of ash and scrubber waste would impact an additional approximately 60 ha (145 ac) assuming a 40-year operating life for the plant. Additional land-use changes

(a) Heat rate is a measure of generating station thermal efficiency. In English units, it is generally expressed in British thermal units (Btu) per net kilowatt-hour (kWh). It is computed by dividing the total Btu content of fuel burned for electric generation by the resulting net kWh generation. A corresponding metric unit for energy is the joule (J).

(b) The capacity factor is the ratio of electricity generated, for the period of time considered, to the energy that could have been generated at continuous full-power operation during the same period.

Table 8-2. Summary of Environmental Impacts of Coal-Fired Generation Using Once-Through Cooling at the Robinson Site and an Alternate Greenfield Site

	Robinson Site		Alternate Greenfield Site	
Category Impact	**Impact**	**Comment**	**Impact**	**Comment**
Land Use	MODERATE	Uses approximately 110 ha (265 ac) of unused Robinson site land for plant, infrastructure, and waste disposal. Additional offsite land impacts for coal and limestone mining.	MODERATE to LARGE	Uses up to 400 ha (1000 ac) for plant, infrastructure, and waste disposal; additional land impacts for coal and limestone mining; possible impacts for transmission line and rail spur.
Ecology	MODERATE	Uses undeveloped areas at RNP. Potential habitat loss and fragmentation and reduced productivity and biological diversity.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission line route; potential habitat loss and fragmentation; reduced productivity and biological diversity.
Water Use and Quality (Surface)	SMALL	Uses existing once-through cooling system.	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body.
Water Use and Quality (Groundwater)	SMALL	Existing wells would likely continue to be used.	SMALL to MODERATE	Impacts would be site dependent.
Air Quality	MODERATE	Sulfur oxides • 1842 MT (2031 tons) Nitrogen oxides • 405 MT/yr (447 tons/yr) Particulates • 72 MT/yr (80 tons/yr) of total suspended particulates, which would include 16 MT/yr (18 tons/yr) of PM_{10} Carbon monoxide • 418 MT/yr (461 tons/yr) Small amounts of mercury and other hazardous air pollutants and naturally occurring radioactive materials – mainly uranium and thorium	MODERATE	Potentially same impacts as the Robinson site, although emission control standards may vary.

Table 8-2. (contd)

	Robinson Site		Alternate Greenfield Site	
Category Impact	**Impact**	**Comment**	**Impact**	**Comment**
Waste	MODERATE	Total waste volume would be approximately 246,000 MT/yr (271,000 tons/yr) of ash, spent catalyst, and scrubber sludge requiring approximately 60 ha (145 ac) for disposal during the 40-year life of the plant.	MODERATE	Same impacts as Robinson site; waste disposal constraints may vary.
Human Health	SMALL	Impacts are uncertain, but considered SMALL in the absence of more quantitative data.	SMALL	Same impacts as Robinson site.
Socioeconomics	MODERATE to LARGE	During construction, impacts would be MODERATE. Up to 800 workers during the peak of the construction period, followed by reduction from current RNP work force of 520 to 110. Tax base preserved. Impacts during operation would be SMALL. Transportation impacts associated with construction workers could be MODERATE to LARGE. Rail transportation of coal and lime/limestone would result in MODERATE impacts.	MODERATE to LARGE	Construction impacts depend on location, but could be LARGE if plant is located in a rural area. Up to 800 workers during the peak of the construction period. Darlington County would experience loss of Unit 2 tax base and employment with potentially MODERATE impacts. Impacts during operation would be SMALL. Transportation impacts associated with construction workers could be MODERATE to LARGE. For rail transportation of coal and lime/limestone, the impact is considered MODERATE. For barge transportation, the impact is considered SMALL.

Table 8-2. (contd)

	Robinson Site		Alternate Greenfield Site	
Category Impact	**Impact**	**Comment**	**Impact**	**Comment**
Aesthetics	MODERATE	Exhaust stack will be highly visible from offsite locations. Noise associated with rail transportation of coal and lime/limestone would have a MODERATE aesthetic impact. Noise impact from plant operations would be MODERATE.	MODERATE to LARGE	Impacts would depend on the site selected and the surrounding land features. If needed, a new transmission line or rail spur could have a LARGE aesthetic impact. Noise associated with rail transportation of coal and lime/limestone would have a MODERATE aesthetic impact. Barge transportation of coal and lime/limestone would have a SMALL aesthetic impact. Noise impact from plant operations would be MODERATE.
Historic and Archaeological Resources	SMALL	Some construction would affect previously developed parts of Robinson site; cultural resource inventory should minimize any impacts on undeveloped lands.	SMALL	Alternate location would necessitate cultural resource studies.
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction; loss of 410 operating jobs at RNP could reduce employment prospects for minority and low-income populations.	SMALL to LARGE	Impacts at alternate site vary depending on population distribution and makeup at site. Darlington County would lose tax revenue, which could have a MODERATE impact on minority and low-income populations.

would occur offsite in an undetermined coal-mining area to supply coal for the plant. In the GEIS, the staff estimated that approximately 8900 ha (34 mi^2) would be affected for mining the coal and disposing of the waste to support a 1000-MW(e) coal plant during its operational life (NRC 1996). A replacement coal-fired plant to replace the 710 MW(e) capacity of RNP would affect proportionately less land. Partially offsetting this offsite land use would be the elimination of the need for uranium mining and processing to supply fuel for RNP. In the GEIS, the staff estimated that approximately 400 ha (1000 ac) would be affected for mining and processing the uranium during the operating life of a 1000 MW(e) nuclear power plant (NRC 1996).

The impact of a coal-fired generating unit on land use at the Robinson site is best characterized as MODERATE. The impact would definitely be greater than the alternative of renewing the OL.

In the GEIS, the staff estimated that a 1000-MW(e) coal-fired plant and associated facilities would require approximately 700 ha (1700 ac) (NRC 1996). A 585-MW(e) coal-fired generation alternative at an alternate site would require proportionately less land. Additional land could be needed for a transmission line and for a rail spur to the plant site. Depending particularly on transmission line and rail line routing requirements, this alternative would result in MODERATE to LARGE land-use impacts.

- **Ecology**

Locating a coal-fired plant at the Robinson site would alter ecological resources because of the need to convert land that is currently unused to industrial use for the plant, coal storage, and waste disposal. However, much of this land would have been previously disturbed. Siting a coal-fired plant at the Robinson site would have a MODERATE ecological impact that would be greater than renewal of the RNP OL.

At an alternate site, the coal-fired generation alternative would introduce construction impacts and new incremental operational impacts. Even assuming siting at a previously disturbed area, the impacts would alter the ecology. Impacts could include wildlife habitat loss, reduced productivity, habitat fragmentation, and a local reduction in biological diversity. Use of cooling makeup water from a nearby surface water body could have adverse aquatic resource impacts. If needed, construction and maintenance of a transmission line and a rail spur would have ecological impacts. Overall, the ecological impacts at an alternate site would be MODERATE to LARGE.

- **Water Use and Quality**

Surface Water. The coal-fired generation alternative at the Robinson site is assumed to use the existing once-through cooling system, which would minimize incremental water use and quality impacts. The staff assumed that an alternative coal-fired plant located at the Robinson site would follow the current practice of obtaining process and fire-protection water from Lake Robinson and potable water from the Darlington County Water and Sewer Authority (CP&L 2002a). Some erosion and sedimentation would likely occur during construction (NRC 1996). Overall, surface water use and quality impacts are expected to remain SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

For a coal-fired plant located at an alternate greenfield site, impacts on surface water would depend on the discharge volume and the characteristics of the receiving body of water.

Intake from and discharge to any surface body of water would be regulated by the State. Impacts on surface water use and quality are considered SMALL to MODERATE.

Groundwater. An alternative coal-fired plant located at the Robinson site would likely continue to use the five groundwater wells that currently supply limited special uses at the Robinson site. Wastes could potentially leach to groundwater. Overall, however, groundwater impacts are expected to remain SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

Groundwater withdrawal at an alternate site could require a permit. The impacts of groundwater withdrawal would be site specific and dependent on recharge rate and other withdrawal rates from the aquifer. Overall, groundwater use and quality impacts are considered SMALL to MODERATE.

- **Air Quality**

The air-quality impacts of coal-fired generation vary considerably from those of nuclear generation due to emissions of sulfur oxides (SO_x), nitrogen oxides (NO_x), particulates, carbon monoxide, hazardous air pollutants such as mercury, and naturally occurring radioactive materials.

Darlington County, which is in the Florence Intrastate Air Quality Control Region, is in compliance with the national ambient air quality standards for criteria pollutants (40 CFR 81.341).[(a)]

A new coal-fired generating plant located at the Robinson site would likely need a prevention of significant deterioration (PSD) permit issued under Title I Part C of the Clean Air Act and an operating permit issued under Title V of the Clean Air Act. The plant would need to comply with the new source performance standards for such plants set forth in 40 CFR Part 60 Subpart Da. These regulations establish limits for particulate matter and opacity (40 CFR 60.42a), SO_2 (40 CFR 60.43a), and NO_x (40 CFR 60.44a).

The U.S. Environmental Protection Agency (EPA) has various regulatory requirements for visibility protection in 40 CFR 51 Subpart P, including a specific requirement for review of any new major stationary source in an area designated as attainment or unclassified under the Clean Air Act. Darlington County is classified as in attainment or unclassified for criteria pollutants.

(a) Existing criteria pollutants under the Clean Air Act are ozone, carbon monoxide, particulates, sulfur dioxide, lead, and nitrogen oxide. Ambient air standards for criteria pollutants are set out at 40 CFR Part 50.

Section 169A of the Clean Air Act (42 USC 7401) establishes a national goal of preventing future and remedying existing impairment of visibility in mandatory Class I Federal areas when impairment results from man-made air pollution. In addition, the EPA issued a new regional haze rule in 1999 (64 FR 35714; July 1,1999 [EPA 1999]). The rule specifies that for each mandatory Class I Federal area located within a state, the state must establish goals that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most-impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period [40 CFR 51.308(d)(1)]. If a new coal-fired power station were located close to a mandatory Class I area, additional air pollution control requirements could be imposed. The mandatory Class I Federal area closest to the Robinson site is the Cape Romain Wilderness located approximately 153 km (95 mi) southeast (40 CFR 81.426).

In 1998, the EPA issued a rule requiring 22 eastern states, including South Carolina, to revise their state implementation plans to reduce NO_x emissions. Nitrogen oxide emissions contribute to violations of the national ambient air quality standard for ozone (40 CFR 50.9). The total amount of NO_x that can be emitted by each of the 22 states in the year 2007 ozone season (May 1 through September 30) is set out at 40 CFR 51.121(e). Any new coal-fired plant sited in South Carolina would be subject to this limitation. For South Carolina, the amount is 111,656 MT (123,105 tons).

Impacts for specific pollutants are as follows:

Sulfur oxides. CP&L states in its ER that an alternative coal-fired plant located at the Robinson site would use wet scrubber technology utilizing lime/limestone for flue gas desulfurization (CP&L 2002a).

A new coal-fired power plant would be subject to the requirements in Title IV of the Clean Air Act. Title IV was enacted to reduce emissions of SO_2 and NO_x, the two principal precursors of acid rain, by restricting emissions of these pollutants from power plants. Title IV caps aggregate annual power plant SO_2 emissions and imposes control on SO_2 emissions through a system of marketable allowances. EPA issues one allowance for each ton of SO_2 that a unit is allowed to emit. New units do not receive allowances but are required to have allowances to cover their SO_2 emissions. Owners of new units must therefore acquire allowances from owners of other power plants by purchase or reduce SO_2 emissions at other power plants they own. Allowances can be banked for use in future years. Thus, a new coal-fired power plant would not add to net regional SO_2 emissions, although it might do so locally. Regardless, SO_2 emissions would be greater for the coal alternative than the OL renewal alternative since a nuclear power plant releases almost no SO_2 during normal operations.

CP&L estimates that by using the best technology to minimize SO_2 emissions, the total annual stack emissions would be approximately 1842 MT (2031 tons) of SO_2 (CP&L 2002a).

Nitrogen oxides. Section 407 of the Clean Air Act establishes technology-based emission limitations for NO_x emissions. The market-based allowance system used for SO_2 emissions is not used for NO_x emissions. A new coal-fired power plant would be subject to the new source performance standards for such plants at 40 CFR 60.44a(d)(1). This regulation, issued on September 16, 1998 (63 FR 49453 [EPA 1998]), limits the discharge of any gases that contain nitrogen oxides (expressed as NO_2) in excess of 200 ng/J of gross energy output (1.6 lb/MWh), based on a 30-day rolling average.

CP&L estimates that by using low NO_x burners, overfire air, and selective catalytic reduction with steam/water injection, the total annual NO_x emissions for a new coal-fired power plant would be approximately 405 MT (447 tons) or approximately 12 percent of the new source performance standard emission rate (CP&L 2002a). Regardless of control technology, the level of NO_x emissions would be greater than the OL renewal alternative since a nuclear power plant releases almost no NO_x during normal operations.

Particulates. CP&L estimates that the total annual stack emissions would include 72 MT (80 tons) of filterable total suspended particulates (particulates that range in size from less than 0.1 micrometer [μm] up to approximately 45 μm). The 72 MT (80 tons) would include 16 MT (18 tons) of PM_{10} (particulate matter having an aerodynamic diameter less than or equal to 10 μm). Fabric filters or electrostatic precipitators would be used for control (CP&L 2002a). In addition, coal-handling equipment would introduce fugitive particulate emissions. Particulate emissions would be greater under the coal alternative than the OL renewal alternative since a nuclear power plant releases few particulates during normal operations.

During the construction of a coal-fired plant, fugitive dust would be generated. In addition, exhaust emissions would come from vehicles and motorized equipment used during the construction process.

Carbon monoxide. CP&L estimates that the total carbon monoxide emissions would be approximately 418 MT (461 tons) per year (CP&L 2002a). This level of emissions is greater than the OL renewal alternative.

Hazardous air pollutants including mercury. In December 2000, the EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (EPA 2000b). The EPA determined that coal- and oil-fired electric utility steam-generating units are significant emitters of hazardous air pollutants. Coal-fired power plants were found by EPA to emit arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, hydrogen fluoride, lead, manganese, and mercury (EPA 2000b). The EPA concluded that mercury is the hazardous air pollutant of greatest concern. The EPA found that (1) there is

a link between coal utilization and mercury emissions, (2) electric utility steam-generating units are the largest domestic source of mercury emissions, and (3) certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures resulting from consumption of contaminated fish (EPA 2000b). Accordingly, EPA added coal- and oil-fired electric utility steam-generating units to the list of source categories under Section 112(c) of the Clean Air Act for which emission standards for hazardous air pollutants will be issued (EPA 2000b).

Uranium and thorium. Coal contains uranium and thorium. Uranium concentrations are generally in the range of 1 to 10 parts per million. Thorium concentrations are generally about 2.5 times greater than uranium concentrations (Gabbard 1993). One estimate is that a typical coal-fired plant had an annual release of approximately 4.7 MT (5.2 tons) of uranium and 11.6 MT (12.8 tons) of thorium in 1982 (Gabbard 1993). The population dose equivalent from the uranium and thorium releases and daughter products produced by the decay of these isotopes has been calculated to be significantly higher than that from nuclear power plants (Gabbard 1993).

Carbon dioxide. A coal-fired plant would also have unregulated carbon dioxide emissions that could contribute to global warming.

Summary. The GEIS analysis did not quantify emissions from coal-fired power plants but implied that air impacts would be substantial. The GEIS also mentioned global warming from unregulated carbon dioxide emissions and acid rain from SO_x and NO_x emissions as potential impacts (NRC 1996). Adverse human health effects from coal combustion such as cancer and emphysema have been associated with the products of coal combustion. The appropriate characterization of air impacts from coal-fired generation would be MODERATE. The impacts would be clearly noticeable, but would not destabilize air quality.

Siting a coal-fired generation plant at a location other than the Robinson site would not significantly change air-quality impacts, although it could result in installing more or less stringent pollution-control equipment to meet applicable local requirements. The plant would need to meet applicable new source performance standards. Siting in an area that is in compliance with national ambient air quality standards would likely require a PSD permit. Siting in an area not in attainment with national ambient air quality standards would likely require a nonattainment permit under Title I Part D of the Clean Air Act. An air operating permit would likely be needed at either type of location. Overall, the air quality impacts would be MODERATE.

- **Waste**

  Coal combustion generates waste in the form of ash, and equipment for controlling air pollution generates additional ash, spent selective catalytic reduction (SCR) catalyst, and scrubber sludge. A 585-MW(e) coal-fired plant would generate approximately 246,000 MT (271,000 tons) of this waste annually. The ash and scrubber sludge would be disposed of onsite, accounting for approximately 59 ha (145 ac) of land area over the 40-year plant life. Spent SCR catalyst would be regenerated or disposed of offsite. Waste impacts to groundwater and surface water could extend beyond the operating life of the plant if leachate and runoff from the waste storage area occurs. Disposal of the waste could noticeably affect land use and groundwater quality but, with appropriate management and monitoring, it would not destabilize any resources. After closure of the waste site and revegetation, the land could be available for other uses.

  In May 2000, the EPA issued a "Notice of Regulatory Determination on Wastes From the Combustion of Fossil Fuels" (EPA 2000a). The EPA concluded that some form of national regulation is warranted to address coal combustion waste products because (1) the composition of these wastes could present danger to human health and the environment under certain conditions; (2) EPA has identified 11 documented cases of proven damages to human health and the environment by improper management of these wastes in landfills and surface impoundments; (3) present disposal practices are such that, in 1995, these wastes were being managed in 40 to 70 percent of landfills and surface impoundments without reasonable control in place, particularly in the area of groundwater monitoring; and (4) EPA identified gaps in state oversight of coal combustion wastes. Accordingly, EPA announced its intention to issue regulations for disposal of coal combustion waste under subtitle D of the Resource Conservation and Recovery Act.

  Construction-related debris would be generated during construction activities.

  For all of the preceding reasons, the appropriate characterization of impacts from waste generated from burning coal is MODERATE; the impacts would be clearly noticeable but would not destabilize any important resource.

  Siting the coal-fired plant at a location other than the Robinson site would not alter waste generation, although other sites might have more constraints on disposal locations. Therefore, the impacts would be MODERATE.

- **Human Health**

  Coal-fired power generation introduces worker risks from coal and limestone mining, worker and public risks from coal and lime/limestone transportation, worker and public risks from disposal of coal combustion wastes, and public risks from inhalation of stack emissions.

Emission impacts can be widespread, and health risks can be difficult to quantify. The coal alternative also introduces the risk of coal-pile fires and attendant inhalation risks.

The staff stated in the GEIS that there could be human health impacts (cancer and emphysema) from inhalation of toxins and particulates from a coal-fired plant, but did not identify the significance of these impacts (NRC 1996). In addition, the discharges of uranium and thorium from coal-fired plants can potentially produce radiological doses in excess of those arising from nuclear power plant operations (Gabbard 1993).

Regulatory agencies, including the EPA and State agencies, set air emission standards and requirements based on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health. As discussed previously, the EPA has recently concluded that certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures from sources such as coal-fired power plants. However, in the absence of more quantitative data, human health impacts from radiological doses and inhaling toxins and particulates generated by burning coal at a newly constructed coal-fired plant are characterized as SMALL.

- **Socioeconomics**

Construction of a coal-fired alternative would take approximately 3 years. The staff assumed that construction would take place while RNP continues operation and would be completed by the time RNP permanently ceases operations. The staff estimates that the work force would be up to 800 workers during the construction period. These workers would be in addition to the approximately 520 workers employed at RNP and additional workers at Robinson Unit 1 and the Darlington County Internal Combustion Turbine Electric Plant. During construction of the new coal-fired plant, communities near Robinson site would experience demands on housing and public services that could have MODERATE impacts. These impacts would be tempered because workers could commute to the site from Florence, Columbia, and other communities. After construction, the nearby communities would be impacted by the loss of the construction jobs. CP&L estimates that the completed coal plant would employ approximately 110 workers (CP&L 2002a).

If a coal-fired replacement plant were constructed at the Robinson site and Unit 2 were decommissioned, there would be a loss of approximately 410 permanent, high-paying jobs (520 for Unit 2 down to 110 for the coal-fired plant), with a commensurate reduction in demand on socioeconomic resources and contributions to the regional economy. The coal-fired plant would provide a new tax base to offset the loss of tax base associated with decommissioning of the nuclear unit. For all of these reasons, the appropriate characterization of nontransportation socioeconomic impacts for an operating coal-fired

plant constructed at the Robinson site would be MODERATE; the socioeconomic impacts would be noticeable but would be unlikely to destabilize the area.

During the construction period for a replacement coal-fired plant, the 800 construction workers would place significant traffic loads on existing highways near the Robinson site. Such impacts would be MODERATE to LARGE.

For transportation related to commuting of plant operating personnel, the impacts are considered SMALL. The maximum number of plant operating personnel would be approximately 110. The current work force for RNP is approximately 520. Therefore, traffic impacts associated with plant personnel commuting to a coal-fired plant would be expected to be SMALL compared to the current impacts from RNP operations.

The Robinson site is served by an existing rail spur that would be used to deliver coal and lime/limestone for a replacement coal-fired plant. Socioeconomic impacts associated with rail transportation, such as delays at rail crossings, would likely be MODERATE.

Construction of a replacement coal-fired power plant at an alternate site would relocate some socioeconomic impacts but not eliminate them. The communities around the Robinson site would experience the impact of RNP operational job loss, and Darlington County would lose some of its tax base. These losses would have MODERATE socio-economic impacts, given the proportion of the tax base in these jurisdictions attributable to RNP. Communities around the alternate site would have to absorb the impacts of a substantial, temporary work force (up to 800 workers at the peak of construction) and a permanent work force of approximately 110 workers. The staff stated in the GEIS that socioeconomic impacts at a rural site would be larger than at an urban site, because more of the peak construction work force would need to move to the area to work (NRC 1996). Alternate greenfield sites would need to be analyzed on a case-by-case basis. Socioeconomic impacts at a rural site could be MODERATE to LARGE. Transportation-related impacts associated with commuting construction workers at an alternate site are site dependent, but could be MODERATE to LARGE. Transportation impacts related to commuting of plant operating personnel would also be site-dependent but can be characterized as SMALL to MODERATE.

Coal and lime/limestone would likely be delivered by rail, although barge delivery is feasible for an alternate site located on a navigable body of water. Socioeconomic impacts associated with rail transportation would likely be MODERATE. Barge delivery of coal and lime/limestone would likely have SMALL socioeconomic impacts.

For siting at the Robinson site or at an alternate site, socioeconomic impacts would also occur at the site of coal mining.

- **Aesthetics**

The coal-fired power block could be as much as 60 m (200 ft) tall and would be visible from offsite during daylight hours. The exhaust stack, which could be as much as 185 m (600 ft) high, would likely be highly visible in daylight hours for distances greater than 16 km (10 mi). The plant and associated stack would also be visible at night because of outside lighting and aircraft warning lights. The U.S. Federal Aviation Administration (FAA) generally requires that all structures exceeding an overall height of 61 m (200 ft) above ground level have markings and/or lighting so as not to impair aviation safety (FAA 2000). Visual impacts of a new coal-fired plant could be mitigated by landscaping and color selection for buildings that is consistent with the environment. Visual impact at night could be mitigated by reduced use of lighting, provided the lighting meets FAA requirements, and appropriate use of shielding. Overall, the addition of the coal-fired unit and the associated exhaust stack at the Robinson site would likely have a MODERATE aesthetic impact.

Coal-fired generation would introduce mechanical sources of noise that would be audible offsite. Sources contributing to total noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the equipment related to coal handling, solid-waste disposal, transportation related to coal and lime/limestone delivery, use of outside loudspeakers, and the commuting of plant employees. The incremental noise impacts of a coal-fired plant compared to those from operations at the existing Robinson Units 1 and 2 are considered to be MODERATE.

At an alternate greenfield site, there would be an aesthetic impact from the buildings and exhaust stack. There would be an aesthetic impact that could be LARGE if construction of a new transmission line and/or rail spur is needed. Noise impacts associated with rail delivery of coal and lime/limestone would be most significant for residents living in the vicinity of the facility and along the rail route. Although noise from passing trains significantly raises noise levels near the rail corridor, the short duration of the noise reduces the impact. Nevertheless, given the frequency of train transport and the fact that many people are likely to be within hearing distance of the rail route, the impacts of noise on residents in the vicinity of the facility and the rail line is considered MODERATE. Noise associated with barge transportation of coal and lime/limestone would be SMALL. Noise and light from the plant would be detectable offsite. Aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power plants. Overall, the aesthetic impacts associated with locating at an alternate site can be categorized as MODERATE to LARGE.

- **Historic and Archaeological Resources**

  At the Robinson site or an alternate site, a cultural resources inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

  Before construction at the Robinson site or at an alternate greenfield site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission line rights-of-way, rail lines, or other rights-of-way). Historic and archaeological resource impacts can generally be effectively managed and as such are considered SMALL.

- **Environmental Justice**

  No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement coal-fired plant were built at the Robinson site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. Closure of RNP would result in a decrease in employment of approximately 410 operating employees. Resulting economic conditions could reduce employment prospects for minority or low-income populations. Overall, impacts are expected to be SMALL to MODERATE.

  Impacts at other sites would depend upon the site chosen and the nearby population distribution. If a replacement coal-fired plant were constructed at an alternate site, Darlington County would experience a loss of property tax revenue, which could affect its ability to provide services and programs. Property tax payments made by CP&L to Darlington County for RNP constitute slightly less than 20 percent of the County's total property tax revenue (CP&L 2002a). Impacts to minority and low-income populations could be SMALL to LARGE depending on site characteristics.

8.2.1.2 Closed-Cycle Cooling System

The environmental impacts of constructing a coal-fired generation system at an alternate greenfield site using closed-cycle cooling with cooling towers are essentially the same as the impacts for a coal-fired plant using the once-through system. However, there are some

environmental differences between the closed-cycle and once-through cooling systems. Table 8-3 summarizes the incremental differences.

Table 8-3. Summary of Environmental Impacts of Coal-Fired Generation at an Alternate Greenfield Site with Closed-Cycle Cooling Utilizing Cooling Towers

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	An additional 10 to 12 ha (25 to 30 ac) required for cooling towers and associated infrastructure.
Ecology	Impact would depend on ecology at the site. Additional impact to terrestrial ecology from cooling tower drift. Reduced impact to aquatic ecology.
Surface Water Use and Quality	Discharge of cooling tower blowdown containing dissolved solids. Discharge would be regulated by the State. Decreased water withdrawal and less thermal load on receiving body of water.
Groundwater Use and Quality	Potential impacts on groundwater quality are possible due to leaching from cooling ponds.
Air Quality	No change
Waste	No change
Human Health	No change
Socioeconomics	No change
Aesthetics	Introduction of cooling towers and associated plumes. Natural draft towers could be up to 158 m (520 ft) high. Mechanical draft towers could be up to 30 m (100 ft) high and also have an associated noise impact from motor and fan operation.
Historic and Archaeological Resources	Additional land impacted
Environmental Justice	No change

8.2.2 Natural-Gas-Fired Generation

The environmental impacts of the natural-gas-fired alternative are examined in this section for both the Robinson site and an alternate greenfield site. For the Robinson site, the staff assumed that the plant would use the existing once-through cooling system.

There is an existing natural gas pipeline to the Robinson site that provides gas for CP&L's Darlington County Internal Combustion Turbine Electric Plant, which is located approximately 1.7 km (1 mi) north of RNP. Approximately 2.4 km (1.5 mi) of new pipeline construction would be required to connect a replacement natural gas plant to the existing pipeline network connection at the Darlington County Plant (CP&L 2002a). It may also be necessary to upgrade the connection from the Darlington County Plant to the State-wide pipeline network. In its ER, CP&L states that it would ensure natural-gas availability for a replacement natural-gas-fired plant through its holding company, Progress Energy, Inc. (CP&L 2002a).

If a new natural-gas-fired plant were built elsewhere to replace RNP, a new transmission line could need to be constructed to connect to existing lines. In addition, construction or upgrade of a natural gas pipeline from the plant to a supply point where a firm supply of gas would be available could be needed.

The staff assumed that a replacement natural-gas-fired plant would use combined-cycle combustion turbines (CP&L 2002a). The following additional assumptions are made for the natural-gas-fired plant (CP&L 2002a):

- 585-MW(e) unit consisting of two 189-MW combustion turbines and a 207-MW heat recovery boiler
- natural gas with an average heating value of 38 MJ/m^3 (1025 Btu/ft^3) as the primary fuel
- heat rate of 1.8 J fuel/J electricity (6200 Btu/kWh)
- capacity factor of 0.85.

Unless otherwise indicated, the assumptions and numerical values used throughout this section are from the RNP ER (CP&L 2002a). The staff reviewed this information and compared it to environmental impact information in the GEIS. Although the OL renewal period is only 20 years, the impact of operating the natural-gas-fired alternative for 40 years is considered (as a reasonable projection of the operating life of a natural-gas-fired plant).

8.2.2.1 Once-Through Cooling System

The overall impacts of the natural gas generating system are discussed in the following sections and summarized in Table 8-4. The extent of impacts at an alternate site will depend on the location of the particular site selected.

Table 8-4. Summary of Environmental Impacts of Natural-Gas-Fired Generation Using Once-Through Cooling at the Robinson Site and at an Alternate Greenfield Site

	Robinson Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
Land Use	MODERATE	20 ha (50 ac) for powerblock, roads, and parking areas. Additional impact for construction of an underground gas pipeline.	MODERATE to LARGE	26 ha (65 ac) for power- block, offices, roads, switchyard, and parking areas. Additional land possibly impacted for transmis-sion line and/or natural gas pipeline.
Ecology	SMALL to MODERATE	Uses undeveloped areas at the Robinson site plus land for a new gas pipeline.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and possible transmission and pipeline routes; potential habitat loss and fragmentation; reduced productivity and biological diversity.
Water Use and Quality (Surface)	SMALL	Uses existing once-through cooling system	SMALL to MODERATE	Impact depends on volume of water withdrawal and discharge and characteristics of surface water body.
Water Use and Quality (Groundwater)	SMALL	Existing wells would likely continue to be used.	SMALL to MODERATE	Impacts would be site dependent.
Air Quality	MODERATE	Sulfur oxides • 44 MT/yr (48 tons/yr) Nitrogen oxides • 139 MT/yr (153 tons/yr) Carbon monoxide • 29 MT/yr (32 tons/yr) PM_{10} particulates • 24 MT/yr (27 tons/yr) Some hazardous air pollutants	MODERATE	Same emissions as Robinson site

Table 8-4. (contd)

	Robinson Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
Waste	SMALL	The only significant solid waste would be spent SCR catalyst used for control of NO_x emissions.	SMALL	The only significant solid waste would be spent SCR catalyst used for control of NO_x emissions.
Human Health	SMALL	Impacts considered to be minor.	SMALL	Impacts considered to be minor.
Socioeconomics	MODERATE	During construction, impacts would be MODERATE. Up to 500 additional workers during the peak of the 2-year construction period, followed by reduction from current RNP work force of 520 to 25; tax base preserved. Impacts during operation would be SMALL. Transportation impacts associated with construction workers would be MODERATE.	MODERATE	During construction, impacts would be MODERATE. Up to 500 additional workers during the peak of the 2-year construction period. Darlington County would experience loss of RNP tax base and employment with potentially MODERATE impacts. Impacts during operation would be SMALL. Transportation impacts associated with construction workers would be MODERATE.
Aesthetics	MODERATE	Exhaust stacks will be visible from offsite locations.	MODERATE to LARGE	Impact would depend on the site selected and the surrounding land features. If needed, a new electric power transmission line could have a LARGE aesthetic impact.
Historic and Archaeological Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Same as Robinson site; any potential impacts can likely be effectively managed.
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction; loss of 495 operating jobs at RNP could reduce employment prospects for minority and low-income populations.	SMALL to MODERATE	Impacts at alternate site vary depending on population distribution and makeup at site. Darlington County would lose tax revenue, which could have MODERATE impacts on minority and low-income populations.

- **Land Use**

  For siting at the Robinson site, existing facilities and infrastructure would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, the staff assumed that the natural-gas-fired replacement plant alternative would use the existing once-through cooling system, switchyard, offices, and transmission line rights-of-way. At the Robinson site, approximately 20 ha (50 ac) would be needed for the

plant and associated infrastructure. There would be an additional land-use impact if construction of a new natural gas pipeline to the plant site is needed. CP&L estimates that approximately 5.5 ha (13.5 ac) would be impacted to connect a new gas-fired plant located at the Robinson site to the natural gas pipeline at the Darlington County Internal Combustion Turbine Electric Plant (CP&L 2002a). Additional land would be impacted if it is necessary to construct a pipeline to the State-wide natural gas pipeline network.

For construction at an alternate greenfield site, the staff assumed that 26 ha (65 ac) would be needed for the plant and associated infrastructure (NRC 1996). Additional land could be impacted for construction of a transmission line and/or natural gas pipeline to serve the plant. For any new natural-gas-fired power plant, additional land would be required for natural gas wells and collection stations. In the GEIS, the staff estimated that approximately 1500 ha (3600 ac) would be needed for a 1000-MW(e) plant (NRC 1996). Proportionately less land would be needed for a natural-gas-fired plant replacing the 710 MW(e) generated by RNP. Partially offsetting these offsite land requirements would be the elimination of the need for uranium mining and processing to supply fuel for RNP. NRC staff states in the GEIS (NRC 1996) that approximately 400 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a 1000-MW(e) nuclear power plant.

Overall, land-use impacts at the Robinson site would be MODERATE, and at an alternate greenfield location, the impacts would be MODERATE to LARGE.

- **Ecology**

At the Robinson site, there would be ecological land-related impacts for siting of the gas-fired plant. If needed, there would also be ecological impacts associated with bringing a new underground gas pipeline to the site. Ecological impacts at an alternate site would depend on the nature of the land converted for the plant and the possible need for a new transmission line and/or gas pipeline. Construction of a transmission line and a gas pipeline to serve the plant would be expected to have temporary ecological impacts. Ecological impacts to the plant site and utility easements could include impacts on threatened or endangered species, wildlife habitat loss and reduced productivity, habitat fragmentation, and a local reduction in biological diversity. At an alternate site, the cooling makeup water intake and discharge could have impacts on aquatic resources. Overall, ecological impacts are considered SMALL to MODERATE at the Robinson site and MODERATE to LARGE at an alternate greenfield location.

- **Water Use and Quality**

Surface Water. The natural-gas-fired generation alternative at the Robinson site is assumed to use the existing once-through cooling system, which would minimize

incremental water use and quality impacts. The staff assumed that an alternative natural-gas-fired plant located at the Robinson site would follow the current practice of obtaining process and fire-protection water from Lake Robinson and potable water from the Darlington County Water and Sewer Authority (CP&L 2002a). Some erosion and sedimentation would likely occur during construction (NRC 1996). Overall, surface water use and quality impacts are expected to remain SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

For a natural gas-fired plant located at an alternate greenfield site, impacts on surface water would depend on the discharge volume and the characteristics of the receiving body of water. Intake from and discharge to any surface body of water would be regulated by the State. Impacts on surface water use and quality are considered SMALL to MODERATE.

Groundwater. An alternative natural-gas-fired plant located at the Robinson site would likely continue to use the five groundwater wells that currently supply limited special uses at the Robinson site. Wastes could potentially leach to groundwater. Overall, however, groundwater impacts are expected to remain SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

Groundwater withdrawal at an alternate site could require a permit. The impacts of groundwater withdrawal would be site specific and dependent on recharge rate and other withdrawal rates from the aquifer. Overall, groundwater use and quality impacts are considered SMALL to MODERATE.

- **Air Quality**

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

A new gas-fired generating plant located at the Robinson site would likely need a PSD permit issued under Title I Part C of the Clean Air Act and an operating permit issued under Title V of the Clean Air Act. A new combined-cycle natural gas power plant would also be subject to the new source performance standards for such units at 40 CFR Part 60, Subparts Da and GG. These regulations establish emission limits for particulates, opacity, SO_2, and NO_x.

The EPA has various regulatory requirements for visibility protection in 40 CFR Part 51 Subpart P, including a specific requirement for review of any new major stationary source in an area designated as attainment or unclassified under the Clean Air Act. Darlington County is classified as attainment or unclassified for criteria pollutants.

Section 169A of the Clean Air Act (42 USC 7491) establishes a national goal of preventing future and remedying existing impairment of visibility in mandatory Class I Federal areas when impairment results from man-made air pollution. In addition, the EPA issued a new regional haze rule in 1999 (64 FR 35714; July 1,1999 [EPA 1999]). The rule specifies that for each mandatory Class I Federal area located within a state, the state must establish goals that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most-impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period [40 CFR 51.308(d)(1)]. If a new natural-gas-fired power station were located close to a mandatory Class I area, additional air pollution control requirements could be imposed. The mandatory Class I Federal area closest to the Robinson site is the Cape Romain Wilderness located approximately 153 km (95 mi) southeast (40 CFR 81.426).

In 1998, the EPA issued a rule requiring 22 eastern states, including South Carolina, to revise their state implementation plans to reduce NO_x emissions. The NO_x emissions contribute to violations of the national ambient air quality standard for ozone (40 CFR 50.9). The total amount of NO_x that can be emitted by each of the 22 states in the year 2007 ozone season (May 1 through September 30) is set out at 40 CFR 51.121(e). For South Carolina, the amount is 111,656 MT (123,105 tons). Any new natural-gas-fired plant sited in South Carolina would be subject to these limitations.

CP&L projects the following emissions for the natural-gas-fired alternative (CP&L 2002a):

- sulfur oxides - 44 MT/yr (48 tons/yr)
- nitrogen oxides - 139 MT/yr (153 tons/yr)
- carbon monoxide - 29 MT/yr (32 tons/yr)
- PM_{10} particulates - 24 MT/yr (27 tons/yr).

A natural-gas-fired plant would also have unregulated carbon dioxide emissions that could contribute to global warming.

In December 2000, the EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (EPA 2000b). Natural-gas-fired power plants were found by EPA to emit arsenic, formaldehyde, and nickel (EPA 2000b). Unlike coal-and oil-fired plants, EPA did not determine that regulation of emissions of hazardous air pollutants from natural-gas-fired power plants should be regulated under Section 112 of the Clean Air Act.

Construction activities would result in temporary fugitive dust. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process.

Siting a natural-gas-fired generation plant at a site other than the Robinson site would not significantly change air-quality impacts, although it could result in installing more or less stringent pollution-control equipment to meet applicable local requirements. The plant would need to meet applicable new source performance standards. Siting in an area that is in compliance with national ambient air quality standards would likely require a PSD permit. Siting in an area not in attainment with national ambient air quality standards would likely require a nonattainment permit under Title I Part D of the Clean Air Act. An air operating permit would likely be needed at either type of location.

Overall, the air quality impacts at the Robinson site or at an alternate greenfield site would be MODERATE.

- **Waste**

In the GEIS the staff concluded that waste generation from gas-fired technology would be minimal (NRC 1996). The only significant solid waste generated at a new natural-gas-fired plant would be spent SCR catalyst. SCR catalyst is used for control of NO_x emissions. The spent catalyst would be regenerated or disposed of offsite.

Gas firing results in very few combustion by-products because of the clean nature of the fuel. Other than spent SCR catalyst, waste generation at an operating gas-fired plant would be largely limited to typical office wastes; impacts would be so minor that they would not noticeably alter any important resource attribute. Construction-related debris would be generated during construction activities.

In the winter, it may become necessary for a replacement baseload natural-gas-fired plant to operate on fuel oil due to lack of gas supply. Combustion of No. 2 fuel oil generates minimal waste products.

Overall, the solid waste impacts associated with a natural-gas-fired plant at the Robinson site or at an alternate greenfield site are expected to be SMALL.

- **Human Health**

In the GEIS, the staff identified cancer and emphysema as potential health risks from gas-fired plants (NRC 1996). The risk may be attributable to NO_x emissions that contribute to ozone formation, which in turn contribute to health risks. NO_x emissions from any plant would be regulated. For a plant sited in South Carolina, NO_x emissions would be regulated by the South Carolina Department of Health and Environmental Control. Human health

effects are not expected to be detectable or sufficiently minor that they would neither destabilize nor noticeably alter any important attribute of the resource. Overall, the impacts on human health of a newly constructed natural-gas-fired plant sited at Robinson or at an alternate greenfield site are considered SMALL.

- **Socioeconomics**

  Construction of a natural-gas-fired plant would take approximately 2 years. Peak employment could be up to 500 workers. The staff assumed that construction would take place while Unit 2 continues operation and would be completed by the time it permanently ceases operations. During construction, the communities immediately surrounding the Robinson site would experience demands on housing and public services that could have MODERATE impacts. These impacts would be tempered by construction workers commuting to the site from more distant cities. After construction, the communities would be impacted by the loss of jobs. The current RNP work force (520 workers) would decline through a decommissioning period to a minimal maintenance size. The new natural-gas-fired plant would replace the nuclear plant tax base of RNP or provide a new tax base at an alternate greenfield site and provide approximately 25 permanent jobs. Siting at an alternate greenfield site would result in the loss of the nuclear plant tax base in Darlington County and the associated employment, with potentially SMALL to MODERATE socioeconomic impacts.

  In the GEIS, the staff concluded that socioeconomic impacts from constructing a natural-gas-fired plant would not be very noticeable and that the small operational work force would have the lowest socioeconomic impacts of any nonrenewable technology (NRC 1996). Compared to the coal-fired and nuclear alternatives, the smaller size of the construction work force, the shorter construction time frame, and the smaller size of the operations work force would mitigate socioeconomic impacts.

  Transportation impacts associated with construction personnel commuting to the plant site would depend on the population density and transportation infrastructure in the vicinity of the site. The impacts can be classified as MODERATE for siting at Robinson or at an alternate greenfield site. Impacts associated with operating personnel commuting to the plant site would be SMALL.

  Overall, socioeconomic impacts resulting from construction of a natural-gas-fired plant at the Robinson site would be MODERATE. For construction at an alternate greenfield site, socioeconomic impacts would also be MODERATE.

- **Aesthetics**

  The turbine buildings and stacks (approximately 60 m [200 ft] tall) would be visible from offsite during daylight hours. The gas pipeline compressors also would be visible. Noise and light from the plant would be detectable offsite. At the Robinson site, these impacts would result in a MODERATE aesthetic impact.

  At an alternate greenfield site, the buildings and stacks would likely be visible offsite. If a new electric power transmission line is needed, the aesthetic impact could be as much as LARGE. Aesthetic impacts would be mitigated if the plant were located in an industrial area adjacent to other power plants. Overall, the aesthetic impacts associated with a replacement natural-gas-fired plant at an alternate greenfield site are categorized as MODERATE to LARGE, with site-specific factors determining the final categorization.

- **Historic and Archaeological Resources**

  At both the Robinson site and at an alternate greenfield site, a cultural resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

  Before construction at the Robinson site or at an alternate greenfield site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission and pipeline rights-of-way, or other rights-of-way). Impacts to cultural resources can be effectively managed under current laws and regulations and kept SMALL.

- **Environmental Justice**

  No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement natural-gas-fired plant were built at the Robinson site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. Closure of RNP would result in a decrease in employment of approximately 495 operating employees. Resulting economic conditions could reduce employment prospects for minority or low-income populations. Overall, impacts are expected to be SMALL to MODERATE.

Impacts at an alternate greenfield site would depend upon the site chosen and the nearby population distribution. If a replacement natural-gas-fired plant were constructed at an alternate site, Darlington County would experience a loss of property tax revenue, which would affect its ability to provide services and programs. Property tax payments made by CP&L to Darlington County for RNP constitute slightly less than 20 percent of the County's total property tax revenue (CP&L 2002a). Overall impacts to minority and low-income populations would be SMALL to MODERATE.

8.2.2.2 Closed-Cycle Cooling System

The environmental impacts of constructing a natural-gas-fired generation system at an alternate greenfield location using a closed-cycle cooling system with cooling towers are essentially the same as the impacts for a natural-gas-fired plant using once-through cooling. However, there are some environmental differences between the closed-cycle and once-through cooling systems. Table 8-5 summarizes the incremental differences.

8.2.3 Nuclear Power Generation

Since 1997, the NRC has certified three new standard designs for nuclear power plants under 10 CFR Part 52, Subpart B. These designs are the U.S. Advanced Boiling Water Reactor (10 CFR Part 52, Appendix A), the System 80+ Design (10 CFR 52, Appendix B), and the AP600 Design (10 CFR Part 52, Appendix C). All of these plants are light-water reactors. Although no applications for a construction permit or a combined license based on these certified designs have been submitted to the NRC, the submission of the design certification applications indicates continuing interest in the possibility of licensing new nuclear power plants.

Entergy Nuclear, a subsidiary of Entergy Corporation, has announced that it will prepare an application for an early site permit for a new advanced nuclear power plant at the Grand Gulf Nuclear Station site in Port Gibson, Mississippi, under the procedures in 10 CFR Part 52 Subpart A (Entergy Corporation 2002).

For the preceding reasons, construction of a new nuclear power plant at the Robinson site using the existing once-through cooling system and at an alternate greenfield site using both closed- and open-cycle cooling are considered in this section. The staff assumed that the new nuclear plant would have a 40-year lifetime.

Table 8-5. Summary of Environmental Impacts of Natural-Gas-Fired Generation at an Alternate Greenfield Site with Closed-Cycle Cooling Utilizing Cooling Towers

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	An additional 10 to 12 ha (25 to 30 ac) required for cooling towers and associated infrastructure.
Ecology	Impact would depend on ecology at the site. Additional impact to terrestrial ecology from cooling tower drift. Reduced impact to aquatic ecology.
Surface Water Use and Quality	Discharge of cooling tower blowdown containing dissolved solids. Discharge would be regulated by the State. Decreased water withdrawal and less thermal load on receiving body of water.
Groundwater Use and Quality	Potential impacts on groundwater quality are possible due to leaching from cooling ponds.
Air Quality	No change
Waste	No change
Human Health	No change
Socioeconomics	No change
Aesthetics	Introduction of cooling towers and associated plumes. Possible noise impact from operation of cooling towers.
Historic and Archaeological Resources	Additional land impacted
Environmental Justice	No change

The NRC has summarized environmental data associated with the uranium fuel cycle in Table S-3 of 10 CFR 51.51. The impacts shown in Table S-3 are representative of the impacts that would be associated with a replacement nuclear power plant built to one of the certified designs at the Robinson site or at an alternate greenfield site. The impacts shown in Table S-3 are for a 1000-MW(e) reactor and would need to be adjusted to reflect replacement of RNP, which has a capacity of 710 MW(e). The environmental impacts associated with transporting fuel and waste to and from a light-water cooled nuclear power reactor are summarized in Table S-4 of 10 CFR 51.52. The summary of NRC's findings on NEPA issues for license renewal of nuclear power plants in Table B-1 of 10 CFR Part 51 Subpart A, Appendix B, is also relevant, although not directly applicable, for consideration of environmental impacts associated with the operation of a replacement nuclear power plant. Additional environmental impact information for a replacement nuclear power plant using once-through cooling is presented in Section 8.2.3.1 and using closed-cycle cooling in Section 8.2.3.2.

8.2.3.1 Once-Through Cooling System

The overall impacts of the nuclear generating system are discussed in the following sections. The impacts are summarized in Table 8-6. The extent of impacts at an alternate greenfield site will depend on the location of the particular site selected.

- **Land Use**

  The existing facilities and infrastructure at the Robinson site would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, the staff assumed that a replacement nuclear power plant would use the existing cooling system, switchyard, offices, and transmission line rights-of-way. Because this existing infrastructure could be used, a replacement nuclear power plant at the Robinson site would require approximately 100 ha (250 ac), some of which may be previously undeveloped land. Some additional land beyond the current site boundary may be needed to construct a new nuclear power plant while the existing Robinson units continue to operate.

  There would be no net change in land needed for uranium mining because land needed for the new nuclear plant would offset land needed to supply uranium for fuel for the existing RNP.

  The impact of a replacement nuclear generating plant on land use at the Robinson site is best characterized as MODERATE. The impact would be greater than the OL renewal alternative.

  Land-use requirements at an alternate greenfield site would be approximately 200 ha (500 ac) plus the possible need for a new electric power transmission line (NRC 1996). In addition, it may be necessary to construct a rail spur to an alternate site to bring in equipment during construction. Depending particularly on transmission line routing, siting a new nuclear plant at an alternate greenfield site could result in MODERATE to LARGE land-use impacts.

- **Ecology**

  Locating a replacement nuclear power plant at the Robinson site would alter ecological resources because of the need to convert land to an industrial use. Some of this land, however, would have been previously disturbed. Siting at the Robinson site would have a MODERATE ecological impact that would be greater than renewal of the RNP OL.

Table 8-6. Summary of Environmental Impacts of New Nuclear Generation Using Once-Through Cooling at Robinson and an Alternate Greenfield Site

	Robinson Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
Land Use	MODERATE	Requires approximately 100 ha (250 ac) for the plant	MODERATE to LARGE	Requires approximately 200 ha (500 ac) for the plant. Possible additional land if a new electric power transmission line is needed.
Ecology	MODERATE	Uses undeveloped areas at the Robinson site plus additional offsite land. Potential habitat loss and fragmentation and reduced productivity and biological diversity on offsite land.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission line route; potential habitat loss and fragmentation; reduced productivity and biological diversity.
Water Use and Quality (Surface)	SMALL	Uses existing once-through cooling system	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body.
Water Use and Quality (Groundwater)	SMALL	Existing wells would likely continue to be used.	SMALL to MODERATE	Impacts would be site dependent.
Air Quality	SMALL	Fugitive emissions and emissions from vehicles and equipment during construction. Small amounts of emissions from diesel generators and possibly other sources during operation.	SMALL	Same impacts as the Robinson site
Waste	SMALL	Waste impacts for an operating nuclear power plant are set out at 10 CFR 51, Subpart A, Appendix B, Table B-1. Debris would be generated and removed during construction.	SMALL	Same impacts as the Robinson site
Human Health	SMALL	Human health impacts for an operating nuclear power plant are set out at 10 CFR 51, Subpart A, Appendix B, Table B-1.	SMALL	Same impacts as the Robinson site

Table 8-6. (contd)

	Robinson Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
Socioeconomics	MODERATE to LARGE	During construction, impacts would be MODERATE to LARGE. Up to 1500 workers during the peak of the 4-year construction period. Operating work force assumed to be similar to RNP. Darlington County tax base preserved. Transportation impacts associated with commuting construction workers could be MODERATE to LARGE. Transportation impacts during operation would be SMALL.	MODERATE to LARGE	Construction impacts depend on location. Impacts at a rural location could be LARGE. Darlington County would experience loss of tax base and employment with MODERATE impacts. Transportation impacts associated with commuting construction workers could be MODERATE to LARGE. Transportation impacts during operation would be SMALL to MODERATE.
Aesthetics	SMALL to MODERATE	No exhaust stacks or cooling towers would be needed. Daytime visual impact could be mitigated by landscaping and appropriate color selection for buildings. Visual impact at night could be mitigated by reduced use of lighting and appropriate shielding. Noise impacts would be relatively small and could be mitigated.	SMALL to LARGE	Similar to impacts at the Robinson site. Potential LARGE impact if a new electric power transmission line is needed.
Historic and Archaeological Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Any potential impacts can likely be effectively managed.
Environmental Justice	SMALL	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction.	SMALL to LARGE	Impacts will vary depending on population distribution and makeup at the site. Darlington County would lose tax revenue, which could have a MODERATE impact on minority and low-income populations.

At an alternate site, there would be construction impacts and new incremental operational impacts. Even assuming siting at a previously disturbed area, the impacts would alter the ecology. Impacts could include wildlife habitat loss, reduced productivity, habitat fragmentation, and a local reduction in biological diversity. Use of cooling water from a nearby surface water body could have adverse aquatic resource impacts. If needed, construction and maintenance of the transmission line would have ecological impacts. Overall, the ecological impacts at an alternate greenfield site would be MODERATE to LARGE.

- **Water Use and Quality**

  Surface Water. The new nuclear generation alternative at the Robinson site is assumed to use the existing once-through cooling system, which would minimize incremental water use and quality impacts. The staff assumed that an alternative new nuclear plant located at the Robinson site would follow the current practice of obtaining process and fire-protection water from Lake Robinson and potable water from the Darlington County Water and Sewer Authority (CP&L 2002a). Some erosion and sedimentation would likely occur during construction (NRC 1996). Overall, surface water use and quality impacts are expected to remain SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

  For a new nuclear plant located at an alternate greenfield site, impacts on surface water would depend on the discharge volume and the characteristics of the receiving body of water. Intake from and discharge to any surface body of water would be regulated by the State. Impacts on surface water use and quality are considered SMALL to MODERATE.

  Groundwater. An alternative new nuclear plant located at the Robinson site would likely continue to use the five groundwater wells that currently supply limited special uses at the Robinson site. Wastes could potentially leach to groundwater. Overall, however, groundwater impacts are expected to remain SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

  Groundwater withdrawal at an alternate site could require a permit. The impacts of groundwater withdrawal would be site specific and dependent on recharge rate and other withdrawal rates from the aquifer. Overall, groundwater use and quality impacts are considered SMALL to MODERATE.

- **Air Quality**

  Construction of a new nuclear plant at the Robinson site or an alternate site would result in fugitive emissions during the construction process. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process. An operating nuclear plant would have minor air emissions associated with diesel generators. These emissions would be regulated by the State. Emissions from a plant sited in South Carolina would be regulated by the South Carolina Department of Health and Environmental Control. Overall, emissions and associated impacts are considered SMALL.

- **Waste**

  The waste impacts associated with operation of a nuclear power plant are set out in Table B-1 of 10 CFR Part 51 Subpart A, Appendix B. In addition to the impacts shown in Table B-1, construction-related debris would be generated during construction activities and removed to an appropriate disposal site. Overall, waste impacts are considered SMALL.

  Siting the replacement nuclear power plant at a site other than the Robinson site would not alter waste generation. Therefore, the impacts would be SMALL.

- **Human Health**

  Human health impacts for an operating nuclear power plant are set out in 10 CFR Part 51 Subpart A, Appendix B, Table B-1. Overall, human health impacts are considered SMALL.

  Siting the replacement nuclear power plant at a site other than the Robinson site would not alter human health impacts. Therefore, the impacts would be SMALL.

- **Socioeconomics**

  The construction period and the peak work force associated with construction of a new nuclear power plant are currently unquantified (NRC 1996). In the absence of quantified data, the staff assumed a construction period of 4 years and a peak work force of 1500. The staff assumed that construction would take place while RNP continues operation and would be completed by the time Unit 2 permanently ceases operations. During construction, the communities surrounding the Robinson site would experience demands on housing and public services that could have MODERATE to LARGE impacts. These impacts would be tempered by construction workers commuting to the site from Florence, Columbia, and other communities. After construction, the communities would be impacted by the loss of the construction jobs.

  The replacement nuclear plant is assumed to have an operating work force comparable to the 520 workers currently working at RNP. The replacement nuclear plant would provide a new tax base to offset the loss of tax base associated with decommissioning of RNP. The appropriate characterization of nontransportation socioeconomic impacts for operating a replacement nuclear plant constructed at the Robinson site would be SMALL.

  During the 4-year construction period, up to 1500 construction workers would be working at the Robinson site in addition to the 520 workers at RNP. The addition of the construction workers could place significant traffic loads on existing highways, particularly those leading to the Robinson site. Such impacts would be MODERATE to LARGE. Transportation

impacts related to commuting of plant operating personnel would be similar to current impacts associated with operation of RNP and are considered SMALL.

Construction of a replacement nuclear power plant at an alternate site would relocate some socioeconomic impacts, but would not eliminate them. The communities around the Robinson site would still experience the impact of RNP operational job loss and the loss of tax base with potentially MODERATE impacts. The communities around the new site would have to absorb the impacts of a large, temporary work force (up to 1500 workers at the peak of construction) and a permanent work force of approximately 520 workers. In the GEIS, the staff noted that socioeconomic impacts at a rural site would be larger than at an urban site because more of the peak construction work force would need to move to the area to work (NRC 1996). Alternate sites would need to be analyzed on a case-by-case basis. Socioeconomic impacts at a rural site could be LARGE. Transportation-related impacts associated with commuting construction workers at an alternate greenfield site are site dependent, but could be MODERATE to LARGE. Transportation impacts related to commuting of plant operating personnel would also be site dependent, but can be characterized as SMALL to MODERATE.

- **Aesthetics**

The containment buildings for a replacement nuclear power plant sited at the Robinson site and other associated buildings would likely be visible in daylight hours. Visual impacts could be mitigated by landscaping and selecting a color for buildings that is consistent with the environment. Visual impact at night could be mitigated by reduced use of lighting and appropriate use of shielding. No exhaust stacks would be needed. No cooling towers would be needed, assuming use of the existing once-through cooling system.

Noise from operation of a replacement nuclear power plant would potentially be audible offsite in calm wind conditions or when the wind is blowing in the direction of the listener. Mitigation measures, such as reduced or no use of outside loudspeakers, can be employed to reduce noise level and keep the impact SMALL to MODERATE.

At an alternate site, there would be an aesthetic impact from the buildings. There would also be a significant aesthetic impact if a new transmission line were needed. Noise and light from the plant would be detectable offsite. The impact of noise and light would be mitigated if the plant is located in an industrial area adjacent to other power plants. Overall, the aesthetic impacts associated with locating at an alternative site can be categorized as SMALL to MODERATE; however, the impact could be LARGE if a new transmission line is needed to connect the plant to the power grid.

- **Historic and Archaeological Resources**

  At both the Robinson site and an alternate greenfield site, a cultural resources inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

  Before construction at the Robinson site or at another site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission line rights-of-way, rail lines, or other rights-of-way). Historic and archaeological resource impacts can generally be effectively managed and as such are considered SMALL.

- **Environmental Justice**

  No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement nuclear plant were built at the Robinson site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. After completion of construction, it is possible that the ability of the local government to maintain social services could be reduced at the same time as diminished economic conditions reduce employment prospects for minority and low-income populations. Overall, however, impacts are expected to be SMALL.

  Impacts at an alternate greenfield site would depend upon the site chosen and the nearby population distribution. If a replacement nuclear plant were constructed at an alternate site, Darlington County would experience a loss of property tax revenue, which could affect its ability to provide services and programs. Property tax payments made by CP&L to Darlington County for RNP constitute slightly less than 20 percent of the county's total property tax revenue (CP&L 2002a). Impacts to minority and low-income populations are expected to be SMALL to LARGE.

8.2.3.2 Closed-Cycle Cooling System

The environmental impacts of constructing a nuclear power plant at an alternate greenfield site using closed-cycle cooling with cooling towers are essentially the same as the impacts for a nuclear power plant using once-through cooling. However, there are minor environmental differences between the closed-cycle and once-through cooling systems. Table 8-7 summarizes the incremental differences.

Table 8-7. Summary of Environmental Impacts of a New Nuclear Power Plant at an Alternate Greenfield Site with Closed-Cycle Cooling Utilizing Cooling Towers

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	An additional 10 to 12 ha (25 to 30 ac) required for cooling towers and associated infrastructure.
Ecology	Impact would depend on ecology at the site. Additional impact to terrestrial ecology from cooling tower drift. Reduced impact to aquatic ecology.
Surface Water Use and Quality	Discharge of cooling tower blowdown containing dissolved solids. Discharge would be regulated by the State of South Carolina. Decreased water withdrawal and less thermal load on receiving body of water.
Groundwater Use and Quality	Potential impacts on groundwater quality are possible due to leaching from cooling ponds.
Air Quality	No change
Waste	No change
Human Health	No change
Socioeconomics	No change
Aesthetics	Introduction of cooling towers and associated plume. Natural draft towers could be up to 158 m (520 ft) high. Mechanical draft towers could be up to 30 m (100 ft) high and also have an associated noise impact from operation of the motors and fans.
Historic and Archaeological Resources	Additional land impacted
Environmental Justice	No change

8.2.4 Purchased Electrical Power

If available, purchased power from other sources could potentially obviate the need to renew the RNP OL. CP&L currently purchases power from other generators (CP&L 2002b). Overall, however, South Carolina is a net exporter of electricity (DOE/EIA 2001b).

Imported power from Canada or Mexico is unlikely to be available for replacement of RNP baseload capacity. In Canada, 62 percent of the country's electricity capacity is derived from renewable energy sources, principally hydropower (DOE/EIA 2002a). Canada's nuclear generation is projected to increase by 1.7 percent by 2020, but its share of power generation in Canada is projected to remain stable at 14 percent (DOE/EIA 2002a). EIA projects that total gross U.S. imports of electricity from Canada and Mexico will gradually increase from 47.9 billion kWh in year 2000 to 66.1 billion kWh in year 2005 and then will gradually decrease to 47.4 billion kWh in year 2020 (DOE/EIA 2001a). On balance, it is unlikely that electricity imported from Canada or Mexico would be able to replace the RNP capacity.

If power to replace RNP baseload capacity were to be purchased from sources within the United States or a foreign country, the generating technology likely would be one of those described in this SEIS and in the GEIS (probably coal, natural gas, or nuclear). The description of the environmental impacts of other technologies in Chapter 8 of the GEIS is representative of the environmental impacts associated with the purchased electrical power alternative to renewal of the RNP OL. Under the purchased power alternative, the environmental impacts of imported power would still occur, but would be located elsewhere within the region, nation, or another country.

8.2.5 Other Alternatives

Other generation technologies are discussed in the following subsections.

8.2.5.1 Oil-Fired Generation

The EIA projects that oil-fired plants will account for very little of the new generation capacity in the U.S. through the year 2020 because of higher fuel costs and lower efficiencies (DOE/EIA 2001a). Oil-fired operation is more expensive than nuclear or coal-fired operation. In addition, future increases in oil prices are expected to make oil-fired generation increasingly more expensive than coal-fired generation. The high cost of oil has prompted a steady decline in its use for electricity generation. In Section 8.3.11 of the GEIS, the staff estimated that construction of a 1000-MW(e) oil-fired plant would require about 48 ha (120 ac) (NRC 1996). Additionally, operation of oil-fired plants would have environmental impacts (including impacts on the aquatic environment and air) that would be similar to those from a coal-fired plant.

8.2.5.2 Wind Power

Most of South Carolina is in a wind power Class 1 region (average wind speeds at 10 m [30 ft] elevation of 0 to 4.4 m/s [9.8 mph]). Class 1 has the lowest potential for wind energy generation (DOE 2002a). Wind turbines are economical in wind power Classes 4 through 7 (average wind speeds of 5.6 to 9.4 m/s [12.5 to 21.1 mph] [DOE 2002a]). Aside from the coastal areas and exposed mountains and ridges of the Appalachians, there is little wind energy potential in the East Central region of the United States for current wind turbine applications (Elliott et al. 1986). As of December 31, 2000, there were no grid-connected wind power plants in North or South Carolina (NREL 2001). Wind turbines typically operate at a 25 to 35 percent capacity factor compared to 90 to 95 percent for a baseload plant (NWPPC 2000). Ten offshore wind power projects are currently operating in Europe, but such projects have not been developed in the United States. The European plants together provide approximately 170 MW, which is less than the electrical output of RNP (British Wind Energy Association 2002).

The South Carolina Energy Office summarized the wind energy potential in South Carolina as follows (South Carolina Energy Office 2002a):

> Currently, the wind climate in South Carolina is not conducive to wind farm development. Only a small portion of the state supports constant wind speeds that approach what is necessary to power the turbine on a windmill. Until the technology allows for lower wind speeds to be useful, developing wind power in South Carolina would not be feasible.

For the preceding reasons, the staff concludes that locating a wind-energy facility on or near the Robinson site or offshore as a replacement for RNP generating capacity would not be economically feasible given the current state of wind energy generation technology.

8.2.5.3 Solar Power

Solar technologies use the sun's energy and light to provide heat and cooling, light, hot water, and electricity for homes, businesses, and industry. Neither photovoltaic nor thermal solar power technologies can currently compete with conventional fossil-fueled technologies in grid-connected applications due to higher capital costs per kilowatt of capacity. The average capacity factor of photovoltaic cells is about 25 percent (NRC 1996), and the capacity factor for solar thermal systems is about 25 to 40 percent (NRC 1996). Energy storage requirements limit the use of solar-energy systems as baseload electricity supply.

There are substantial impacts to natural resources (wildlife habitat, land-use, and aesthetic impacts) from construction of solar-generating facilities. As stated in the GEIS, land requirements are high – 14,000 ha (55 mi^2) per 1000 MW(e) for photovoltaic (NRC 1996) and

approximately 5700 ha (22 mi^2) per 1000 MW(e) for solar thermal systems (NRC 1996). Neither type of solar electric system would fit at the Robinson site, and both would have large environmental impacts at a greenfield site.

The Robinson site receives approximately 4 to 5 kWh of direct normal solar radiation per square meter per day compared to 7 to 8 kWh of solar radiation per square meter per day in areas of the western United States such as California, which are most promising for solar technologies (DOE/EIA 2000). Because of the natural resource impacts (land and ecological), the area's relatively low rate of solar radiation, and high cost, solar power is not deemed a feasible baseload alternative to renewal of the RNP OL. Some onsite generated solar power (e.g., from rooftop photovoltaic applications) may substitute for electric power from the grid. Implementation of solar generation on a scale large enough to replace RNP would likely result in LARGE environmental impacts.

8.2.5.4 Hydropower

South Carolina has an estimated 480 MW of developable hydroelectric resources (INEEL 1997). This amount is less than needed to replace the 710 MW(e) capacity of RNP. As stated in Section 8.3.4 of the GEIS, hydropower's percentage of U.S. generating capacity is expected to decline because hydroelectric facilities have become difficult to site as a result of public concern about flooding, destruction of natural habitat, and alteration of natural river courses. Hydroelectric generation in South Carolina declined at an annual rate of 14.7 percent between 1990 and 1999, and constituted only 0.7 percent of total electricity generation in South Carolina in 1999 (DOE/EIA 2002b). In the GEIS, the staff estimated that land requirements for hydroelectric power are approximately 400,000 ha (1 million ac) per 1000 MW(e) (NRC 1996). Due to the relatively low amount of undeveloped hydropower resource in South Carolina and the large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to replace RNP's generating capacity, the staff concludes that local hydropower is not a feasible alternative to renewal of the RNP OL. Any attempts to site hydroelectric facilities large enough to replace RNP would result in LARGE environmental impacts.

8.2.5.5 Geothermal Energy

Geothermal energy has an average capacity factor of 90 percent and can be used for baseload power where available. However, geothermal technology is not widely used as baseload generation due to the limited geographical availability of the resource and the immature status of the technology (NRC 1996). As illustrated by Figure 8.4 in the GEIS, geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii where

hydrothermal reservoirs are prevalent. There is no feasible eastern location for geothermal capacity to serve as an alternative to RNP. The staff concludes that geothermal energy is not a feasible alternative to renewal of the RNP OL.

8.2.5.6 Wood Waste

A wood-burning facility can provide baseload power and operate with an average annual capacity factor of around 70 to 80 percent and with 20 to 25 percent efficiency (NRC 1996). The fuels required are variable and site specific. A significant barrier to the use of wood waste to generate electricity is the high delivered-fuel cost and high construction cost per megawatt of generating capacity. The larger wood-waste power plants are only 40 to 50 MW(e) in size. Estimates in the GEIS suggest that the overall level of construction impact per megawatt of installed capacity should be approximately the same as that for a coal-fired plant, although facilities using wood waste for fuel would be built at smaller scales (NRC 1996). Like coal-fired plants, wood-waste plants require large areas for fuel storage and processing and involve the same type of combustion equipment.

Due to uncertainties associated with obtaining sufficient wood and wood waste to fuel a baseload generating facility, ecological impacts of large-scale timber cutting (e.g., soil erosion and loss of wildlife habitat), and high inefficiency, the staff has determined that wood waste is not a feasible alternative to renewing the RNP OL.

8.2.5.7 Municipal Solid Waste

Municipal waste combustors incinerate the waste and use the resultant heat to generate steam, hot water, or electricity. The combustion process can reduce the volume of waste by up to 90 percent and the weight of the waste by up to 75 percent (EPA 2002). Municipal waste combustors use three basic types of technologies: mass burn, modular, and refuse-derived fuel (DOE/EIA 2001c). Mass burning technologies are most commonly used in the United States. This group of technologies process raw municipal solid waste “as is,” with little or no sizing, shredding, or separation before combustion. The initial capital costs for municipal solid-waste plants are greater than for comparable steam-turbine technology at wood-waste facilities. This is due to the need for specialized waste-separation and -handling equipment for municipal solid waste (NRC 1996).

Growth in the municipal waste combustion industry slowed dramatically during the 1990s after rapid growth during the 1980s. The slower growth was due to three primary factors: (1) the Tax Reform Act of 1986, which made capital-intensive projects such as municipal waste combustion facilities more expensive relative to less capital-intensive waste disposal alternative such as landfills; (2) the 1994 Supreme Court decision (*C&A Carbone, Inc. v. Town of Clarkstown*), which struck down local flow control ordinances that required waste to be delivered to specific municipal waste combustion facilities rather than landfills that may have

had lower fees; and (3) increasingly stringent environmental regulations that increased the capital cost necessary to construct and maintain municipal waste combustion facilities (DOE/EIA 2001c).

Municipal solid waste combustors generate an ash residue that is buried in landfills. The ash residue is composed of bottom ash and fly ash. Bottom ash refers to that portion of the unburned waste that falls to the bottom of the grate or furnace. Fly ash represents the small particles that rise from the furnace during the combustion process. Fly ash is generally removed from flue-gases using fabric filters and/or scrubbers (DOE/EIA 2001c).

Currently there are approximately 102 waste-to-energy plants operating in the United States. These plants generate approximately 2800 MW(e), or an average of approximately 28 MW(e) per plant (Integrated Waste Services Association 2002). The staff concludes that generating electricity from municipal solid waste would not be a feasible alternative to replace the 683 MW(e) baseload capacity of RNP and, consequently, would not be a feasible alternative to renewal of the RNP OL.

8.2.5.8 Other Biomass-Derived Fuels

In addition to wood and municipal solid waste fuels, there are several other concepts for fueling electric generators, including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste). In the GEIS, the staff stated that none of these technologies has progressed to the point of being competitive on a large scale or of being reliable enough to replace a baseload plant such as RNP (NRC 1996). For these reasons, such fuels do not offer a feasible alternative to renewal of the RNP OL.

8.2.5.9 Fuel Cells

Fuel cells work without combustion and its environmental side effects. Power is produced electrochemically by passing a hydrogen-rich fuel over an anode and air over a cathode and separating the two electrodes by an electrolyte. The only by-products are heat, water, and carbon dioxide. Hydrogen fuel can come from a variety of hydrocarbon resources by subjecting them to steam under pressure. Natural gas is typically used as the source of hydrogen.

Phosphoric acid fuel cells are generally considered first-generation technology. These fuel cells are commercially available today at a cost of approximately $4500 per kW of installed capacity (DOE 2002b). Higher-temperature second-generation fuel cells achieve higher fuel-to-electricity and thermal efficiencies. The higher temperatures contribute to improved efficiencies and give the second-generation fuel cells the capability to generate steam for cogeneration and combined-cycle operations.

Second generation fuel cell technology uses the molten carbonate and solid oxide fuel cell systems. DOE's goal is to ready these technologies for initial commercial entry by the end of 2003. DOE hopes to bring about dramatic reductions in fuel cell costs in the future. Its goal is to cut costs to as low as $400 per kW by the end of this decade, which would make fuel cells competitive for virtually every type of power application (DOE 2003). For comparison, the installed capacity cost for a natural-gas-fired combined-cycle plant is approximately $456 per kW (DOE/EIA 2001a). As market acceptance and manufacturing capacity increase and technology development continues, natural-gas-fueled fuel cell plants in the 50- to 100-MW range are projected to become available. At the present time, however, fuel cells are not economically or technologically competitive with other alternatives for baseload electricity generation. Fuel cells are, consequently, not a feasible alternative to renewal of the RNP OL.

8.2.5.10 Delayed Retirement

It is conceptually possible that delayed retirement of other CP&L generating units could replace the power generated by RNP. CP&L has no plans for retiring any of its nuclear plants. Although some fossil plants may be retired, principally if they have difficulty in meeting air emission requirements, CP&L states it has no current plan to do so (CP&L 2003). Delayed retirement of these fossil units would involve major construction to upgrade or replace plant components. The environmental impacts of such a scenario are bounded by the coal- (Section 8.2.1) and gas-fired (Section 8.2.2) alternatives.

8.2.5.11 Utility-Sponsored Conservation

CP&L has developed residential, commercial, and industrial programs to reduce both peak demands and daily energy consumption. These programs are commonly referred to as demand-side management (DSM). These DSM savings are part of CP&L's long-range plan for meeting projected demand, and thus are not available offsets for RNP capacity.

CP&L offers energy efficiency, standby generation, and voltage reduction DSM programs (South Carolina Energy Office 2002b). Energy efficiency programs reduce energy consumption by encouraging consumers to use energy more efficiently. Standby generation programs provide incentives for customers owning standby generators to utilize them during periods of high demand, thereby reducing the system peak demand. Voltage reduction programs reduce the supplied voltage of electricity to customers. The reduction is usually between 2 and 5 percent. Lowering the voltage has the effect of reducing the demand for electricity.

The CP&L DSM programs in South Carolina were projected to result in a savings of approximately 146 MW from peak demand in 2001. This represented approximately 10.4 percent of CP&L's peak demand for 2001. Total electricity savings were projected to be approximately 22,000 MW hours or approximately 0.3 percent of total system energy (South Carolina Energy

Office 2002b). The staff concludes that additional DSM, by itself, would not be sufficient to replace the 683 MW(e) capacity of RNP and that it is not a reasonable replacement for renewing the OL.

8.2.6 Combination of Alternatives

Even though individual alternatives to RNP might not be sufficient on their own to replace RNP's generating capacity due to the small size of the resource or lack of cost-effective opportunities, it is conceivable that a combination of alternatives might be cost effective.

As discussed in Section 8.2, RNP has a net capacity of 683 MW(e). For the natural-gas-fired, combined-cycle alternative, CP&L assumed 585 MW(e) of generating capacity from two 189 MW natural-gas-fired combustion turbines and heat recovery boiler capacity of 207 MW in its ER as a potential replacement for RNP.

There are many possible combinations of alternatives. Table 8-8 presents a summary of the environmental impacts of an assumed combination of alternatives consisting of 400 MW of combined-cycle, natural-gas-fired generation at the Robinson site using the existing once-through/cooling-pond system and at an alternate greenfield location using closed-cycle cooling; 100 MW purchased from other generators; and 85 MW gained from additional DSM measures. The impacts associated with the combined-cycle, natural-gas-fired units are based on the gas-fired generation impact assumptions discussed in Section 8.2.2, adjusted for the reduced generating capacity. While the DSM measures would have few environmental impacts, operation of the new natural-gas-fired plant would result in increased emissions and environmental impacts. The environmental impacts associated with power purchased from other generators would still occur but would be located elsewhere within the region, nation, or another country as discussed in Section 8.2.4. The environmental impacts associated with purchased power are not shown in Table 8-8. The staff concludes that it is very unlikely that the environmental impacts of any reasonable combination of generating and conservation options could be reduced to the level of impacts associated with renewal of the RNP OL.

8.3 Summary of Alternatives Considered

The environmental impacts of the proposed action, renewal of the RNP OL are SMALL for all impact categories (except collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, for which a single significance level was not assigned). Alternative actions (i.e., no-action alternative [discussed in Section 8.1], new generation alternatives [from coal, natural gas, and nuclear discussed in Sections 8.2.1 through 8.2.3, respectively], purchased electrical power [discussed in Section 8.2.4], alternative technologies [discussed in Section 8.2.5], and the combination of alternatives [discussed in Section 8.2.6]) were considered.

Table 8-8. Summary of Environmental Impacts for an Assumed Combination of Generating and Acquisition Alternatives

	Robinson Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
Land Use	MODERATE	14 ha (34 ac) for powerblock, roads, and parking areas. Possible additional impact for construction of an underground gas pipeline.	MODERATE to LARGE	18 ha (44 ac) for power-block, offices, roads, and parking areas. Additional impact for construction of an underground natural gas pipeline and a transmission line.
Ecology	SMALL to MODERATE	Uses undeveloped areas at the Robinson site plus land for a new gas pipeline.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and electric power transmission and pipeline routes; potential habitat loss and fragmentation; reduced productivity and biological diversity; impacts to terrestrial ecology from cooling tower drift.
Water Use and Quality (Surface)	SMALL	Uses existing once-through cooling system	SMALL to MODERATE	Impact depends on volume of water withdrawal and discharge and characteristics of surface water body. Discharge of cooling tower blowdown will have impacts.
Water Use and Quality (Groundwater)	SMALL	Existing wells would continue to be used.	SMALL to MODERATE	Impacts would be site dependent.
Air Quality	MODERATE	Sulfur oxides • 30 MT/yr (33 tons/yr) Nitrogen oxides • 95 MT/yr (105 tons/yr) Carbon monoxide • 20 MT/yr (22 tons/yr) PM_{10} particulates • 17 MT/yr (18 tons/yr) Some hazardous air pollutants	MODERATE	Same as siting at RNP.

Table 8-8. (contd)

		Robinson Site	Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
Waste	SMALL	The only significant solid waste would be spent SCR catalyst used for control of NO_x emissions.	SMALL	The only significant solid waste would be spent SCR catalyst used for control of NO_x emissions.
Human Health	SMALL	Impacts considered to be minor.	SMALL	Impacts considered to be minor.
Socioeconomics	MODERATE	During construction, impacts would be MODERATE. Up to 500 additional workers during the peak of the 2-year construction period, followed by reduction from current RNP work force of 520 to approximately 25. Tax base preserved. Impacts during operation would be SMALL. Transportation impacts associated with construction workers would be MODERATE.	MODERATE	Construction impacts depend on location, but could be significant if location is in a rural area. Darlington County would experience loss of tax base and employment with potentially MODERATE impacts. Impacts during operation would be SMALL. Transportation impacts associated with construction workers would be MODERATE.
Aesthetics	MODERATE	Exhaust stacks will be visible from offsite locations.	MODERATE to LARGE	MODERATE impact from plant, stacks, and cooling towers and associated plumes. Additional impact that could be LARGE if a new electric power transmission line is needed.
Historic and Archeological Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Any potential impacts can likely be effectively managed.
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction; loss of approximately 495 operating jobs at RNP could reduce employment prospects for minority and low-income populations.	SMALL to MODERATE	Impacts vary depending on population distribution and makeup at site. Darlington County would lose tax revenue, which could have MODERATE impacts on minority and low-income populations.

The no-action alternative would require replacing electrical generating capacity by (1) DSM and energy conservation, (2) power purchased from other electricity providers, (3) generating alternatives other than RNP, or (4) some combination of these options, and would result in decommissioning RNP. For each of the new generation alternatives (coal, natural gas, and nuclear), the environmental impacts would not be less than the impacts of license renewal. For

example, the land-disturbance impacts resulting from construction of any new facility would be greater than the impacts of continued operation of RNP. The impacts of purchased electrical power would still occur, but would occur elsewhere. Alternative technologies are not considered feasible at this time and it is very unlikely that the environmental impacts of any reasonable combination of generation and conservation options could be reduced to the level of impacts associated with renewal of the OL for RNP.

The staff concludes that the alternative actions, including the no-action alternative, may have environmental effects in at least some impact categories that reach MODERATE or LARGE significance.

8.4 References

10 CFR 20. Code of Federal Regulations, Title 10, *Energy*, Part 20, "Standards for Protection Against Radiation."

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

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

10 CFR 52. Code of Federal Regulations, Title 10, *Energy,* Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."

40 CFR 50. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 50, "National Primary and Secondary Ambient Air Quality Standards."

40 CFR 51. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 51, "Requirements for Preparation, Adoption, and Submittal of Implementation Plans."

40 CFR 60. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 60, "Standards of Performance for New Stationary Sources."

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9.0 Summary and Conclusions

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 No. 2 (RNP), for an additional 20-year period (CP&L 2002). 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 of the current OL, which expires on 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 Plant*s (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[(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 meetings (67 FR 54499 [NRC 2002]) on August 22, 2002. The staff visited the Robinson site in September 2002 and held public scoping meetings on September 25, 2002, in Hartsville, South Carolina (NRC 2003a). The staff reviewed the CP&L Environmental Report (ER) (CP&L 2002) and compared it to the GEIS, consulted with other agencies, and 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* (NRC 2000). The staff also considered the public comments received during the scoping process for preparation of this supplemental environmental impact statement (SEIS) for RNP. The public comments received during the scoping process are provided in Appendix A, Part I, of this SEIS.

On May 14, 2003, the NRC published the Notice of Availability of the draft SEIS (68 FR 25907) beginning a 75-day comment period (NRC 2003b). During the comment period, members of the public could comment on the preliminary results of the NRC staff's review. During this comment period, two public meetings were held in Hartsville, South Carolina, on June 25, 2003, to describe the results of the NRC environmental review, to answer questions, and to provide

(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.

members of the public with information to assist them in formulating their comments. At the end of the comment period, the staff considered all of the comments received for revision of the draft SEIS. These comments are addressed in Appendix A, Part II, of this SEIS.

This SEIS includes the NRC staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse effects. It also includes the staff's recommendation regarding the proposed action.

The NRC 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) and in accordance with § 51.23(b).[(a)]

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 the 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 staff analysis in the GEIS shows the following:

(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 off site 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.

(a) The title of 10 CFR 51.23 is "Temporary storage of spent fuel after cessation of reactor operations – generic determination of no significant environmental impact."

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 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 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 alternative (not renewing the OL for RNP) and alternative methods of power generation. These alternatives were evaluated assuming that the replacement power generation plant is located at either the Robinson site or some other unspecified greenfield location.

9.1 Environmental Impacts of the Proposed Action – License Renewal

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, CP&L, nor the staff 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 Category 1 issues that are applicable to RNP.

CP&L's license-renewal application presents an analysis of the Category 2 issues that are applicable to RNP, 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 Robinson. Four Category 2 issues are not discussed in this SEIS because they are specifically related to refurbishment. CP&L (CP&L 2002) 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 are within the bounds of normal plant component replacement and, therefore, are not expected to affect the environment outside of the bounds of the plant operations evaluated in the *Final Environmental Statement Related to Operation of H.B. Robinson Steam Electric Plant Unit 2* (NRC 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 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 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. CP&L is further evaluating these two SAMAs and has not made any commitment to implement them. NRC will further evaluate the need for implementation of these SAMAs as a current operating plant issue.

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.

The following sections discuss unavoidable adverse impacts, irreversible or irretrievable commitments of resources, and the relationship between local short-term use of the environment and long-term productivity.

9.1.1 Unavoidable Adverse Impacts

An environmental review conducted at the license-renewal stage differs from the review conducted in support of a construction permit because the plant is in existence at the license-renewal stage and has operated for a number of years. As a result, adverse impacts associated with the initial construction have been avoided, have been mitigated, or have

already occurred. The environmental impacts to be evaluated for license renewal are those associated with refurbishment and continued operation during the renewal term.

The adverse impacts of continued operation identified are considered to be of SMALL significance, and none warrants implementation of additional mitigation measures. The adverse impacts of likely alternatives if RNP ceases operation at or before the expiration of the current OL will not be smaller than those associated with continued operation of this unit, and they may be greater for some impact categories in some locations.

9.1.2 Irreversible or Irretrievable Resource Commitments

The commitment of resources related to construction and operation of RNP during the current license period was made when the plant was built. The resource commitments to be considered in this SEIS are associated with continued operation of the plant for an additional 20 years. These resources include materials and equipment required for plant maintenance and operation, the nuclear fuel used by the reactor, and ultimately, permanent offsite storage space for the spent fuel assemblies.

The most significant resource commitments related to operation during the renewal term are the fuel and the permanent storage space. RNP replaces approximately one-third of the fuel assemblies in the unit during every refueling outage, which occurs on an 18-month cycle.

The likely power generation alternatives if RNP ceases operation on or before the expiration of the current OL will require a commitment of resources for construction of the replacement plants as well as for fuel to run the plants.

9.1.3 Short-Term Use Versus Long-Term Productivity

An initial balance between short-term use and long-term productivity of the environment at the Robinson site was set when the plant was approved and construction began. That balance is now well established. Renewal of the OL for RNP, and continued operation of the plant will not alter the existing balance, but may postpone the availability of the site for other uses. Denial of the application to renew the OL will lead to shutdown of the plant and will alter the balance in a manner that depends on subsequent uses of the site. For example, the environmental consequences of turning the Robinson site into a park or an industrial facility are quite different.

9.2 Relative Significance of the Environmental Impacts of License Renewal and Alternatives

The proposed action is renewal of the OL for RNP. Chapter 2 describes the site, power plant, and interactions of the plant with the environment. As noted in Chapter 3, no refurbishment and no refurbishment impacts are expected at RNP. Chapters 4 through 7 discuss environmental issues associated with renewal of the OL. Environmental issues associated with the no-action alternative and alternatives involving power generation and use reduction are discussed in Chapter 8.

The significance of the environmental impacts from the proposed action (approval of the application for renewal of the OL), the no-action alternative (denial of the application), alternatives involving nuclear or coal- or gas-fired generation of power at the Robinson site and an unspecified "greenfield site," and a combination of alternatives are compared in Table 9-1. Continued use of the existing cooling pond is assumed for the Robinson site alternatives.

Table 9-1 shows that the significance of the environmental effects of the proposed action are SMALL for all impact categories (except for collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, for which a single significance level was not assigned [see Chapter 6]). The alternative actions, including the no-action alternative, may have environmental effects in at least some impact categories that reach MODERATE or LARGE significance.

9.3 Staff Conclusions and Recommendations

Based on (1) the analysis and findings in the GEIS (NRC 1996, 1999); (2) the ER submitted by CP&L (CP&L 2002); (3) consultation with Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of public comments received, the recommendation of the 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.

Table 9-1. Summary of Environmental Significance of License Renewal, the No-Action Alternative, and Alternative Methods of Generation Using Once-Through Cooling

	Proposed Action	No-Action Alternative	Coal-Fired Generation		Natural-Gas-Fired Generation		New Nuclear Generation		Combination of Alternatives	
Impact Category	License Renewal	Denial of Renewal	Robinson Site	Alternate Greenfield Site	Robinson Site	Alternate Greenfield Site[a]	Robinson Site	Alternate Greenfield Site	Robinson Site	Alternate Greenfield Site
Land Use	SMALL	SMALL	MODERATE	MODERATE to LARGE	MODERATE	MODERATE to LARGE	MODERATE	MODERATE to LARGE	MODERATE	MODERATE to LARGE
Ecology	SMALL	SMALL	MODERATE	MODERATE to LARGE	SMALL to MODERATE	MODERATE to LARGE	MODERATE	MODERATE to LARGE	SMALL to MODERATE	MODERATE to LARGE
Water Use and Quality-Surface Water	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Water Use and Quality-Groundwater	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Air Quality	SMALL	SMALL	MODERATE	MODERATE	MODERATE	MODERATE	SMALL	SMALL	MODERATE	MODERATE
Waste	SMALL	SMALL	MODERATE	MODERATE	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Human Health	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Socio-economics	SMALL	MODERATE	MODERATE to LARGE	MODERATE to LARGE	MODERATE	MODERATE	MODERATE to LARGE	MODERATE to LARGE	MODERATE	MODERATE
Transportation	SMALL	SMALL	SMALL to LARGE	SMALL to LARGE	SMALL to MODERATE	SMALL to MODERATE	SMALL to LARGE	SMALL to LARGE	SMALL to MODERATE	SMALL to MODERATE
Aesthetics	SMALL	SMALL	MODERATE	MODERATE to LARGE	MODERATE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE	MODERATE	MODERATE to LARGE
Historic and Archaeological Resources	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Environmental Justice	SMALL	MODERATE	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to MODERATE	SMALL	SMALL to LARGE	SMALL to MODERATE	SMALL to MODERATE

(a) Except for collective offsite radiological impacts from the fuel cycle and from HLW and spent-fuel disposal, for which a significance level was not assigned. See Section 6 for details.

9.4 References

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

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

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U.S. Nuclear Regulatory Commission (NRC). 1975. *Final Environmental Statement related to the operation of H. B. Robinson Nuclear Steam-Electric Plant, Unit 2*. Carolina Power and Light Company. Docket No. 50-261. NUREG-75/024. Office of Nuclear Reactor Regulation. Washington, DC.

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

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

U.S. Nuclear Regulatory Commission (NRC). 2002. "Carolina Power & Light Company, H.B. Robinson Steam Electric Plant, Unit No. 2; Notice of Intent To Prepare an Environmental Impact Statement and Conduct Scoping Process." *Federal Register*. Vol. 67, No. 163, pp. 54,499-54,501. Washington, D.C.

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Appendix A

Comments Received on the Environmental Review

Appendix A

Part 1 – Comments Received on the Environmental Review

Part I – Comments Received During Scoping

On August 22, 2002, the U.S. Nuclear Regulatory Commission (NRC) published a Notice of Intent in the *Federal Register* (67 FR 54499), to notify the public of the staff's intent to prepare a plant-specific supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2, to support the renewal application for the H.B. Robinson, Unit 2 (RNP), operating license and to conduct scoping. The plant-specific supplement to the GEIS has been prepared in accordance with the National Environmental Policy Act (NEPA), and 10 CFR Part 51. As outlined by Part 51, the NRC initiated the scoping process with the issuance of the *Federal Register* Notice. The NRC invited the applicant; Federal, State, Native American Tribal, and local government agencies; local organizations; and individuals to participate in the scoping process by providing oral comments at scheduled public meetings and/or submitting written suggestions and comments no later than October 25, 2002.

The scoping process included two public scoping meetings, which were held at Coker College's Davidson Hall in Hartsville, South Carolina, on September 25, 2002. Approximately 55 people attended the meetings. Each session began with NRC staff members providing brief overviews of the license renewal process and the NEPA process. After the NRC's prepared statements, the meetings were open for public comments. Fifteen attendees provided oral statements that were recorded and transcribed by a certified court reporter. The meeting transcripts are an attachment to the Scoping Meeting Summary dated January 9, 2003. No additional comments were received by the NRC.

At the conclusion of the scoping period, the NRC staff and its contractors reviewed the transcripts to identify specific comments and issues. Each set of comments from a given commenter was given a unique identifier (Commenter ID), so that the comments could be traced back to the original transcript containing the comment. Specific comments were numbered sequentially within each comment set. One commenter submitted comments at both the afternoon and evening scoping meetings. In this case, there is a unique Commenter ID for each set of comments.

Table A-1 identifies the individuals who provided comments applicable to the environmental review and the Commenter ID number associated with each set of comments. Individuals who spoke at the scoping meetings are listed in the order in which they spoke at the public meeting. To maintain consistency with the *Robinson Scoping Summary Report* dated January 9, 2003, the unique identifier used in that report for each set of comments is retained in this report.

Table A-1. Individuals Providing Comments During Scoping Comment Period

Commenter ID	Commenter	Affiliation (If Stated)	Comment Source
A	Jay Lucas	South Carolina House of Representatives	Afternoon Scoping Meeting
B	Rainey Knight	Superintendent of the Darlington County School Board	Afternoon Scoping Meeting
C	John Moyer	Site Vice President for CP&L and Process Energy at RNP	Afternoon Scoping Meeting
D	Jan Lucas	Superintendent of Environmental and Chemistry at RNP	Afternoon Scoping Meeting
E	Jacqueline Kirvan	Hartsville, South Carolina	Afternoon Scoping Meeting
F	Nancy McGee	Hartsville Chamber of Commerce	Afternoon Scoping Meeting
G	Mal Hyman	Professor at Coker College	Afternoon Scoping Meeting
H	Franklin Hines	Hartsville businessman	Afternoon Scoping Meeting
I	Joseph Rubinstein	Professor at Coker College	Evening Scoping Meeting
J	Eric Hewling	Lake Robinson resident	Evening Scoping Meeting
K	Robert Griggs	Retired school principal	Evening Scoping Meeting
L	Bill Gaskins	Mayor of Hartsville	Evening Scoping Meeting
M	Anne Warr	Darlington County Council	Evening Scoping Meeting
N	Beth Blum	Principal of N. Hartsville Elementary School	Evening Scoping Meeting
O	Thelma Dawson	Dentist in Florence and Darlington	Evening Scoping Meeting
P	Jacqueline Kirvan	Hartsville, South Carolina	Evening Scoping Meeting

Specific comments were categorized and consolidated by topic. Comments with similar specific objectives were combined to capture the common essential issues raised by the commenters. The comments fall into one of the following general groups:

- Specific comments that address environmental issues within the purview of the NRC environmental regulations related to license renewal. These comments address Category 1 or Category 2 issues or issues that were not addressed in the GEIS. They also address alternatives and related federal actions.

- General comments (1) in support of or opposed to nuclear power or license renewal or (2) on the renewal process, the NRC's regulations, and the regulatory process. These comments may or may not be specifically related to the RNP license renewal application.

- Questions that do not provide new information.

- Specific comments that address issues that do not fall within or are specifically excluded from the purview of NRC environmental regulations. These comments typically address issues such as the need for power, emergency preparedness, current operational safety issues, and safety issues related to operation during the renewal period.

Each comment received during this scoping process is summarized in the Robinson Scoping Summary Report. The ADAMS accession number for the summary report is ML030090582. This accession number is provided to facilitate access to the document through the Public Electronic Reading Room (ADAMS) at http://www.nrc.gov/reading-rm.html.

The following pages summarize the comments and suggestions received as part of the scoping process and discuss the disposition of the comments and suggestions. The parenthetical alpha-numeric identifier after each comment refers to the comment set (Commenter ID) and the comment number.

Comments in this section are grouped in the following categories:

A.1 Comments and Responses

A.1.1 Questions about the License Renewal Process

Comment: Have any plants that have applied for renewal failed, or have all of the renewal applications passed? (RNP/I-1)

Response: *Up to this point, the plants that have applied and completed the NRC process for license renewal have been approved. The comment provides no new information; therefore, it will not be evaluated further.*

A.1.2 General Support of the License Renewal at RNP

Comment: I support the license renewal for the H. B. Robinson Nuclear Plant. The Robinson Nuclear Plant has been a great corporate citizen, not only in South Carolina, but to the Pee Dee Region of our state for over 30 years....CP&L is our largest taxpayer in Darlington County due primarily to having the Robinson Nuclear Plant in our county....I support this plant not only because of what it does for our school system and our local government, but CP&L is such a good steward of the environmental resources...CP&L actively promotes economic development throughout the Pee Dee Region...I've been so impressed with the commitment by CP&L and the employees of the Robinson Nuclear Plant to protect the health and safety of the public....A renewed operating license will allow the Robinson Nuclear Plant to continue to provide safe, reliable power and economic benefits to our local community for many years to come....I don't get complaints about this facility. (RNP/A-1)

Comment: The Robinson Nuclear Plant has been a valuable partner with us for several years....I would like to highlight for you are three areas that I think that they have been very supportive. First, financially...about 8-plus million comes into the county...A second thing [is] the way CP&L supports us is with the volunteers....And third,...the employees' commitment to their own children in our schools...I would hope that CP&L—the relicensure of the Robinson Nuclear Plant...would be a partnership that we would have long, long beyond me, just for the future generations of Darlington County. (RNP/B-1)

Comment: I think the best indicator of our commitment to safe and reliable nuclear plant operation is our industrial safety record. We have worked at Robinson nearly nine million person hours without a lost-time injury. We apply that same operating philosophy to our plant and to the environmental stewardship that we are charged with, and we're proud of our record....I've been in this business about 40 years. In my judgement, this is the best, most professional group of men and women operating nuclear power plants that I have ever in my life had the pleasure to work with....We see what our tax dollar does for this county and for this city.

And in addition to those tax dollars, in our last United Way giving campaign this little plant of fewer than 500 people was responsible for $1.1 million of charitable contributions....We're one of the handful of utilities in the business who have run 500 consecutive days since we closed the breaker after our last refuel outage. And that is a testament, not to me, but to the employees who work at that plant and whose philosophy is safe, reliable, conservative operation of a nuclear power station. (RNP/C-1)

Comment: The Greater Hartsville Chamber of Commerce Board of Directors has asked me to express their support for the license renewal for the H. B. Robinson Nuclear Plant. CP&L is a good corporate citizen, a valuable partner with our community, and specifically with our local chamber of commerce....And the Robinson Plant is important to our local economy....CP&L's taxes do help support our schools. The Robinson Plant's a good neighbor, one in which our community feels very safe existing with. We ask that their license be renewed so that these mutually beneficial relationship can continue. (RNP/F-1)

Comment: I'm impressed with the quality and the professionalism that I find with the people I know that are working there and that operate that plant. The Robinson Plant employees seem to be committed to operating the plant safely and – and protecting this environment. The employees also have committed to making a difference in our community, as was stated by some others before me such as the chamber of commerce, the school system, and other places where they are personally involved, even if beyond the – the value of the check that you send every year....A renewed operating license would allow the Robinson Plant to continue to provide safe and reliable economic benefit to our local community for many years to come, and I'm personally pleased and I appreciate the opportunity to express my support for the license renewal of the Robinson Plant. (RNP/H-1)

Comment: On behalf of the City of Hartsville...we have enjoyed the partnership between the Robinson Nuclear Plant and the City of Hartsville during the plant's first 30 years of operation, and we are looking forward to the next 30 years. The Robinson Plant is a power partner with the City of Hartsville. The plant supports about 450 families with good jobs, and annually pays millions of dollars in taxes to this region. These employees are committed to keeping the plant running safely and reliably. They are also good citizens in our community, taking active roles in our schools, in our civic and community organizations. CP&L and the Robinson Plant have worked continuously with the City of Hartsville to improve the quality of life, and to protect the environment in our community. I hope the Nuclear Regulatory Commission will extend the operating license for the plant so that we will continue to have the Robinson Plant as a valuable partner in our community. (RNP/L-1)

Comment: I know many of the people who work at the plant, and I've been impressed with their commitment to safety, the ideals that they follow to protect our citizens, and health and safety of the public, and protecting the environment, also. Renewing the operating license will

allow the Robinson Plant to continue to provide safe and reliable power and economic benefits to our community. And additional 20 years of safe operation of this plant will provide an estimated $160 million in property tax revenue for Darlington County. This contribution to Darlington County will have a significant effect on our county's education system, as well as our safety services and the quality of life that we enjoy in Darlington County. We recognize that CP&L and the Robinson Nuclear Plant is a powerful partner in Darlington County, and we look forward for continuing this partnership for many years to come. (RNP/M-1)

Comment: I appreciate having this opportunity to express my support for license renewal for the H. B. Robinson Nuclear Plant. There is a special partnership between CP&L and the local communities where the Robinson employees work and live. In addition to generating safe and reliable power, the employees at the Robinson Nuclear Plant also believe it is important to be good citizens in the community. The Ambassador Program is CP&L's business education partnership with North Hartsville Elementary School. Through this program, about 40 Robinson Plant employees serve as mentors and tutors for school children in Grades 1 through 6....I also know that they are committed to operating the plant safely and protecting the environment....I hope that the NRC will approve this license extension so that the Robinson Plant and its employees will continue to deliver energy and be our partner in the community. (RNP/N-1)

Comment: I've had the opportunity to tour the plant and see some of the safety issues that are involved. One of the things that I like is I think we get more in the school district in terms of safety [because of CP&L's involvement as] corporate partners with the school district....As a health care provider and a school board member and a citizen, certainly we appreciate the tax revenue from them. But obviously, as an educator, we need the money. The Robinson Plant also has been helpful in the Pee Dee, and I think that we will continue to enjoy it if you relicense it, and I support the relicense of the plant. (RNP/O-1)

Response: *The comments are supportive of license renewal at Robinson and are general in nature. The comments provide no new information; therefore, they will not be evaluated further.*

A.1.3 Comments Concerning the Environment

Comment: The Robinson Plant...is very focused on being a good steward of all of our environmental resources: land, water, air....We continue to work with our state and local officials to improve the quality of life and to protect the environment for the future. We're involved in some typical environmental activities like recycling, which many of you experience: paper, aluminum cans, batteries, printer toner cartridges. But I think we're also involved in some environmental activities that you may not be as familiar with. We've registered the land at the Robinson Nuclear Plant to protect the red-cockaded woodpeckers through the South Carolina Safe Harbors Program; we maintain wood boxes on the lake; we have many

employees that volunteer on Saturday workdays to help improve our South Carolina state parks. And we encourage the public use of our lake for boating and fishing and water fowl observation. CP&L has spent the last two-and-a-half years doing an extensive study of the environmental impact for license renewal. And while we're here to renew the license to operate the Robinson Nuclear Plant, I'm also here to renew our commitment to the protection of the environment, and to continue to be the good steward of all the resources that you've entrusted us with. (RNP/D-1)

Response: *The comment is supportive of the Robinson Plant's environmental program and is general in nature. The comment provides no new information; therefore it will not be evaluated further.*

A.1.4 Comments Concerning Water Quality and Aquatic Ecology

Comment: The Robinson reactor was built without a cooling tower. Instead, Lake Robinson is used for this purpose. The resulting heat, the thermal pollution has made that lake a virtual desert in terms of aquatic life. And water flows from it into Black Creek....We enjoyed that lake before the nuclear plant was built, and we have witnessed the changes. The condition of the lake is becoming worse. (RNP/E-2)

Comment: My concern strictly is environmental with regard to the water temperature....we can have water temperatures that range anywhere from 95 degrees to 112 degrees for extended periods of time. Not just during the past two years of drought, but almost every summer....They have a detrimental effect on both the fishery and the aquatic life in the lake. I [have] been told that they've [CP&L] done cost analysis and studies on what it would take to reduce the temperature of the discharge to make the lake more recreationally friendly. My hope is that they would do so. And I would like to see that made as part of the requirement for the 20-year relicensing. (RNP/J-2)

Response: *Lake Robinson was created specifically as a cooling pond for the Robinson energy production facilities. CP&L holds a thermal variance for Robinson as indicated in the NPDES permit, and has routinely provided required reports and studies to SCDHEC since the 1970s. In 1996, CP&L analyzed and summarized this long-term demonstration of continued protection and propagation of a balanced, indigenous shellfish, fish, and wildlife population. The comment provides no new information; therefore, it will not be evaluated further. Descriptive information regarding plant-specific water quality and aquatic ecology will be addressed in Chapters 2 and 4 of the Robinson Supplemental Environmental Impact Statement (SEIS).*

Comment: What effect is the drought causing for the use of Lake Robinson for cooling purposes, and are there plans to use groundwater resources for this purpose? (RNP/E-3)

Response: *Lake Robinson was originally constructed in the late 1950s as a cooling pond for Robinson, Unit 1, a coal fired power plant. It was planned and sized to provide cooling water for future plant additions. Drought does impact lakes, and has also impacted Lake Robinson to some extent, but there are no plans to use groundwater resources for cooling purposes. Lake Robinson is not operated as a storage reservoir and, except for water loss to evaporation, water is passed through the lake (e.g., if inflows are lower than normal, outflows are lower than normal). Because groundwater provides a significant portion of the inflow to Lake Robinson, and the groundwater aquifer supply is extensive, water levels in the lake do not change appreciably with inflow variations in Black Creek that are caused by drought conditions. The historic lake level has been maintained during the drought. The comment provides no new information; therefore, it will not be evaluated further. The appropriate descriptive information regarding the plant-specific water quality will be addressed in Chapters 2 and 4 of the Robinson Supplemental Environmental Impact Statement (SEIS).*

Comment: During the environmental process, because CP&L operates two other [facilities] – the coal and gas fired turbines, do they take that into effect as far as the water temperature or discharge temperature in relicensing the #2 Unit? (RNP/J-1)

Response: *The gas fired turbine plant does not discharge cooling water (or other effluent) to Lake Robinson and has only a potential, slight, indirect impact on the lake from groundwater use. Cooling water from Unit 1, the coal-fired plant, is mixed with cooling water from Unit 2, the nuclear plant, at the head of the discharge canal. Water temperature restrictions and monitoring requirements include the effects of the operation of both Unit 1 and Unit 2 on Lake Robinson and do not differentiate between the two units. The comment provides no new information; therefore, it will not be evaluated further. Descriptive information regarding the plant-specific water quality will be addressed in Chapters 2 and 4 of the Robinson Supplemental Environmental Impact Statement (SEIS).*

Comment: In considering reports like DHEC, [regarding] bacteria in the lake because of the heated water, will that be a factor in your decision? (RNP/K-1)

Response: *Reports from sources including the South Carolina Department of Health and Environmental Control are used in the evaluation of environmental effects from license renewal. Health impacts, such as bacteria in the lake, are monitored and controlled by continued application of accepted industrial hygiene practices. Maximum temperatures recorded in Lake Robinson in the vicinity of and downstream of the discharge canal have consistently been below the optimal temperature range (122° F to 140° F) for maximum growth and reproduction of thermophilic microorganisms. Such organisms have not been a problem in the past. Given the thermal characteristics of Lake Robinson and the disinfection of sewage treatment plant effluent, future bacterial growth due to heated water is not expected to be a concern. The comment provides no new information; therefore, it will not be evaluated further. Descriptive*

information regarding the plant-specific microbiological organisms as it relates to public health will be addressed in Chapter 4 of the Robinson Supplemental Environmental Impact Statement (SEIS).

A.1.5 Comments Concerning Aging and Postulated Accidents

Comment: Do your studies include what might happen in the event of an accident, or do they just include the impact under normal operating conditions? (RNP/I-2)

Comment: The Robinson reactor is an old nuclear reactor. And with aging come[s] problems of embrittlement and cracking of the metal parts which have been subjected to intense heat and radiation bombardment, and cause premature aging of the components. In 1982, after approximately 10 years of operation, the NRC cited our Robinson reactor as one of the nation's worst cases of reactor vessel embrittlement. Twenty (20) years of continued operation since that time have made embrittlement an even greater concern. If any accident or situation calls for putting emergency cooling water into the reactor, a flaw in the wall could cause a dangerous crack. So my question is: How do you address the environmental consequences of an accident involving pressurized thermal shock at Robinson? (RNP/E-1)

Comment: With aging reactors come embrittlement problems due to the metal which has been subjected to intense heat and radiation bombardment, and that can cause premature aging of the components. And if any accident or situation calls for putting emergency cooling water into the reactor, a flaw in the wall could cause a dangerous crack. This is known as pressurized thermal shock, and could have some environmental consequences which certainly are not trivial....The potential for cracking at Robinson and the resulting environmental effects make license extension a critical decision....the prudent course may be not to extend their license, but to begin the monumental task of decommissioning and attempting to insure the security of the high level nuclear waste in the form of spent fuel that is stored at the Robinson Plant. (RNP/P-2)

Comment: In reading through statements by Dr. Hanauer of the NRC, about a decade ago he was talking about these problems [of thermal shock] and reports, and said, “All things considered, the NRC report reached a reasonably comforting conclusion. It listed 40 pressurized water reactors in which pressurized thermal shock was an issue. No one does anything. We've got one reactor that's in big trouble, four others that are a little behind it.” The reactor he was referring to was H.B. Robinson 2. And I'm wondering how we've dealt with this. (RNP/G-2)

Response: *NRC’s ongoing safety program focuses on prevention of safety problems so that potential issues like aging and thermal shock do not lead to accidents. The NRC’s environmental review for license renewal includes the issue of postulated accidents in its review of severe accident mitigation alternatives (SAMAs) to determine whether additional measures*

are cost effective in preventing accidents. The staff concluded that the probability-weighted environmental consequences from severe accidents (i.e., beyond design basis accidents) are small for all plants but that alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives. See 10 CFR 51.53(c)(3)(ii)(L). To the extent that the comments pertaining to safety of equipment and aging are within the scope of license renewal, these issues will be addressed during the parallel safety analysis review performed under 10 CFR Part 54. Operational safety issues are outside the scope of 10 CFR Part 51 and will not be evaluated further in this SEIS. Descriptive information regarding the plant-specific SAMA analysis will be addressed in Section 5 of the Robinson SEIS. The comments provide no new information and, therefore, will not be evaluated further in the context of the environmental review. However, the comments will be forwarded to the project manager for the license renewal safety review for consideration.

A.1.6 Comments Concerning Nuclear Waste and Disposal

Comment: The Robinson Plant was designed to generate electricity, not to be a repository for high-level nuclear waste. However, since reprocessing has not panned out, spent fuel has been stored at our reactor site and at reactor sites all over the country....If the Robinson Plant license is extended, what will be done with this additional spent fuel? Will this high-level waste remain here with us? (RNP/P-1)

Response: *The siting and construction of a national waste repository are the responsibility of the U.S. Department of Energy (DOE). The Commission believes there is reasonable assurance that at least one mined geologic repository will be available within the first quarter of the twenty-first century (10 CFR Part 51.23). In the interim, onsite spent fuel storage in pools and in dry cask storage facilities continues in accordance with NRC regulations. The Commission has determined that spent fuel can be stored onsite safely for 30 years after the current operating license or a renewed license expires. The evaluation of the impacts of spent fuel storage is outside the scope of this analysis and will not be not addressed in this SEIS. No new information was provided by the comment. Therefore, it will not be evaluated further. Descriptive information regarding environmental impacts of solid waste management will be addressed in Chapter 6 of the Robinson SEIS.*

A.1.7 Comments Concerning Issues Outside the Scope of License Renewal: Terrorism

Comment: Regarding security, the control room [and] the spent fuel storage aren't protected by the dome at the plant. What are the environmental consequences of an attack, God forbid? (RNP/G-1)

Response: *In light of the recent terrorist attacks, U.S. Nuclear Regulatory Commission officials and staff have been working to ensure adequate protection of nuclear power plants and nuclear fuel facilities. This has involved close coordination with the Federal Bureau of Investigation, other intelligence and law enforcement agencies, NRC licensees, and military, state and local authorities. Nuclear power plants have inherent capability to protect public health and safety through such features as robust containment buildings, redundant safety systems, and highly trained operators. They are among the most hardened structures in the country and are designed to withstand extreme events, such as hurricanes, tornadoes and earthquakes. In addition, all NRC licenses with significant radiological material have emergency response plans to enable the mitigation of impacts on the public in the event of a release. Emergency and safeguards planning are part of the current operating license and are outside the scope of the environmental analysis for license renewal. The comment provides no new information and does not pertain to the scope of license renewal as set forth in 10 CFR Part 51 and Part 54. Therefore, it will not be evaluated further under this review.*

Part II – Comments Received on the Draft SEIS

Pursuant to 10 CFR Part 51, the staff transmitted the *Generic Environmental Impact Statement* for License Renewal of Nuclear Plants, Regarding H.B. Robinson Steam Electric Plant, Unit No. 2, Draft Report for Comment (NUREG-1437, Supplement 13, referred to as the draft SEIS) to Federal, State, Native American Tribal, and local government agencies as well as interested members of the public. As part of the process to solicit public comments on the draft SEIS, the staff:

- placed a copy of the draft SEIS in the NRC's electronic Public Document Room, its license renewal website, and at the Hartsville Memorial Public Library, Hartsville, South Carolina

- sent copies of the draft SEIS to the applicant, members of the public who requested copies, and certain Federal, State, Native American Tribal, and local agencies

- published a notice of availability of the draft SEIS in the *Federal Register* on May 14, 2003 (68 FR25907)

- issued public announcements, such as advertisements in local newspapers and postings in public places, of the availability of the draft SEIS

- announced and held two public meetings in Hartsville, South Carolina, on June 25, 2003, to describe the results of the environmental review and answer related questions

- issued public service announcements and press releases announcing the issuance of the draft SEIS, the public meetings, and instructions on how to comment on the draft SEIS

- established a website to receive comments on the draft SEIS through the Internet.

During the comment period, the staff received a total of five comment letters. There were no comments received during the public meetings.

The staff has reviewed the public meeting transcripts and the five comment letters that are part of the docket file for the application, all of which are available in the NRC's Public Electronic Reading Room. Appendix A, Part II, Section A.2, contains a summary of the comments and the staff's responses. Related issues are grouped together. Appendix A, Part II, Section A.3, contains copies of the comment letters.

Each comment identified by the staff was assigned a specific alpha-numeric identifier (marker). That identifier is typed in the margin of the letter at the beginning of the discussion of the comment. A cross-reference of the alpha-numeric identifiers, the author of the comment, the page where the comment can be found, and the section(s) of this report in which the comment is addressed is provided in Table A-2. The five written comment letters are identified by the letters A through E. The accession number is provided for the written comments to facilitate access to the document through the Agencywide Document Access and Management System (ADAMS) http://www.nrc.gov/reading-rm/adams/login.html.

Table A-2. Comments Received on the Draft SEIS

Comment No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
A-01	Samuel E. "RedHawk" Davis	Letter, June 11, 2003 ML0317506012	A-21	A.2.2
B-01	C.T. Baucom, Progress Energy	Letter, July 24, 2003 ML032110414	A-24	A.2.8
B-02	C.T. Baucom, Progress Energy	Letter, July 24, 2003 ML032110414	A-24	A.2.9
B-03	C.T. Baucom, Progress Energy	Letter, July 24, 2003 ML032110414	A-24	A.2.9
B-04	C.T. Baucom, Progress Energy	Letter, July 24, 2003 ML032110414	A-24	A.2.5
B-05	C.T. Baucom, Progress Energy	Letter, July 24, 2003 ML032110414	A-24	A.2.5

Table A-2. (contd)

Comment No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
B-06	C.T. Baucom, Progress Energy	Letter, July 24, 2003 ML032110414	A-24	A.2.3
B-07	C.T. Baucom, Progress Energy	Letter, July 24, 2003 ML032110414	A-24	A.2.8
B-08	C.T. Baucom, Progress Energy	Letter, July 24, 2003 ML032110414	A-24	A.2.8
B-09	C.T. Baucom, Progress Energy	Letter, July 24, 2003 ML032110414	A-24	A.2.6
B-10	C.T. Baucom, Progress Energy	Letter, July 24, 2003 ML032110414	A-24	A.2.6
B-11	C.T. Baucom, Progress Energy	Letter, July 24, 2003 ML032110414	A-24	A.2.9
C-01	Gregory Hogue, Dept of Interior	email response, July 24, 2003 ML032110419	A-25	A.2.1
D-01	Heinz J. Mueller, US EPA	Letter, July 29, 2003 ML032260526	A-26	A.2.7
E-01	Marta Matthews, SHPO	Letter, August 7, 2003 ML032661160	A-29	A.2.3
E-02	Marta Matthews, SHPO	Letter, August 7, 2003 ML032661160	A-29	A.2.3
E-03	Marta Matthews, SHPO	Letter, August 7, 2003 ML032661160	A-29	A.2.3
E-04	Marta Matthews, SHPO	Letter, August 7, 2003 ML032661160	A-29	A.2.3
E-05	Marta Matthews, SHPO	Letter, August 7, 2003 ML032661160	A-29	A.2.3
E-06	Marta Matthews, SHPO	Letter, August 7, 2003 ML032661160	A-29	A.2.3
E-07	Marta Matthews, SHPO	Letter, August 7, 2003 ML032661160	A-29	A.2.3
E-08	Marta Matthews, SHPO	Letter, August 7, 2003 ML032661160	A-29	A.2.3
E-09	Marta Matthews, SHPO	Letter, August 7, 2003 ML032661160	A-28	A.2.3

Table A-2. (contd)

Comment No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
E-10	Marta Matthews, SHPO	Letter, August 7, 2003 ML032661160	A-28	A.2.3
F-01	Joseph F. Cockrell, FWS	Letter, October 17, 2003 ML033100418	A-31	A.2.4

The staff made a determination on each comment that it was one of the following:

(1) A comment that was either related to support or opposition of license renewal in general (or specifically H.B. Robinson Steam Electric Plant, Unit 2) or that made a general statement about the license renewal process. It may have made only a general statement regarding Category 1 and/or Category 2 issues. In addition, it provided no new information and does not relate to safety considerations reviewed under 10 CFR Part 54.

(2) A comment regarding environmental issues pertaining to 10 CFR Part 51.

(3) A comment that raised an environmental issue that was not addressed in the GEIS or the DSEIS

(4) A comment regarding severe accident mitigation alternative analysis

(5) A comment outside the scope of license renewal (not related to 10 CFR Parts 51 or 54).

Comments without a supporting technical basis or without any new information are discussed in this appendix, and not in other sections of this report. Relevant references that address the issues within the regulatory authority of the NRC are provided where appropriate. Many of these references can be obtained from the NRC Electronic Public Document Room.

Within each section of Part II of this appendix (A.2.1 through A.2.8), similar comments are grouped together for ease of reference, and a summary description of the comments is given, followed by the staff's response. Where the comment or question resulted in a change in the text of the draft report, the corresponding response refers the reader to the appropriate section of this report where the change was made. Revisions to the text in the draft report are designated by vertical lines beside the text.

A.2 Comments and Responses on the Draft SEIS

Comments in this section are grouped in the following categories:

A.2.1 General Comments Concerning License Renewal

Comment: The Department of the Interior has reviewed the above referenced document. We have no comments to provide for your consideration at this time. (C-01)

Response*: This comment is acknowledged and did not provide significant new information relevant to this Supplement. Therefore, it will not be evaluated further. There were no changes made in this Supplement as a result of this comment.*

A.2.2 Comments in Support of H.B. Robinson Steam Electric Plant, Unit 2

Comment: The Natchez (PeeDee) Indian Tribe of Orangeburg, S.C. has asked me to write expressing their support of the license renewal for the H.B. Robinson Nuclear Plant. Carolina Power and Light also known as C.P.&L. Has shown to be a good corporate citizen and a valuable partner within the community. (A-01)

Response*: This comment is in support of the DSEIS conclusions. The comment did not provide significant new information relevant to this Supplement and will not be evaluated further. There were no changes made in this Supplement as a result of this comment.*

A.2.3 Comments Concerning Historic and Archaeological Resources

Comment: The recommendation that forested areas within the exclusion zone should be treated as having moderate-to-high potential for historic or archaeological resources should be deleted. Statements in section 2.2.9.2 indicate that a farm was formerly located at the plant site, but that "[a]ny structures that were part of the farm have been destroyed." This and other

statements in sections 2.2.9.2 and 4.4.5 do not support the characterizations of moderate-to-high potential, and do not support expansion of the recommendation beyond the exclusion area to the rest of a site that is shared by coal- and gas-fired plants. (B-06)

***Response**: Section 4.4.5 has been revised to reflect Section 106 consultation with the South Carolina State Historic Preservation Office.*

The following comments were received from the South Carolina State Historic Preservation Office (SHPO) and relate primarily to a consultation with NRC under the 106 certification process. Because these comments were sent in response to the DSEIS, they are briefly discussed here.

Comment: Is this EIS just for the Plant and immediate property or the whole lake, etc. as shown in Figure 2-3? I assume it is the whole thing. We would like to see the project (and APE) plotted on a topographic-based map. (E-01)

***Response:** This SEIS evaluates the environmental impacts associated with the proposed license renewal of the Operating License for H.B. Robinson Steam Electric Plant, Unit No. 2. A topographic map was provided to the SHPO as requested. The area of potential effect is confined to the area at the power plant site and its immediate environs, which may be impacted by post-license renewal land disturbing operations or projected refurbishment activities associated with the proposed action. This includes the cooling water intake structures, the cooling canal, and the shoreline of Lake Robinson between the intake structures and the discharge outfall. Section 4.4.5 in the Supplement has been clarified as a result of this comment.*

Comment: Does the land that CP&L leases out fall under FERC regulation? If so, how are activities on those lands reviewed for effects to historic properties? (E-02)

***Response:** The land that CP&L leases out does not fall under FERC regulation. These lands are outside of the scope of license renewal reviews. The comment did not provide significant new information relevant to this Supplement and will not be evaluated further. There were no changes made as a result of this comment.*

Comment: Under 2.2.9.1, include a discussion of the Segars Mill Farm property under Euro-American Historic Period. Our office has just learned about this property and determined it eligible for the National Register of Historic Places. The families that lived here played an important role in the Hartsville area history. (E-03)

Response: *A discussion of the Segars Mill Farm property, located 3.2 km (2 mi) south and east of RNP, has been added to Section 2.2.9.2 of the Supplement in response to this comment.*

Comment: Under 2.2.9.2, there may not have been sites near the project that were considered to be eligible or potentially eligible for the National Register earlier, but I know, with our review of Segars Mill Farm, that there are now. Several Native American sites on the farm tract also appear to be eligible, but need more testing. This indicates, too, that with a comprehensive survey, more sites would likely be identified. (E-04)

Response: *The NRC conducted discussions with SHPO about historic properties as part of the National Historic Preservation Act Section 106 compliance process. The licensee has committed to implement a corporate policy to protect unknown archaeological and historic resources. This comment did not provide information about any new sites within the RNP area of potential effects. Therefore, no changes have been made to this Supplement as a result of this comment.*

Comment: We believe that an effort needs to be made to locate the Wiley Warren family cemetery (2.2.9.2) – this should not wait for ground-disturbing activities. Also additional work needs to be done to locate and evaluate resources associated with the other farm properties known to have been in the project area. (E-05)

Response: *The area in question was heavily disturbed during construction of RNP and a visitor's center. The NRC conducted discussions with the South Carolina SHPO as part of the National Historic Preservation Act Section 106 compliance process. The licensee has committed to implement a corporate policy to protect unknown archaeological and historic resources. There were no changes made to this Supplement as a result of this comment.*

Comment: Is the Old Camden Road likely to be affected by the project in any way? (E-06)

Response: *No, the Old Camden Road passes east-west to the south of the H.B. Robinson Steam Electric Plant, Unit No. 2 site and will not be affected by the proposed license renewal. The comment did not provide significant new information relevant to this Supplement, and, therefore, will not be evaluated further. There were no changes made as a result of this comment.*

Comment: The definition of areas of low, moderate and high probability is reasonable, but pretty general. We would like to see these more carefully defined, and procedures put in place for how to proceed with undertakings in the higher probability areas. (E-07)

Comment: We concur with the recommendations on page 4-32 in the paragraph beginning on line 24. But, again, the language is too vague. What does "care should be taken mean?" Let's describe how care will be taken. What are "normal operational and maintenance activities?" A partial list in included, but these are pretty general categories that could include a wide variety on undertakings. How will property managers know what to do when? We absolutely agree that forested areas are particularly high probability and vulnerable. There should be a plan to identify and manage the resources in them. (E-08)

Comment: Our major comments regarding archaeological sites are in response to Section 4.4.5. This section notes that the SC SHPO in May of 2001 wrote that license renewal should not affect historic properties or archaeological sites (which of course can be historic properties). Our office now has new information both from this draft EIS, and other sources, that raises concerns for us. While it appears that the operation of RNP is unlikely to undergo major changes during the new license period, we would like a clearer understanding of the types of activities that are on-going and where they occur. We would also recommend a greater effort to identify likely resources that could be affected by these activities. (E-09)

Comment: We believe that the best way to carefully manage resources, and potential resources, is to develop a Programmatic Agreement. This should be done prior to relicensing. The PA should direct the development of a Cultural/Historic Resources Management Plan (or Historic Properties Management Plan) and define activities that the SHPO would need to review. (E-10)

***Response**: These comments are noted. The staff conducted National Historic Preservation Act Section 106 consultation with the South Carolina SHPO. The correspondence and determinations related to this consultation are contained in Appendix E of this SEIS. The licensee has committed to implement a corporate policy to protect unknown archaeological and historic resources. No changes were made to this SEIS as a result of these comments.*

A.2.4 Comment Concerning Terrestrial Resources

Comment: Erosion and sedimentation problems are likely to be exacerbated at areas where clearing removes deep-rooted vegetation. Therefore, to maintain the integrity of these aquatic resources during transmission line corridor maintenance, we recommend that at least a 25-foot buffer be left on both sides of any stream crossed or paralleled by a transmission line. (F-01)

***Response**: The comment is noted. NRC understands FWS' concerns regarding protection of the wetlands and waters in the vicinity of RNP. CP&L's general practice is to mow the transmission line rights-of-way, which leaves the root mat intact. Mowing minimizes soil disturbance and protects against accelerated erosion. Herbaceous vegetation is quickly re-established, and erosion is minimized. Trees above a certain height are trimmed or cut for*

reasons of transmission line safety; however, the stumps are left in place. Also, vegetation in wetlands is hand-cut to avoid rutting the soil with mowing machinery. Following these practices, CP&L has been successful in preventing erosion and sedimentation problems over the last 30 years.

The NRC notes that its NEPA review performed for license renewal satisfies the requirements of the Fish and Wildlife Coordination Act.

The NRC staff has determined that no further evaluation of the comment is necessary; however, the comment has been forwarded to CP&L for consideration. There were no changes made in this Supplement as a result of the comment.

A.2.5 Comments Concerning Electromagnetic Fields–Acute Effects

Comment: The National Electric Safety Code (NESC) vertical clearance requirement is 22.4 feet; Progress energy maintains a 27 foot vertical clearance requirement for possible errors during construction. (B-04)

Response*: Vertical clearance requirements established by NESC are dependent on nature of surface underneath wires, conductors, or cables. Due to the variety of conditions that may occur under the entire length of the transmission lines, the limiting factor in the evaluation process is the ability of the applicant to demonstrate that a steady state current due to electrostatic effects of 5 milliamps for the largest anticipated truck under a transmission line were short-circuited to ground would not occur. Section 4.2.1 was modified in the Supplement to provide more clarity.*

Comment: The statement is made that the utility did not do any specific modeling or experimental studies to determine if the induced currents would exceed requirements established in the NESC. Refer to Section 4.13 of the Environmental Report, submitted by letter dated June 14, 2002, for a description of modeling that was performed. (B-05)

Response*: As CP&L notes, a modeling study was performed, and an evaluation of this assessment was added to Section 4.2.1 of the Supplement.*

A.2.6 Comments Regarding Alternative Energy Sources

Comment: There are currently no generating plants planned for retirement. (B-09)

Response*: The comment is noted, and Section 8.2.5.10 of the Supplement has been clarified as a result of this comment.*

Comment: The data provided for the demand-side management savings are for the Company's South Carolina service area. (B-10)

***Response**: The comment is noted, and the wording in Section 8.2.5.11 of the Supplement has been changed to reflect this information.*

A.2.7 Comment Concerning Uranium Fuel Cycle and Waste Management Issues

Comment: Based on the review of the DGSEIS, the project received a rating of "EC-1," meaning that some environmental concerns exist regarding aspects of the proposed project. Specifically, protecting the environment involves the continuing need for appropriate storage, and ultimate disposition, of radioactive wastes on-site....Overall, the impacts as defined in the DGSEIS appear to be within acceptable limits. (D-01)

***Response**: The comment is noted. The NRC is committed to protecting the environment, recognizing the continuing need for appropriate storage and ultimate disposition of radioactive wastes stored on-site. The safety and environmental effects of long-term storage of spent fuel onsite have been evaluated by the NRC and, as set forth in the Waste Confidence Rule (10 CFR 51.23), the NRC generically determined that such storage could be accomplished without significant environmental impact. In the Waste Confidence Rule, the Commission determined that spent fuel can be safely stored onsite for at least 30 years beyond the licensed operating life, which may include the term of a renewed license. At or before the end of that period, the fuel would be moved to a permanent repository. The GEIS, NUREG-1437, is based upon the assumption that storage of the spent fuel onsite is not permanent. This Supplement to the GEIS for H.B. Robinson, Unit 2 is also based on the same assumption. Radiological issues are Category 1 issues, and are discussed in Section 2.2.7 of this SEIS. This comment did not provide significant, new information and will not result in a change to this Supplement.*

A.2.8 Miscellaneous Comments

Comment: Note that the power uprate license amendment discussed in this paragraph has been approved by NRC letter dated November 5, 2002. (B-01)

Comment: Note that the plant's maximum dependable capacity has been revised to 710 MW(e). (B-08)

***Response**: These comments are noted. The higher power level did not change any conclusions in the FSEIS. Several sections of the Supplement were modified to address the power uprate.*

Comment: Note that Black Creek is a tributary of the Pee Dee River. (B-07)

***Response**: The comment is noted, and the wording in Section 4.6.1 of the Supplement has been modified to reflect this information.*

A.2.9 Editorial Comments

Comment: Page 2-19, line 9. Hurricane Hugo occurred in September 1989, rather than September 1998. (B-02)

Comment: Page 4-17, line 18. There appears to be an error in the conversion [of flow rates] from metric to English units. (B-03)

Comment: Page 9-6, lines 13 and 18. In line 13, the word "reactors" should be singular. In line 18, the term "in each of the two units" should be revised to "in the reactor." (B-11)

***Response:** The comments are noted, and the identified corrections were made resulting in modifications of the Supplement.*

A.3 Letters and E-Mails Received on the Draft SEIS

See following pages

Natchez Indian Tribe

79 Bluff Rd. Columbia, S.C. 20201 (803) 988-1074
E-mail address: Natchez Tribe@AOL.com

5/14/03
68 FR 25907
(2)

June 11, 2003

Dear Sir,

A-01 The Natchez (PeeDee) Indian Tribe of Orangeburg, S.C. has asked me to write expressing their support of the license renewal for the H.B. Robinson Nuclear Plant. Carolina Power and Light also known as C.P.& L. has shown to be a good corporate citizen and a valuable partner within the community.
We were very impressed with the enviromental impact report and after reading the comments of others about H.B. Robinson and C.P.&L., and reading the generic environmental impact statement for license renewal approve of the license for the nuclear facility.
We also would like to thank those involved with gathering all of the information we have received, good work on your part. We pray that the surrounding environment will be a commitment that the H.B. Robinson Nuclear Plant and C.P.& L. will hold to heart and continue to be caring stewards of all the resources that they are entrusted with and that so many find joy in.

May the eyes of the Creator look down upon you and yours.

Samuel E. RedHawk Davis

Samuel E."RedHawk" Davis
Chief of the Natchez Tribe

cc: Honorable Governor Sanford of the State of South Carolina
U.S. Nuclear Regulatory Commission, Division of Administrative Services
Mr. Richard Emch, Jr. U.S. Nuclear Regulatory Commission
Tribal File

E-RIDS= ADM-03
add = R. Emch (RLE)

Template = ADM-013

Progress Energy

RECEIVED
'03 JUL 25 AM 1:37
Rules and Directives

Serial: RNP-RA/03-0093
JUL 2 4 2003

United States Nuclear Regulatory Commission
Attn: Chief, Rules and Directives Branch
Division of Administrative Services
Office of Administration
Mail Stop T-6D 59
Washington, DC 20555-0001

3/14/03
68 FR 05907
(4)

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23

COMMENTS ON
DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Dear Sir:

By letter dated June 14, 2002, Carolina Power & Light (CP&L) Company, now doing business as Progress Energy Carolinas, Inc. (PEC), submitted an application for renewal of the Operating License for the H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2.

As part of the review of the application, the NRC has published a draft plant-specific supplement (i.e., Supplement 13) to the Generic Environmental Impact Statement, NUREG-1437. PEC has reviewed the draft supplement and provides specific comments from this review in the attachment to this letter.

If you have any questions concerning this matter, please contact me.

Sincerely,

C. T. Baucom
Supervisor - Licensing/Regulatory Programs

JSK/jsk

Attachment

E-RIDS=ADM-03
Add=R. Emch (RLE)

Progress Energy Carolinas, Inc.
Robinson Nuclear Plant
3581 West Entrance Road
Hartsville, SC 29550

Template=ADM-013

c: Mr. T. P. O'Kelley, Director, Bureau of Radiological Health (SC)
Mr. L. A. Reyes, NRC, Region II
Mr. C. P. Patel, NRC, NRR
NRC Resident Inspectors, HBRSEP
Attorney General (SC)
Mr. S. K. Mitra, NRC, NRR
Mr. R. L. Emch, NRC, NRR
Mr. R. M. Gandy, Division of Radioactive Waste Management (SC)

United States Nuclear Regulatory Commission
Attachment to Serial: RNP-RA/03-0093
Page 1 of 1

Comments on Draft Supplemental Environmental Impact Statement

	Location	Comment
B-01	Page 2-6, lines 1-7.	Note that the power uprate license amendment discussed in this paragraph has been approved by NRC letter dated November 5, 2002.
B-02	Page 2-19, line 9.	Hurricane Hugo occurred in September 1989, rather than September 1998.
B-03	Page 4-17, line 18.	There appears to be an error in the conversion from metric to English units.
B-04	Page 4-22, lines 25-28.	The National Electric Safety Code (NESC) vertical clearance requirement is 22.4 feet; Progress Energy maintains a 27 foot vertical clearance requirement for possible errors during construction.
B-05	Page 4-22, lines 28-30.	The statement is made that the utility did not do any specific modeling or experimental studies to determine if induced currents would exceed requirements established in the NESC. Refer to section 4.13 of the Environmental Report, submitted by letter dated June 14, 2002, for a description of modeling that was performed.
B-06	Page 4-32, section 4.4.5.	The recommendation that forested areas within the exclusion zone should be treated as having moderate-to-high potential for historic or archaeological resources should be deleted. Statements in section 2.2.9.2 indicate that a farm was formerly located at the plant site, but that "[a]ny structures that were part of the farm have been destroyed." This and other statements in sections 2.2.9.2 and 4.4.5 do not support the characterizations of moderate-to-high potential, and do not support expansion of the recommendation beyond the exclusion area to the rest of a site that is shared by coal- and gas-fired plants.
B-07	Page 4-41, line 40, and page 4-42, lines 1-2.	Note that Black Creek is a tributary of the Pee Dee River.
B-08	Page 8-8, line 21, page 8-25, line 39, and elsewhere in the report.	Note that the plant's maximum dependable capacity has been revised to 710 MW(e).
B-09	Page 8-48, section 8.2.5.10.	There are currently no generating plants planned for retirement.
B-10	Page 8-48, lines 36-41.	The data provided for demand-side management savings are for the Company's South Carolina service area.
B-11	Page 9-6, lines 13 and 18.	In line 13, the word "reactors" should be singular. In line 18, the term "in each of the two units" should be revised to "in the reactor."

NRCREP - Response from "Comment on NRC Documents" Page 1

From: Gregory Hogue <gregory_hogue@ios.doi.gov>
To: <nrcrep@nrc.gov>
Date: Fri, Jul 25, 2003 10:28 AM
Subject: Response from "Comment on NRC Documents"

Below is the result of your feedback form. It was submitted by

Gregory Hogue (gregory_hogue@ios.doi.gov) on Friday, July 25, 2003 at 10:28:10

Document_Title: Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437, Supplement 13, H.B. Robinson Steam Electric Plan, Unit No. 2, SC

C-01 Comments: The Department of the Interior has reviewed the above referenced document. We have no comments to provide for your consideration at this time.

If you should have any questions concerning this matter you can contact me at 404-331-4524.

organization: Dept of the Interior, Office of Environmental Policy & Compliance

address1: 75 Spring St., S.W.

address2: Room 1144

city: Atlanta

state: GA

zip: 30303

country: USA

phone: 404-331-4524

5/14/03
68 FR 25907
(3)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

July 29, 2003

5/14/03
68FR25907
(5)

Rules Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, D.C. 20555-0001

RE: EPA Review and Comments on
Draft Generic Supplemental Environmental Impact Statement (DGSEIS)
License Renewal of Nuclear Plants, Supplement 13
Regarding H.B. Robinson Steam Electric Plant, Unit No. 2
CEQ No. 030213

Dear Sir:

EPA Region 4 reviewed the Draft Generic Supplemental EIS (DGSEIS) pursuant to Section 309 of the Clean Air Act and Section 102 (2)(C) of the National Environmental Policy Act (NEPA). The purpose of this letter is to provide the Nuclear Regulatory Commission (NRC) with EPA's comments regarding potential impacts of the proposed renewal of the H.B. Robinson Steam Electric Plant, Unit No. 2 Operating License (OL).

Carolina Power and Light Company submitted an application to renew the Operating License (OL) for Unit No. 2, a single-unit nuclear plant, for an additional 20 years. The proposed action, (license renewal), would provide for continued operation and maintenance of existing facilities and transmission lines.

D-01 Based on the review of the DGSEIS, the project received a rating of "EC-1," meaning that some environmental concerns exist regarding aspects of the proposed project. Specifically, protecting the environment involves the continuing need for appropriate storage, and ultimate disposition, of radioactive wastes on-site. The DGSEIS acknowledges that OL renewal of Unit 2 will require continuing radiological monitoring of all plant effluents. Continuing to appropriately store spent fuel and radioactive wastes on-site is required, in order to prevent impacts. Ultimately, long-term radioactive waste disposition will require transportation of wastes to a permitted repository site. Further, the DGSEIS states that renewal of the OL would result in fewer environmental impacts than the feasible alternatives for generating power, and the NRC considers impacts of OL renewal to be small. Overall, the impacts as defined in the DGSEIS appear to be within acceptable limits.

Thank you for the opportunity to comment on this document. We look forward to reviewing the Final GSEIS. If we can be of further assistance, please contact Ramona McConney of my staff at (404) 562-9615.

Sincerely,

for H. J. Mueller

Heinz J. Mueller, Chief
Office of Environmental Assessment

August 7, 2003

Mr. Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

RE: H.B. Robinson Steam Electric Plant, No. 2 (RNP), License Renewal Review and National Historic Preservation Act, Section 106 Review Process

Dear Mr Kuo:

We have reviewed the Generic Environmental Impact Statement for the above-referenced project and would like to offer the following comments.

E-09 Our major comments regarding archaeological sites are in response to section 4.4.5. This section notes that the SC SHPO in May of 2001 wrote that license renewal should not affect historic properties or archaeological sites (which of course can be historic properties). Our office now has new information, both from this draft EIS, and other sources, that raises concerns for us. While it appears that the operation of RNP is unlikely to undergo major changes during the new license period, we would like a clearer understanding of the types of activities that are on-going and where they occur. We would also recommend a greater effort to identify likely resources that could be affected by these activities. Finally, we believe that the best way to carefully manage resources, and potential resources, is to develop a

E-10 Programmatic Agreement. This should be done prior to relicensing. The PA should direct the development of a Cultural/Historic Resources Management Plan (or Historic Properties Management Plan) and define activities that the SHPO would need to review.

Technical comments are attached separately. These comments are provided to assist you with your responsibilities pursuant to Section 106 of the National Historic Preservation Act, as amended. If you have any questions, please contact me at (803) 896-6169. Thank you.

Sincerely,

Marta Matthews
Review and Compliance Coordinator
State Historic Preservation Office

encl.

S.C. Department of Archives & History • 8301 Parklane Road • Columbia • South Carolina • 29223-4905 • 803-896-6100 • www.state.sc.us/scdah

TECHNICAL COMMENTS

The following comments pertain to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants regarding H.B. Robinson Steam Electric Plant, Unit No. 2

E-01 1. Is this EIS just for the Plant and immediate property or the whole lake, etc. as shown in Fig. 2-3? I assume it is the whole thing. We would like to see the project (and APE) plotted on a topographic-based map.

E-02 2. Does the land that CP&L leases out fall under FERC regulation? If so, how are activities on those lands reviewed for effects to historic properties?

E-03 3. Under 2.2.9.1, include a discussion of the Segars Mill Farm property under Euro-American Historic Period. Our office has just learned about this property and determined it eligible for the National Register of Historic Places. The families that lived here played an important role in the Hartsville area history.

E-04 4. Under 2.2.9.2, there may not have been sites near the project that were considered to be eligible or potentially eligible for the National Register earlier, but I know, with our review of Segars Mill Farm, that there are now. Several Native American sites on the farm tract also appear to be eligible, but need more testing. This indicates, too, that with a comprehensive survey, more sites would likely be identified.

E-05 5. We believe that an effort needs to be made to locate the Wiley Warren family cemetery (2.2.9.2) – this should not wait for ground-disturbing activities. Also additional work needs to be done to locate and evaluate resources associated with the other farm properties known to have been in the project area.

E-06 6. Is the Old Camden Road likely to be affected by the project in any way?

E-07 7. The definition of areas of low, moderate and high probability is reasonable, but pretty general. We would like to see these more carefully defined, and procedures put in place for how to proceed with undertakings in the higher probability areas.

E-08 8. We concur with the recommendations on page 4-32 in the paragraph beginning on line 24. But, again, the language is too vague. What does "care should be taken mean"? Let's describe how care will be taken. What are "normal operational and maintenance activities"? A partial list is included, but these are pretty general categories that could include a wide variety of undertakings. How will property managers know what to do when? We absolutely agree that forested areas are particularly high probability and vulnerable. There should be a plan to identify and manage the resources in them.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

October 17, 2003

Mr. Pao-Tsin Kuo
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: License Renewal at H.B. Robinson Steam Electric Plant, Unit 2 (RNP)
TAC No. MB5226, Docket No. 50-261
FWS Log No. 4-6-03-I-491

Dear Mr. Kuo:

The U.S. Fish and Wildlife Service (Service) has reviewed the Biological Assessment and your letter requesting our concurrence regarding the above referenced action in Chesterfield, Darlington, Florence, Lee, and Sumter Counties, South Carolina. We are submitting the following comments under provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*) and the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq.*).

According to the information provided, the renewed operating license would allow 20 additional years of plant operation beyond the current RNP licensed operating period of 40 years. No major refurbishment or replacement of important systems, structures, or components are expected during the RNP license renewal period. In addition, no construction activities are expected to be associated with the license renewal.

Based on our review and the information provided, the Service concurs with your determination that the proposed action is not likely to adversely affect the federally-listed red-cockaded woodpecker, Candby's dropwort, American chaffseed, or the rough-leaved loosestrife. We also concur with your determination that the proposed action will have no effect on the additional federally-listed species, under the jurisdiction of the Service, that were identified to have potential to occur within the project area. Therefore, the requirements of Section 7 of the Act have been fulfilled relative to the proposed action, and no further consultation is necessary at this time. However, obligations under Section 7 of the Act must be reconsidered if: (1) new information reveals that the proposed project may affect listed species in a manner or to an extent not previously considered, (2) the proposed project is subsequently modified to include activities which were not considered during this consultation; or (3) new species are listed or critical habitat designated that might be affected by the proposed project.

In accordance with provisions of the Fish and Wildlife Coordination Act, the Service has also reviewed the subject project with regard to the effects the proposed action may have on waters of the U.S. and related fish and wildlife resources. Information provided revealed the presence of several streams within the proposed area. Erosion and sedimentation problems are likely to be exacerbated at areas where clearing removes deep-rooted vegetation. Therefore, to maintain the integrity of these aquatic resources during transmission line corridor maintenance, we recommend that at least a 25-foot buffer be left on both sides of any stream crossed or paralleled by a transmission line.

F-01

The above views and recommendations constitute the report of the Department of the Interior. If you require additional assistance, please contact Phil DeGarmo of my staff at 843-727-4707 x21.

Sincerely yours,

Joseph F. Cockrell

Joseph F. Cockrell
Acting Field Supervisor

JFC/PMD/km

Appendix B

Contributors to the Supplement

Appendix B

Contributors to the Supplement

The overall responsibility for the preparation of this supplement was assigned to the Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission (NRC). The statement was prepared by members of the Office of Nuclear Reactor Regulation with assistance from other NRC organizations and the Pacific Northwest National Laboratory, Argonne National Laboratory, Los Alamos National Laboratory, Information Systems Laboratories, and Energy Research Incorporated.

Name	Affiliation	Function or Expertise
NUCLEAR REGULATORY COMMISSION		
Richard Emch	Nuclear Reactor Regulation	Project Manager
John Tappert	Nuclear Reactor Regulation	Section Chief
Louis Wheeler	Nuclear Reactor Regulation	Backup Project Manager
Bill Dam	Nuclear Reactor Regulation	Project Management Support
James Wilson	Nuclear Reactor Regulation	Project Management
Gregory Suber	Nuclear Reactor Regulation	Project Management
Tomy Nazario	Nuclear Reactor Regulation	Project Management Support
Stacey Fox Imboden	Nuclear Reactor Regulation	Project Management Support
Jennifer Davis	Nuclear Reactor Regulation	Project Management Support
Alicia Williamson	Nuclear Reactor Regulation	Project Management Support
Barry Zalcman	Nuclear Reactor Regulation	Technical Monitor
Robert Palla	Nuclear Reactor Regulation	Severe Accident Mitigation Alternatives
Nina Barnett	Nuclear Reactor Regulation	Administrative Support
PACIFIC NORTHWEST NATIONAL LABORATORY[(a)]		
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Beverly Miller		Deputy Task Leader
William Sandusky		Air Quality
Michael Scott		Socioeconomics
Susan Sargeant		Aquatic Ecology
Jerry Martin		Radiation Protection
Daniel Tano		Cultural Resources
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Paul Hendrickson		Land Use, Related Federal Programs, Alternatives
Lance Vail		Water Use, Hydrology
Cary Counts and Barbara Wilson		Technical Editing
Trina Russell and Debbie Schulz		Document Production

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	LOS ALAMOS NATIONAL LABORATORY[c]	
Sam Loftin		Terrestrial Ecology
	ENERGY RESEARCH INCORPORATED	
Mohsen Khatib-Rahbar		Severe Accident Mitigation Alternatives
	INFORMATION SYSTEMS LABORATORIES	
Karen Green		Severe Accident Mitigation Alternatives
Jim Meyer		Severe Accident Mitigation Alternatives

(a) Pacific Northwest National Laboratory is operated for the U.S. Department of Energy by Battelle Memorial Institute.
(b) Argonne National Laboratory is operated for the U.S. Department of Energy by the University of Chicago.
(c) Los Alamos National Laboratory is operated for the U.S. Department of Energy by the University of California.

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Carolina Power and Light Company's Application for License Renewal of H.B. Robinson Steam Electric Plant, Unit 2

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Carolina Power and Light Company's Application for License Renewal of H.B. Robinson Steam Electric Plant, Unit 2

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC) and Carolina Power and Light Company (CP&L) and other correspondence related to the NRC staff's environmental review, under 10 CFR Part 51, of CP&L's application for renewal of the H.B. Robinson Steam Electric Plant, Unit 2 (RNP), operating license (OL). All documents, with the exception of those containing proprietary information, have been placed in the Commission's Public Document Room, at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland, and are available electronically from the Public Electronic Reading Room found on the Internet at the following web address: http://www.nrc.gov/reading-rm.html. From this site, the public can gain access to the NRC's Agencywide Document Access and Management Systems (ADAMS), which provides text and image files of NRC's public documents in the Publicly Available Records (PARS) component of ADAMS. The ADAMS accession numbers for each document are included below.

June 14, 2002	Letter from Mr. John Moyer, CP&L to NRC, submitting the application for the renewal of the operating license for H.B. Robinson Steam Electric Plant, Unit 2, OL (Accession Nos. ML021690663, ML021690656, ML021690696, and ML0210700129)
June 26, 2002	Letter from NRC to Ms. Rose Roseveare, Hartsville Memorial Public Library, regarding maintenance of documents at the former H.B. Robinson local public docket room related to application by CP&L for renewal of the H.B. Robinson Steam Electric Plant, Unit 2, OL for an additional 20 years (Accession No. ML021820143)
July 15, 2002	Letter from NRC to CP&L forwarding notice of receipt and availability of the license renewal application for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML021970121)
July 15, 2002	NRC press release announcing the availability of the license renewal application for H.B. Robinson Nuclear Plant, Unit 2 (Accession No. ML021980190)

July 18, 2002	*Federal Register* Notice of receipt of application for renewal of Facility Operating License No. DPR-23 for the H.B. Robinson Steam Electric Plant, Unit 2 for an additional 20-year period (67 FR 47410)
August 12, 2002	Letter from NRC to CP&L forwarding determination of acceptability and sufficiency for docketing, proposed review schedule, and opportunity for a hearing regarding an application from CP&L for renewal of the H.B. Robinson Steam Electric Plant, Unit 2 OL (Accession No. ML022240731)
August 12, 2002	NRC press release announcing the opportunity for hearing on the license renewal application for H.B. Robinson Nuclear Power Plant (Accession No. ML022240350)
August 16, 2002	Letter from NRC to CP&L forwarding notice of intent to prepare an environmental impact statement and conduct scoping process for the license renewal for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML 022280438)
August 22, 2002	*Federal Register* Notice of Intent to prepare an environmental impact statement and conduct scoping process for the H.B. Robinson Steam Electric Plant, Unit 2 (67 FR 54499)
August 29, 2002	Notice of public meeting to discuss environmental scoping process for the H.B. Robinson, Unit 2, license renewal application (Accession No. ML022280125)
August 30, 2002	Letter from NRC to the Catawba Indian Nation inviting participation in the scoping process for the H.B. Robinson Steam Electric Plant, Unit 2, license renewal (Accession No. ML022480055)
August 30, 2002	Letter from NRC to the Pee Dee Indian Nation inviting participation in the scoping process for the H.B. Robinson Steam Electric Plant, Unit 2, license renewal (Accession No. ML022480106)
August 30, 2002	Letter from NRC to the Santee Indian Nation inviting participation in the scoping process for the H.B. Robinson Steam Electric Plant, Unit 2, license renewal (Accession No. ML022480196)

August 30, 2002	Letter from NRC to the Chaloklowas Indian People of the Chickasaw Indian Nation inviting participation in the scoping process for the H.B. Robinson Steam Electric Plant, Unit 2, license renewal (Accession No. ML022480165)
August 30, 2002	Letter from NRC to the Natchez Pee Dee Indian Tribe of Orangeburg, South Carolina inviting participation in the scoping process for the H.B. Robinson Steam Electric Plant, Unit 2, license renewal (Accession No. ML022480210)
August 30, 2002	Letter from NRC to the Beaver Creek Band of Pee Dee Indians inviting participation in the scoping process for the H.B. Robinson Steam Electric Plant, Unit 2, license renewal (Accession No. ML022480228)
August 30, 2002	Letter from NRC to the Lumbee Tribe inviting participation in the scoping process for the H.B. Robinson Steam Electric Plant, Unit 2, license renewal (Accession No. ML022480239)
August 30, 2002	Letter from NRC to the Pee Dee Indian Nation of Beaver Creek inviting participation in the scoping process for the H.B. Robinson Steam Electric Plant, Unit 2, license renewal (Accession No. ML022480247)
September 5, 2002	NRC press release announcing public meetings on Robinson Nuclear Plant license renewal (Accession No. ML022480164)
September 13, 2002	Letter from NRC to CP&L forwarding a revision of schedule for the review of the H.B. Robinson Steam Electric Plant, Unit 2, license renewal application (Accession No. ML022590085)
September 25, 2002	Placement of handout materials from the September 25, 2002, public scoping meeting in the public domain (Accession No. ML022740260)
September 25, 2002	Documents submitted during the September 25, 2002, scoping meetings regarding the Robinson, Unit 2, license renewal application (Accession Nos. ML022740260, ML022910364, ML022910367, ML022940206)

October 11, 2002	Summary of a meeting on severe accident management alternatives to support review of the H.B. Robinson Steam Electric Plant, Unit 2, license renewal application (Accession Nos. ML022910114)
October 23, 2002	Request for additional information regarding severe accident mitigation alternatives for the H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML022970347)
October 23, 2002	Summary of environmental site audit to support review of the H.B. Robinson Steam Electric Plant, Unit 2, license renewal application (Accession No. ML022940661)
October 23, 2002	Summary of public scoping meetings to support review of the H.B. Robinson Steam Electric Plant, Unit 2, license renewal application (Accession No. ML022960641)
November 5, 2002	Letter from NRC to CP&L forwarding license amendment approving 1.7% increase in power for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML023100365)
November 20, 2002	Letter from NRC to CP&L forwarding a revision of schedule for the H.B. Robinson Steam Electric Plant, Unit 2, license renewal application (Accession No. ML 023240495)
December 9, 2002	Letter from NRC to the U.S. Fish and Wildlife Service requesting an updated list of protected species within the area under evaluation for the H.B. Robinson Steam Electric Plant, Unit 2, license renewal (Accession No. ML023450482)
December 19, 2002	Letter from Mr. Roger L. Banks, U.S. Fish and Wildlife Service, to NRC providing an updated list of protected species within the area under evaluation for the H.B. Robinson Steam Electric Plant, Unit 2, license renewal (Accession No. ML030160655)
January 2, 2003	Letter from CP&L to NRC providing a response to a request for additional information regarding severe accident mitigation alternatives analysis for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML030060112)

January 9, 2003	Letter from NRC to CP&L forwarding issuance of an environmental scoping summary report associated with the staff's review of the application for renewal of the operating license for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML 030090582)
January 15, 2003	Note to File: Docket information in support of the staff's review of the H.B. Robinson, Unit 2, license renewal application (Accession No. ML030160698)
January 15, 2003	Letter from CP&L to NRC forwarding a schedule for providing a supplemental response to request for additional information for the H.B. Robinson Steam Electric Plant, Unit 2, license renewal (Accession No. ML030170187)
January 16, 2003	Note to File: Summary of a teleconference with the National Marine Fishery Service and the South Carolina Department of Natural Resources in support of the staff's review of the H.B. Robinson, Unit 2, license renewal application (Accession No. ML030170639)
January 20, 2003	Letter from CP&L to NRC providing a response to an NRC request for additional information regarding severe accident mitigation alternatives (Accession No. ML030220231)
January 24, 2003	Note to File: Summary of a teleconference with CP&L in support of the staff's review of the H.B. Robinson, Unit 2, license renewal application (Accession No. ML030300619)
February 11, 2003	Note to File: Docket information in support of the staff's review of the H.B. Robinson, Unit 2, license renewal application (Accession No. ML030430154)
March 18, 2003	Note to File: Summary of teleconference with Carolina Power and Light Company in support of the staff's review of the H.B. Robinson, Unit 2, license renewal application (Accession No. ML030800525)
March 19, 2003	Note to File: Summary of teleconference with Carolina Power and Light Company in support of the staff's review of the H.B. Robinson, Unit 2, license renewal application (Package Accession No. ML030870215)

April 2, 2003	Note to File: Summary of teleconference with Carolina Power and Light Company in support of the staff's review of the H.B. Robinson, Unit 2, license renewal application (Package Accession No. ML030930684)
April 15, 2003	Note to File: Docket information in support of the staff's review of the H.B. Robinson, Unit 2, license renewal application (Package Accession No. ML031070230)
April 22, 2003	Letter from NRC to the U.S. Fish and Wildlife Service transmitting biological assessment for H.B. Robinson Steam Electric Plant, Unit 2, license renewal (Accession No. ML031130250)
April 22, 2003	Letter from NRC to National Oceanic and Atmospheric Administration Fisheries transmitting biological assessment for H.B. Robinson Steam Electric Plant, Unit 2, license renewal (Accession No. ML031130427)
May 5, 2003	Letter from NRC to EPA providing Draft Supplement 13, to the Generic Environmental Impact Statement regarding H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML031260480)
May 5, 2003	Letter from NRC to CP&L providing notice of availability to the Draft Supplement 13, Generic Environmental Impact Statement for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML031260084)
May 5, 2003	Letter from NRC to CP&L requesting comments on Draft Supplement 13, Generic Environmental Impact Statement for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML032160432)
May 5, 2003	*Federal Register* Notice of availability of the Draft Supplement 13, Generic Environmental Impact Statement for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML031260105)
May 31, 2003	Draft Report for Comment, NUREG-1437, Supplement 13, Generic Environmental Impact Statement for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML031250150)

June 6, 2003	NRC press release announcing issuance of Draft Supplement 13, Generic Environmental Impact Statement for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML031570357)
June 6, 2003	Notice of meeting to discuss the Draft Supplement 13, Generic Environmental Impact Statement for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML031570744)
June 25, 2003	Letter from CP&L to NRC providing annual update information for license renewal for H.B. Robinson Steam Electric Plant, Unit No. 2 (Accession No. ML031820165)
June 27, 2003	Placement of handout materials from the June 25, 2003, Draft Supplement 13, Generic Environmental Impact Statement for H.B. Robinson Steam Electric Plant, Unit 2 meetings in public domain (Accession No. ML031780821, ML031780771)
July 7, 2003	Letter from NRC to South Carolina Department of Archives and History providing Historic and Archaeological Resources Report for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML031950463)
July 24, 2003	Letter from CP&L to NRC providing comments on Draft Supplemental Environmental Impact Statement (for H.B. Robinson Steam Electric Plant, Unit No. 2) (Accession No. ML032110414)
July 29, 2003	Letter from EPA to NRC providing EPA review and comment on Draft Generic Environmental Impact Statement, Supplement 13 regarding H.B. Robinson Steam Electric Plant, Unit No. 2 (Accession No. ML032260526)
August 7, 2003	Letter from Ms. Marta Matthews, South Carolina Department of Archives and History to NRC providing comments on Draft Supplement 13, Generic Environmental Impact Statement for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML032661160)
August 15, 2003	Summary of visit to Robinson site in support of the staff's review of the H.B. Robinson Steam Electric Plant, Unit 2 license renewal application (Accession No. ML032270604)

August 15, 2003	Summary of meetings held on June 25, 2003, in support of the H.B. Robinson Steam Electric Plant, Unit 2 license renewal application (Accession No. ML032270603, ML032270600, ML032270601, ML031780802)
August 18, 2003	Letter from Ms. Marta Matthews, South Carolina Department of Archives and History to NRC providing comments on the Historic and Archaeological Resources Report Narrative for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML032661159)
October 7, 2003	Letter from Mr. Roy E. Crabtree, National Marine Fisheries Service to the NRC providing comments on the biological assessment for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML032930113)
October 8, 2003	Note to File: Summary of teleconference with South Carolina State Historic Preservation Office in support of the staff's review of the H.B. Robinson, Unit 2, license renewal application (Accession No. ML032820198)
October 8, 2003	Letter from CP&L to NRC providing annual update information for license renewal application for H.B. Robinson Steam Electric Plant, Unit No. 2 (Accession No. ML032880498)
October 17, 2003	Letter from Joseph F. Cockrell, U. S. Fish and Wildlife Service to the NRC providing comments on the biological assessment for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML033100418)
November 10, 2003	Note to File: Summary of teleconference with South Carolina State Historic Preservation Office in support of the staff's review of the H.B. Robinson, Unit 2, license renewal application (Accession No. ML033180439)
November 12, 2003	Letter from CP&L to the NRC committing to implement guidance to preserve archaeological, historic, and cultural resources at H.B. Robinson, Unit 2 (Accession No. ML033180546)
November 17, 2003	Letter from NRC to South Carolina Department of Archives and History providing revised Historic and Archaeological Resources Report for H.B. Robinson Steam Electric Plant, Unit 2 (Accession No. ML033230321)

Appendix D

Organizations Contacted

Appendix D

Organizations Contacted

During the course of the staff's independent review of environmental impacts from operations during the renewal term, the following Federal, State, regional, and local agencies were contacted:

Chesterfield County School District, Chesterfield, South Carolina

Chesterfield County Economic Development, Chesterfield, South Carolina

Darlington County Planning Director, Darlington, South Carolina

Darlington County Economic Development, Darlington, South Carolina

Darlington County Emergency Planning/Emergency Services, Darlington, South Carolina

Darlington County Historical Commission, Darlington, South Carolina

Darlington County Planning, Darlington, South Carolina

Darlington County School District, Darlington, South Carolina

Florence County Development Partnership, Florence, South Carolina

Florence County School District #1, Florence, South Carolina

Gandy-Tiller and Associates, Hartsville, South Carolina

Lee County Planning and Zoning, Bishopville, South Carolina

Lee County Emergency Preparedness, Bishopville, South Carolina

Lord Cares, Darlington, South Carolina

National Marine Fisheries Service (now NOAA Fisheries) Southeastern Regional Office (SERO), St. Petersburg, Florida

Old Darlington District Genealogy Chapter of the South Carolina Genealogical Society, Hartsville, South Carolina

Re/Max Professionals, Florence, South Carolina

South Carolina Department of Archives and History, Columbia, South Carolina

South Carolina Department of Health and Environmental Control, Industrial and Agricultural Wastewater Division, Columbia, South Carolina

South Carolina Department of Natural Resources, Columbia, South Carolina

South Carolina Institute of Archaeology and Anthropology, Columbia, South Carolina

South Carolina State Archaeologist, Columbia, South Carolina

South Carolina Tourism/Research Division, Columbia, South Carolina

United Way of Darlington County, Darlington, South Carolina

U.S. Fish and Wildlife Service, Charleston, South Carolina.

Appendix E

Carolina Power and Light Company Compliance Status and Consultation Correspondence

Appendix E

Carolina Power and Light Company Compliance Status and Consultation Correspondence

The licenses, permits, consultations, and other approvals obtained from Federal, State, regional, and local authorities for the H.B. Robinson Steam Electric Plant, Unit 2 (RNP), are listed in Table E-1.

Following Table E-1 are reproductions of correspondence prepared and sent during the evaluation process of the application for renewal of the RNP operating license.

Source	Recipient	Date of Letter
South Carolina Department of Natural Resources (Julie Holling)	Carolina Power and Light Company	June 4, 2001
Fish and Wildlife Service (Steven S. Gilbert)	Carolina Power and Light Company	June 7, 2001
South Carolina State Historic Preservation Office (Nancy Brock)	Carolina Power and Light Company	August 8, 2001
Nuclear Regulatory Commission (Pao-Tsin Kuo)	U.S. Fish and Wildlife Service	December 9, 2002
Fish and Wildlife Service (Roger L. Banks)	Nuclear Regulatory Commission	December 19, 2002
Nuclear Regulatory Commission (Pao-Tsin Kuo)	U.S. Fish and Wildlife Service	April 22, 2003
Nuclear Regulatory Commission (Pao-Tsin Kuo)	NOAA Fisheries	April 22, 2003
Nuclear Regulatory Commission (Pao-Tsin Kuo)	South Carolina Department of Archives and History (Dr. Stroup)	July 7, 2003
South Carolina State Historic Preservation Office (Marta Matthews)	Nuclear Regulatory Commission	August 7, 2003
South Carolina State Historic Preservation Office (Marta Matthews)	Nuclear Regulatory Commission	August 18, 2003
NOAA Fisheries (Roy E. Crabtree)	Nuclear Regulatory Commission	October 7, 2003
Fish and Wildlife Service (Joseph F. Cockrell)	Nuclear Regulatory Commission	October 17, 2003
Nuclear Regulatory Commission (Pao-Tsin Kuo)	South Carolina Department of Archives and History (Dr. Stroup)	November 17, 2003

Table E-1. Federal, State, Local, and Regional Licenses, Permits, Consultations, and Other Approvals for Robinson Unit 2

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
NRC	10 CFR Part 50	Operating license	DPR-23	07/31/70	07/31/10	Authorizes operation of Unit 2
FWS	Section 7 of the Endangered Species Act (16 USC 1536)	Consultation				Section 7 of the Endangered Species Act requires that Federal agencies, in cooperation with the license applicant, consult with the FWS and/or the NMFS concerning the potential impacts of a proposed licensing action on threatened or endangered species. Correspondence with FWS related to Section 7 is included in Appendix E.
FWS	16 USC 703-712	Depredation permit	MB789112-0	01/01/03	12/31/03	Removal and relocation of migratory bird nests.
Bureau of Land Management	31 Stat. 790; 43 Stat. 959	Permit to flood government lands	BLM-A-047130	08/06/58	No expiration date	Reservoir right-of-way for land in the Carolina Sandhills Wildlife Management Area.
U.S. Department of Transportation	49 USC 5108	Registration	050603550001L	05/06/03	06/30/04	Hazardous materials shipments.
South Carolina Department of Natural Resources	South Carolina Code of Laws, 50-11-1180	Letter of authorization, depredation		01/30/03	12/31/03	Removal and relocation of migratory bird nests.
South Carolina State Board of Health and Water Pollution Control Authority		Construction approval for dam on Black Creek forming Lake Robinson	Water Pollution Control Construction Permit Number 179	05/12/58	No expiration date	
South Carolina State Board of Health		Maintenance permit for Lake Robinson		01/26/60	No expiration date	
South Carolina Historic Preservation Office	Section 106 of the National Historic Preservation Act (16 USC 470f)	Consultation	Letter from State Historic Preservation Officer, to CP&L, 8/8/01			The South Carolina State Historic Preservation Office determined that no properties listed on or determined eligible for inclusion in the National Register of Historic Places will be affected by renewal of the Robinson operating license.

Table E-1. (contd)

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
SCDHEC	South Carolina Code of Regulations, 61-70	Industrial solid waste permits	163341-1601 1602	04/20/94	Compliance reviews every 5 years	Disposal of nonhazardous wastes.
SCDHEC	South Carolina Code of Laws, 44-2	Underground storage tank registration	02635	07/31/03	07/31/04	Fuel tank for emergency diesel generator.
SCDHEC	Clean Air Act, Title V; South Carolina Code of Regulations, 61-62	Air operating permit	TV-0820-0002	12/21/99	03/31/04	Air emission source operation.
SCDHEC	South Carolina Code of Laws, 48-1-10	NPDES permit	SC0002925	01/16/03	06/30/06	Effluent limits for Robinson 1 and 2.
SCDHEC	South Carolina Radioactive Waste Transportation and Disposal Act (Act No. 429)	South Carolina Radioactive Waste Transport Permit	0042-39-03	01/03/03	12/31/03	Transportation of radioactive waste into the State of South Carolina.
State of Tennessee Department of Environment and Conservation Division of Radiological Health	Tennessee Department of Environment and Conservation, Rule 1200-2-10.32	Tennessee Radioactive Waste License-for-Delivery	T-SC003-L03	01/01/03	12/31/03	Transportation of radioactive waste into the State of Tennessee.
U.S. Department of Transportation	49 USC 5108	Registration	050603550001L	05/06/03	06/30/04	Hazardous materials shipments.

CFR = Code of Federal Regulations
CP&L = Carolina Power and Light Company
FWS = U.S. Fish and Wildlife Service
NMFS = National Marine Fisheries Service
NPDES = National Pollution Discharge Elimination System
NRC = U.S. Nuclear Regulatory Commission
SCDHEC = South Carolina Department of Health and Environmental Control
USC = United States Code

South Carolina Department of
Natural Resources

Paul A. Sandifer, Ph.D.
Director
William S. McTeer
Deputy Director for
Wildlife and
Freshwater Fisheries

June 4, 2001

B. L. Fletcher, III
Manager – Regulatory Affairs
CP&L, Robinson Nuclear Plant
3581 West Entrance Rd.
Hartsville, SC 29550

RE: H. B. Robinson Steam Electric Plant, Unit No. 2
Request for information on Listed Species and Important Habitat

Dear Mr. Fletcher,

The only information that I can provide is the known occurrences of rare, threatened and endangered species. Since a comprehensive biological inventory of the state has not been done, we rely on biologists to provide information for our database. We do not currently track habitat information.

I have checked our database, and there are two known occurrences within one mile of the HBRSEP. One, the federally endangered *Picoides borealis*, or Red-cockaded Woodpecker, is found west of the upper section of Lake Robinson (above SSR 346) on Sandhills State Forest property. The other occurrence is of *Condylura cristata* or Star-nosed Mole, a species of state concern. This occurrence is located North of Lake Robinson on Black Creek. Please understand that our database does not represent a comprehensive biological inventory of the state. Fieldwork remains the responsibility of the investigator.

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

Sincerely,

Julie Holling

Julie Holling
SC Department of Natural Resources
Heritage Trust Program

Rembert C. Dennis Building • 1000 Assembly St • P.O. Box 167 • Columbia, S.C. 29202 • Telephone: 803/734-3886
EQUAL OPPORTUNITY AGENCY www.dnr.state.sc.us PRINTED ON RECYCLED PAPER

United States Department of the Interior

FISH AND WILDLIFE SERVICE
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

June 7, 2001

Mr. B. L. Fletcher, III
Carolina Power and Light, Inc.
Robinson Nuclear Plant
3581 West Entrance Road
Hartsville, SC 29550

Re: H. B. Robinson Steam Electric Plant, Unit No. 2 license renewal

Dear Mr. Fletcher:

We have reviewed the information received May 31, 2001 concerning the above-referenced project. The project seeks to renew the operating license of the H. B. Robinson Steam Electric Plant and associated transmission lines that have been in production since 1970. The plant itself covers an area approximately 4800 acres, including Lake Robinson, and is connected to the regional electric transmission grid by 230 kilovolt transmission lines with intra-system tie points at Darlington, SC, at Rockingham, NC, at Sumter, SC, at Florence, SC, and two lines that connect to CP&L's Darlington County plant which is located near HBRSEP. The following comments are provided in accordance with the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-667e), and section 7 of the Endangered Species Act, as amended (16 U.S.C. 1531-1543).

We believe there is potential habitat for federally protected species and/or the presence of designated or proposed critical habitat within the action area of your proposed project. Staffing limitations currently prevent us from conducting a field inspection of the action area. Therefore, we are unable to provide you with site-specific comments at this time.

Without further analysis of the "effects of the action," (as defined by 50 CFR 402.02) on federally protected species we are unable to concur that the proposed action is not likely to adversely impact such species and/or critical habitat.

Therefore, we are providing a list of the federally endangered (E) and threatened (T) and candidate (C) species which potentially occur in Sumter, Darlington, Florence, and Lee Counties in South Carolina to aid you in determining the impacts your project may have on protected species. The list also includes species of concern under review by the Service. Species of

concern (SC) are not legally protected under the Endangered Species Act, and are not subject to any of its provisions, including Section 7, until they are formally proposed or listed as endangered/threatened. We are including these species in our response for the purpose of giving you advance notification. These species may be listed in the future, at which time they will be protected under the Endangered Species Act. Therefore, it would be prudent for you to consider these species early in project planning to avoid any adverse effects.

In-house surveys should be conducted by comparing the habitat requirements for the attached listed species with available habitat types at the project site. Field surveys for the species should be performed if habitat requirements overlap with that available at the project site. Surveys for protected plant species must be conducted by a qualified biologist during the flowering or fruiting period(s) of the species. Surveys for the red-cockaded woodpecker should be conducted in accordance with the "Guidelines for preparation of biological assessments and evaluations for the red-cockaded woodpecker" by Gary Henry. A copy of these guidelines is available from this office. Please notify this office with the results of any surveys for the below list of species and an analysis of the "effects of the action," as defined by 50 CFR 402.02 on any listed species including consideration of direct, indirect, and cumulative effects.

South Carolina Distribution Records of
Endangered, Threatened, Candidate and Species of Concern

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

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

County	Common Name	Scientific Name	Status	Occurrences
Darlington				
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Possible
	Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known

	Carolina bogmint	*Macbridea caroliniana*	SC	Known
	Georgia lead-plant	*Amorpha georgiana var. georgiana*	SC	Known
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Known
	Sandhills milkvetch	*Astragalus michauxii*	SC	Known
	Spring-flowering goldenrod	*Solidago verna*	SC	Known
	Well's pixie-moss	*Pyxidanthera brevifolia*	SC	Known
	White false-asphodel	*Tofieldia glabra*	SC	Known
Florence				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Chaffseed	*Schwalbea americana*	E	Known
	Carolina bogmint	*Macbridea caroliniana*	SC	Known
	Georgia lead-plant	*Amorpha georgiana var. georgiana*	SC	Known
	Ovate catchfly	*Silene ovata*	SC	Known
Lee				
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Chaffseed	*Schwalbea americana*	E	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
Sumter				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Chaff-seed	*Schwalbea americana*	E	Known
	Dwarf burhead	*Echinodorus parvulus*	SC	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Boykin's lobelia	*Lobelia boykinii*	SC	Known

We also recommend you contact the S.C. Department of Natural Resources (SCDNR), Data Manager, Wildlife Diversity Section, Columbia, SC 29202, concerning known populations of federal and/or state endangered or threatened species, and other sensitive species in the project area. Additional habitat information may also be available from SCDNR. The National Marine Fisheries Service, 9721 Executive Center Drive North, St. Petersburg, FL 33702-2449 should be contacted for consultation on species under their jurisdiction.

Your interest in ensuring the protection of endangered and threatened species and our nation's valuable wetland resources is appreciated. If you have any questions please contact Ms. Lori Duncan or Ms. Olivia Westbrook of my staff at (843) 727-4707 ext. 21. In future correspondence concerning the project, please reference FWS Log No. 4-6-01-I-285.

Sincerely yours,

Steven S. Gilbert
Acting Field Supervisor

SSG/LWD/OW

South Carolina Archives History Center
History & Heritage For All Generations

August 8, 2001

Mr. B. L. Fletcher, III
Manger – Regulatory Affairs
Robinson Nuclear Plant
3581 W. Entrance Road
Hartsville, SC 29550

Re: Robinson Nuclear Plant
Darlington County

Dear Mr. Fletcher:

Thank you for your letter of May 31, which we received by fax transmittal on August 8, regarding the proposed renewal of the operating license for the Robinson Nuclear Plant in Darlington County.

It does not appear, based on the information provided, that any properties listed on or determined eligible for inclusion in the National Register of Historic Places will be affected. Since the license renewal does not involve new construction, archaeological sites should not be affected.

These comments are provided as evidence of your consultation with the State Historic Preservation Office. If you have questions, please don't hesitate to call me at 803/896-6169.

Sincerely,

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

S. C. Department of Archives & History • 8301 Parklane Road • Columbia • South Carolina • 29223-4905 • (803) 896-6100 • www.state.sc.us/scdah

December 9, 2002

Roger L. Banks, Field Supervisor
U.S. Fish and Wildlife Service
Ecological Services
176 Croghan Spur Road
Suite 200
Charleston, SC 29407

SUBJECT: REQUEST FOR UPDATED LIST OF PROTECTED SPECIES WITHIN THE AREA UNDER EVALUATION FOR THE H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2, LICENSE RENEWAL

Dear Mr. Banks:

The Nuclear Regulatory Commission (NRC) is evaluating an application submitted by Carolina Power and Light Company (CP&L) for the renewal of the operating license for its H. B. Robinson Steam Electric Plant, Unit 2 (Robinson), which expires on July 31, 2010. The NRC is preparing a supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (NUREG-1437) for this proposed license renewal, for which we are required to evaluate potential impacts to threatened and endangered species.

To support the supplemental environmental impact statement preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests a list of species and information on protected, proposed, and candidate species and critical habitat that may be within the area of the proposed action per 50 CFR 402.12(c). Maps are enclosed showing the locations of Robinson and its associated transmission lines.

The following brief description of the proposed action is provided to assist the U.S. Fish and Wildlife Service in identifying species and habitat that may be affected by the proposed project. The proposed action would include use and continued maintenance of existing facilities and transmission lines and would not result in new construction or disturbance. The plant is located in Darlington County, South Carolina, approximately 4.5 miles west-northwest of the city of Hartsville. The plant is situated on the southwest shore of Lake Robinson, which was created by CP&L in 1959 to serve as a source of cooling water for power production. The plant site encompasses approximately 4,800 acres, including the lake in Darlington and Chesterfield Counties.

The plant is connected to the regional electric transmission grid by 230 kilovolt transmission lines with intra-system tie points at Darlington, Sumter, and Florence in South Carolina and Rockingham in North Carolina. In addition, two lines connect to CP&L's Darlington County Plant, which is located near Robinson.

By letter dated May 31, 2001, CP&L requested information about threatened, endangered, and candidate species that potentially occur in the area to assist in the preparation of an environmental report. Your office responded by letter dated June 7, 2001, and provided the requested information for Darlington, Sumter, Lee, and Florence Counties in South Carolina. On November 6, 2002, we discussed the ongoing preparation of the supplemental environmental impact statement with Ms. Sandy Abbott of your office in a telephone conference call. We discussed information for an additional County; Chesterfield County in South Carolina. We also discussed observations from the site audit, which was conducted by NRC and expert consultants from Pacific Northwest and Los Alamos National Laboratories, on September 24, 2002. Finally, we discussed the level of biological assessments that would be appropriate for license renewal at Robinson. We are submitting this request to obtain documentation of any changes to the list your office provided in the letter dated June 7, 2001. We want to ensure that the supplemental environmental impact statement represents the current status of protected species in the environs of Robinson.

If you have any comments or questions, please contact Mr. Richard L. Emch, Jr., Environmental Project Manager, at (301) 415-1590.

Sincerely,

/RA/

Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No.: 50-261

Enclosure: As stated

cc w/encl: See next page

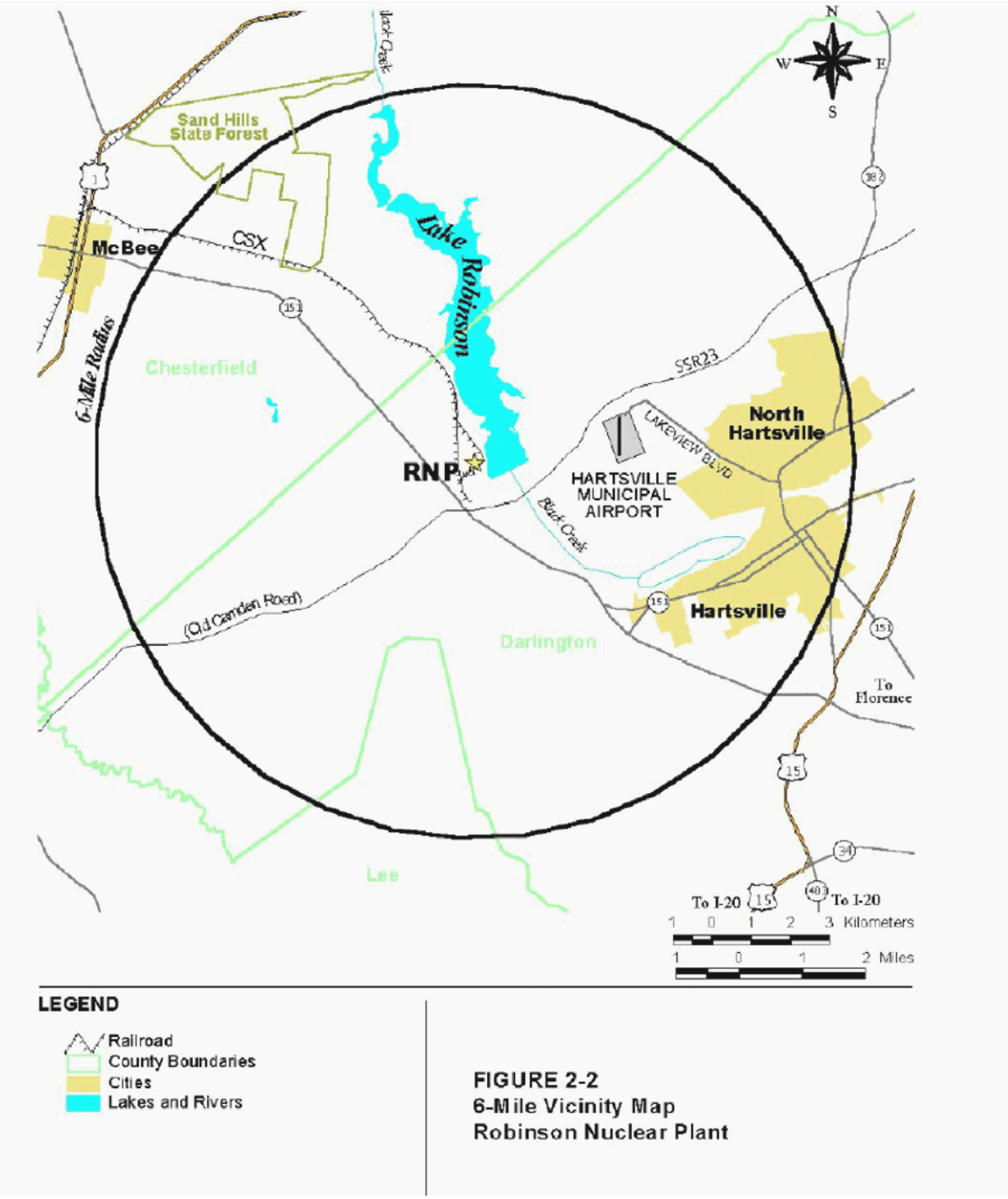

Figure 1. Location of Robinson Station, Unit 2, South Carolina Enclosure

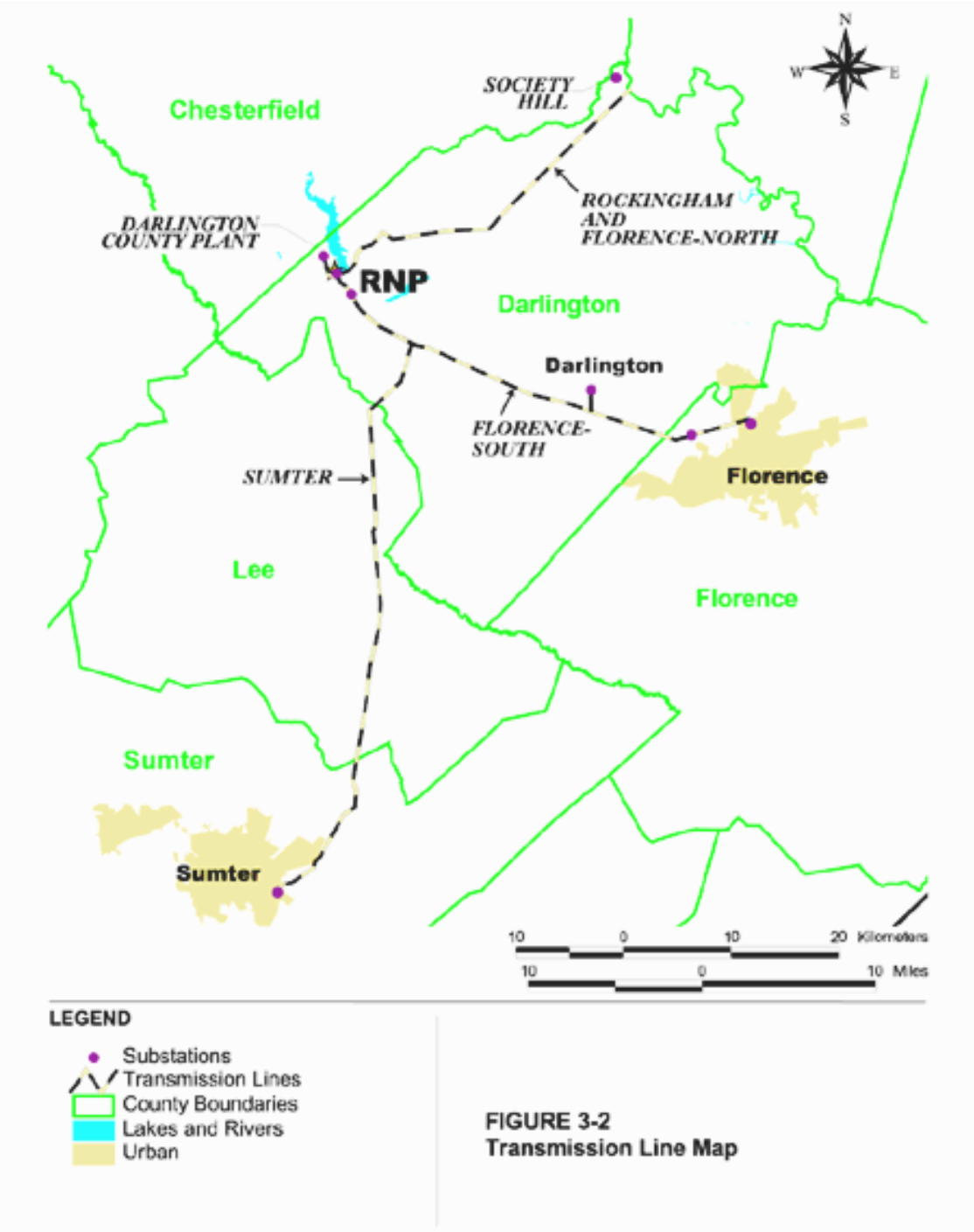

Figure 2. Vicinity of Robinson Station, Unit 2, and Transmission Line

United States Department of the Interior

FISH AND WILDLIFE SERVICE
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

December 19, 2002

Mr. Richard L. Emch, Jr.
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: Request for Updated List of Protected Species within the Area Under Evaluation for the H.B. Robinson Steam Electric Plant, Unit 2, License Renewal
Chesterfield, Darlington, Florence, Lee, and Sumter Counties, South Carolina
FWS No. 4-6-03-T-101

Dear Mr. Emch:

We have reviewed the information received December 16, 2002 concerning the above-referenced project. The following comments are provided in accordance with the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-667e), and section 7 of the Endangered Species Act, as amended (16 U.S.C. 1531-1543).

As requested, we are providing a list of the federally endangered (E) and threatened (T) and candidate (C) species which potentially occur in Chesterfield, Darlington, Florence, Lee, and Sumter Counties, South Carolina to aid you in determining the impacts your project may have on protected species. The list also includes species of concern under review by the Service. Species of concern (SC) are not legally protected under the Endangered Species Act, and are not subject to any of its provisions, including Section 7, until they are formally proposed or listed as endangered/threatened. We are including these species in our response for the purpose of giving you advance notification. These species may be listed in the future, at which time they will be protected under the Endangered Species Act. Therefore, it would be prudent for you to consider these species early in project planning to avoid any adverse effects.

County	Common Name	Scientific Name	Status	Occurrences
Chesterfield				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Possible
	Carolina heelsplitter	*Lasmigona decorata*	E, CH	Known
	Southern Dusky Salamander	*Desmognathus auriculatus*	SC	Possible

	Dwarf aster	*Aster mirabilis*	SC	Possible
	Sandhills milk-vetch	*Astragalus michauxii*	SC	Known
	White-wicky	*Kalmia cuneata*	SC	Known
	Prairie birdsfoot-trefoil	*Lotus purshianus var. helleri*	SC	Possible
	Carolina bogmint	*Macbridea caroliniana*	SC	Known
	Savannah or Piedmont cowbane	*Oxypolis ternata*	SC	Known
	Algae-like pondweed	*Potamogeton confervoides*	SC	Known
	Well's pixie-moss	*Pyxidanthera brevifolia*	SC	Known
	Spring-flowering goldenrod	*Solidago verna*	SC	Known
	Carolina dropseed	*Sporobolus sp1*	SC	Known
	Wire-leaved dropseed	*Sporobolus teretifolius*	SC	Known
	Smooth bog-asphodel	*Tofieldia glabra*	SC	Known
	Bachman's sparrow	*Aimophila aestivalis*	SC	Possible
	Henslow's sparrow	*Ammodramus henslowii*	SC	Known
	American kestrel	*Falco sparverius*	SC	Possible
	Loggerhead shrike	*Lanius ludovicianus*	SC	Possible
	Swainson's warbler	*Limnothlypis swainsonii*	SC	Known
	Painted bunting	*Passerina ciris ciris*	SC	Known
	Redhorse, Robust	Moxostoma robustum	SC	Possible
	Southern hognose snake	*Heterodon simus*	SC	Known
	Northern pine snake	*Pituophis melanoleucus melanoleucus*	SC	Known
Darlington				
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Possible
	Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Known
	Southern Dusky Salamander	*Desmognathus auriculatus*	SC	Possible
	Georgia lead-plant	*Amorpha georgiana var. georgiana*	SC	Known
	Sandhills milkvetch	*Astragalus michauxii*	SC	Known
	Honeycomb head	*Balduina atropurpurea*	SC	Known
	Creeping St. John's wort	*Hypericum adpressum*	SC	Known
	White-wicky	*Kalmia cuneata*	SC	Known
	Carolina bogmint	*Macbridea caroliniana*	SC	Known
	Savannah or Piedmont cowbane	*Oxypolis ternata*	SC	Known
	Well's pixie-moss	*Pyxidanthera brevifolia*	SC	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Spring-flowering goldenrod	*Solidago verna*	SC	Known
	White false-asphodel	*Tofieldia glabra*	SC	Known
	Bachman's sparrow	*Aimophila aestivalis*	SC	Possible
	Henslow's sparrow	*Ammodramus henslowii*	SC	Known
	American kestrel	*Falco sparverius*	SC	Possible

	Loggerhead shrike	*Lanius ludovicianus*	SC	Possible
	Painted bunting	*Passerina ciris ciris*	SC	Possible
	Madtom, broadtail	Noturus sp 2	SC	Possible
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Known
Florence				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Chaffseed	*Schwalbea americana*	E	Known
	Southern Dusky Salamander	*Desmognathus auriculatus*	SC	Possible
	Georgia lead-plant	*Amorpha georgiana var. georgiana*	SC	Known
	Boykin's lobelia	*Lobelia boykinii*	SC	Known
Florence cont.				
	Carolina bogmint	*Macbridea caroliniana*	SC	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Ovate catchfly	*Silene ovata*	SC	Known
	White false-asphodel	*Tofieldia glabra*	SC	Known
	Bachman's sparrow	*Aimophila aestivalis*	SC	Possible
	Henslow's sparrow	*Ammodramus henslowii*	SC	Known
	American kestrel	*Falco sparverius*	SC	Possible
	Loggerhead shrike	*Lanius ludovicianus*	SC	Possible
	Painted bunting	*Passerina ciris ciris*	SC	Possible
	Madtom, broadtail	Noturus sp 2	SC	Possible
Lee				
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Chaffseed	*Schwalbea americana*	E	Known
	Southern Dusky Salamander	*Desmognathus auriculatus*	SC	Possible
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Bachman's sparrow	*Aimophia aestivalis*	SC	Known
	Henslow's sparrow	*Ammodramus henslowii*	SC	Known
	American kestrel	*Falco sparverius*	SC	Possible
	Loggerhead shrike	*Lanius ludovicianus*	SC	Possible
	Painted bunting	*Passerina ciris ciris*	SC	Possible
	Madtom, broadtail	Noturus sp 2	SC	Possible
Sumter				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Known

Chaff-seed	*Schwalbea americana*	E	Known
Southern Dusky Salamander	*Desmognathus auriculatus*	SC	Possible
Dwarf burhead	*Echinodorus parvulus*	SC	Known
Boykin's lobelia	*Lobelia boykinii*	SC	Known
Pineland plantain	*Plantago sparsiflora*	SC	Known
Awned meadowbeauty	*Rhexia aristosa*	SC	Known
Biltmore greenbrier	*Smilax biltmoreana*	SC	Known
Bachman's sparrow	*Aimophia aestivalis*	SC	Known
Henslow's sparrow	*Ammodramus henslowii*	SC	Known
American kestrel	*Falco sparverius*	SC	Possible
Loggerhead shrike	*Lanius ludovicianus*	SC	Possible
Painted bunting	*Passerina ciris ciris*	SC	Possible
Madtom, broadtail	Noturus sp 2	SC	Possible

In-house surveys should be conducted by comparing the habitat requirements for the attached listed species with available habitat types at the project site. Field surveys for the species should be performed if habitat requirements overlap with that available at the project site. Surveys for protected plant species must be conducted by a qualified biologist during the flowering or fruiting period(s) of the species. Please notify this office with the results of any surveys for the above list of species.

We also recommend you contact the S.C. Department of Natural Resources (SCDNR), Data Manager, Wildlife Diversity Section, Columbia, SC 29202, concerning known populations of federal and/or state endangered or threatened species, and other sensitive species in the project area. Additional habitat information may also be available from SCDNR. The National Marine Fisheries Service, 9721 Executive Center Drive North, St. Petersburg, FL 33702-2449 should be contacted for consultation on species under their jurisdiction.

We appreciate the opportunity to comment during the planning stages of this project. If you have further questions or require additional information, please contact Sandy Abbott of this office at (843) 727-4707 ext. 57.

Sincerely yours,

Roger L. Banks
Field Supervisor

RLB/SDA/km

4

April 22, 2003

Roger L. Banks, Field Supervisor
U. S. Fish and Wildlife Service
Ecological Services
176 Croghan Spur Road
Suite 200
Charleston, SC 29407

SUBJECT: BIOLOGICAL ASSESSMENT FOR LICENSE RENEWAL AT H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2 (TAC NO. MB5226)

Dear Mr. Banks:

The NRC staff has prepared the enclosed biological assessment to evaluate whether the proposed renewal of the H. B. Robinson Steam Electric Plant, Unit 2, operating license for a period of an additional 20 years would have adverse effects on Federally listed species. This biological assessment covers the area of the H. B. Robinson Steam Electric Plant, located in Darlington County, South Carolina, approximately 4.5 miles west northwest of the city of Hartsville, South Carolina and the associated transmission line corridors (Sumter, Florence-South, and Rockingham and Florence-North). The plant is situated on the southwest shore of Lake Robinson, and encompasses approximately 4,800 acres, including the lake in Darlington and Chesterfield Counties.

There are seven threatened or endangered species and one candidate species with the potential to be affected, which are addressed within the attached biological assessment. The staff has determined that the proposed action is not a major construction activity and may affect, but is not likely to adversely affect, the redcockaded woodpecker, Canby's dropwort, chaffseed, or the rough-leaved loosestrife; and will have no effect on the bald eagle, shortnose sturgeon, Atlantic sturgeon, or the Carolina heelsplitter. No designated critical habitat for any of these eight species is located near the Robinson plant site or the associated transmission line corridors. We are placing this biological assessment in our project files and requesting your concurrence with our determination for the species within your jurisdiction.

In reaching our conclusion, the NRC staff relied on the geographical information system data base information provided by the South Carolina Department of Natural Resources, the research performed by the NRC staff and contractors, and a current listing of species provided by your office and NOAA Fisheries.

If you have any questions regarding this biological assessment or the staff's request, please contact Mr. Richard Emch by telephone at (301) 415-1590 or by e-mail at rle@nrc.gov.

Sincerely,
/RA/
Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No.: 50-261

Enclosures: As stated

cc w/encls: See next page

NOTE: Enclosure is on page E-22

April 22, 2003

Dr. Stephania K. Bolden
Fishery Biologist
National Oceanic and Atmospheric Administration Fisheries
Protected Resources Division
9721 Executive Center Drive North
St. Petersburg, FL 33702

SUBJECT: BIOLOGICAL ASSESSMENT FOR LICENSE RENEWAL AT H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2 (TAC NO. MB5226)

Dear Mr. Bolden:

The NRC staff has prepared the enclosed biological assessment to evaluate whether the proposed renewal of the H.B. Robinson Steam Electric Plant, Unit 2, operating license for a period of an additional 20 years would have adverse effects on Federally listed species. This biological assessment covers the area of the H.B. Robinson Steam Electric Plant, located in Darlington County, South Carolina, approximately 4.5 miles west northwest of the city of Hartsville, South Carolina and the associated transmission line corridors (Sumter, Florence-South, and Rockingham and Florence-North). The plant is situated on the southwest shore of Lake Robinson, and encompasses approximately 4,800 acres, including the lake in Darlington and Chesterfield Counties.

There are seven threatened or endangered species and one candidate species with the potential to be affected, which are addressed within the attached biological assessment. The staff has determined that the proposed action is not a major construction activity and may affect, but is not likely to adversely affect, the redcockaded woodpecker, Canby's dropwort, chaffseed, or the rough-leaved loosestrife; and will have no effect on the bald eagle, shortnose sturgeon, Atlantic sturgeon, or the Carolina heelsplitter. No designated critical habitat for any of these eight species is located near the Robinson plant site or the associated transmission line corridors. We are placing this biological assessment in our project files and requesting your concurrence with our determination for the species within your jurisdiction.

In reaching our conclusion, the NRC staff relied on the geographical information system data base information provided by the South Carolina Department of Natural Resources, the research performed by the NRC staff and contractors, and a current listing of species provided by your office and the U.S. Fish and Wildlife Service.

If you have any questions regarding this biological assessment or the staff's request, please contact Mr. Richard Emch by telephone at (301) 415-1590 or by e-mail at rle@nrc.gov.

Sincerely,
/RA/
Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No.: 50-261

Enclosures: As stated

cc w/encls: See next page

Biological Assessment

H.B. Robinson Steam Electric Plant, Unit 2 (Nuclear)

License Renewal Review

Hartsville, South Carolina

April 2003

U.S. Nuclear Regulatory Commission
Rockville, Maryland

Biological Assessment of the Effects of the H.B. Robinson Steam Electric Plant, Unit 2 (Nuclear) License Renewal on Threatened and Endangered Species

Executive Summary

This Biological Assessment evaluates the potential impacts of the license renewal of the H.B. Robinson Steam Electric Plant, Unit 2 (Nuclear) (RNP) on Federally listed endangered and threatened species. There will be no major construction, refurbishment or replacement activities associated with this action. The Nuclear Regulatory Commission (NRC) has determined that license renewal for RNP will have no effect on the bald eagle, shortnose sturgeon, Atlantic sturgeon, or the Carolina heelsplitter and may affect, but is not likely to adversely affect the red-cockaded woodpecker, Canby's dropwort, chaffseed, or the rough-leaved loosestrife.

Project Description

The NRC licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. Carolina Power and Light (CP&L), a Progress Energy company, operates the RNP plant pursuant to NRC Operating License DPR-23. The license will expire July 31, 2010. 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) decision makers (NRC 1996). The renewed operating license would allow an additional 20 years of plant operation beyond the current RNP licensed operating period of 40 years.

There will be no major refurbishment or replacement actions to maintain the functionality of important systems, structures, and components during the RNP license renewal period. In addition, there will be no construction activities associated with the RNP license renewal.

Description of Project Area

The Robinson site is located in northeastern South Carolina, approximately 8 km (5 mi) west-northwest of Hartsville, SC (Figure 1). The nearest large city is Columbia, South Carolina, approximately 88 km (55 mi) west-southwest. The site is approximately 48 km (30 mi) south of the North Carolina border and 145 km (90 mi) from the Atlantic Ocean. The site encompasses more than 2,000 ha (5,000 ac) of CP&L property in northwestern Darlington and southwestern

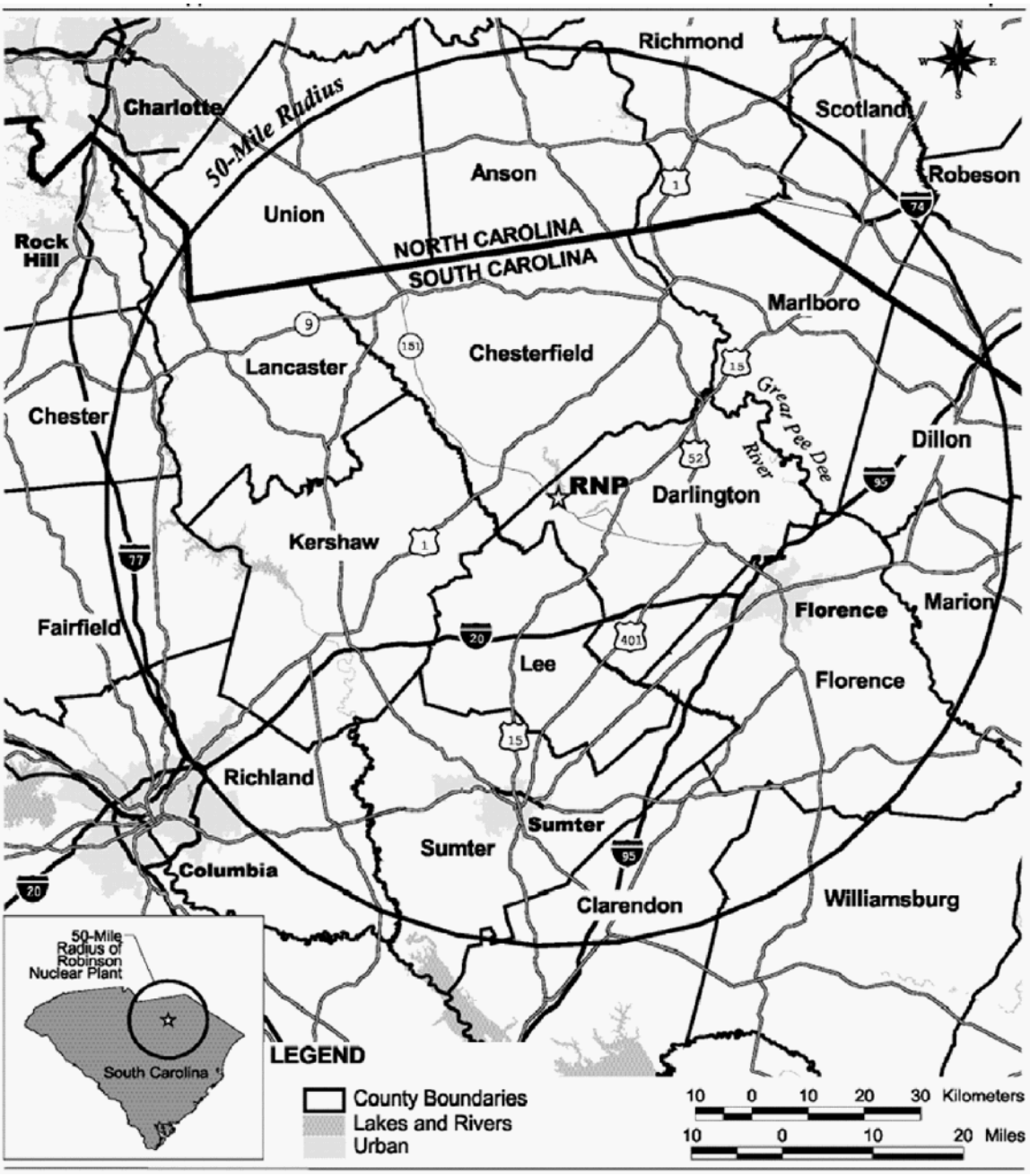

Figure 1. Robinson Site (RNP) and Surrounding Area

Chesterfield Counties, including the 827-ha (2,250-ac) Lake Robinson. Approximately 98 ha (243 ac) consist of generation and maintenance facilities, laydown areas, parking lots, roads, and mowed grass (Kiker 1996). The remaining portion of the site consists primarily of forested areas, residences, recreation leases, and farm rentals. Numerous dwellings are located along the eastern shoreline of Lake Robinson. The Robinson site is along the boundary of the Carolina Sandhills, a region of uneven topography with enough relief to adequately drain the higher elevations, and the Upper Coastal Plain, a region of low relief and generally poor drainage.

The primary terrestrial plant community in the vicinity of the site is the pine-turkey oak-wire grass community typical of the Sandhills (Barry 1980). This community is characterized by longleaf pine (*Pinus palustris*) and loblolly pine (*P. taeda*) with a midstory of oaks, chiefly turkey oak (Q*uercas laevis*), along with blackjack oak (*Q. marilandica*), upland willow oak (*Q. incana*), and post oak (*Q. stellata*). Most of the upland CP&L property west of Lake Robinson and south of Secondary State Route 346 consists of forest from which timber has been harvested in recent years. After timber is removed, areas are replanted with tree species appropriate to the terrain, soils, and drainage characteristics of the site. Harvested areas are usually replanted in loblolly pine, slash pine (*P. elliottii*), or longleaf pine. Approximately 140 ha (346 acres) of CP&L property at the north of the site is leased to the South Carolina Department of Natural Resources (SCDNR) and is managed by SCDNR as a wildlife management area for activities such as public hunting and fishing.

The Pee Dee River Basin, also referred to as the Great Pee Dee River Basin, encompasses 27 watersheds and 887,075 ha (3,425 square mi) within South Carolina, excluding the Lynches River and Black River Basins. The Pee Dee River flows across the North Carolina/South Carolina state line and accepts drainage from Thompson Creek, Crooked Creek, Cedar Creek, Three Creeks, and then Black Creek, where Lake Robinson is located. The Pee Dee River then accepts drainage from Jeffries Creek, Catfish Creek, the Lynches River, the Little Pee Dee River and the Black River Basin before draining into Winyah Bay (SCDHEC 2001).

Black Creek was impounded in the late 1950's to create Lake Robinson and provide cooling water for the Unit 1 coal-fired power plant and Unit 2 nuclear plant. RNP is located on the southwest shore of Lake Robinson, approximately 113 river kilometers (70 river mi) upstream from Black Creek's junction with the Pee Dee River. The lake provides some limited marsh habitat in shallow backwaters at the north (upstream) end of the impoundment. These marshes and adjacent shallows are used by various waterfowl such as the mallard (*Anas platyrhynchos*), green-winged teal (*A. crecca*), wood duck (*Aix sponsa*), and Canada goose (*Branta canadensis*). The impoundment at Lake Robinson has no fish passage facilities, precluding access to the lake by anadromous fish species. Bottomland forest habitat occurs along Black Creek and is characterized by cypress (*Taxodium distichum*), white cedar (*Chamaecyparis thyoides*), red maple (*Acer rubrum*), water oak (*Q. nigra*), red bay (*Persea borbonia*), sweet bay

(*Magnolia virginiana*), and black willow (*Salix nigra*) (NRC 1975). Roughly 8 km (5 river mi) downstream from Lake Robinson, Black Creek enters the Prestwood Lake impoundment. The Prestwood Dam also lacks fish passage facilities.

Black Creek from Lake Robinson to Prestwood Lake is classified by SCDHEC as freshwaters (dissolved oxygen not less than 4 mg/l and pH between 5.0 and 8.5). Freshwaters are considered suitable for the survival and propagation of aquatic life, fishing, recreational contact, industrial and agricultural uses, and as a drinking water source. Based on almost 30 years of monitoring, the aquatic community of Lake Robinson appears to be healthy and indicative of a balanced, self-sustaining biological community (CP&L 2002). Thermal-related impacts are transient and evident only during the hottest summer months, with recovery evident by fall (CP&L 1996). There is no indication of long-term degradation of the aquatic community due to heated discharges. Changes in aquatic population distribution and abundance over the 1975-1995 period were attributed to normal population cycles and ecological succession, as mediated through annual variation in a variety of environmental factors (e.g., nutrient inputs and pH), predation, competition, and recovery of the ecosystem from copper toxicity. These changes occurred in both heated areas of the impoundment and in areas of the impoundment less influenced by thermal inputs. Overall, Lake Robinson continues to support a balanced, indigenous community of benthic macroinvertebrates, plankton, and fish, as demonstrated by monitoring studies conducted by CP&L (CP&L 1996).

Robinson-associated transmission corridors are situated within the Carolina Sandhills and Upper Coastal Plain physiographic regions (Figure 2). The principal land use categories traversed by the transmission corridors are row crops, pasture, and forest. Wooded habitats along transmission corridors consist of pine forest, pine-hardwood forest, and bottomland hardwood forest.

CP&L conducts an annual assessment for the potential presence of Federally threatened and endangered (T&E) species at the site and associated transmission lines. The South Carolina Heritage Trust maintains a database of rare, endangered, and threatened species in South Carolina. The database lists the geographic locations of these populations and their habitats. No T&E species have been reported on the Robinson property or transmission lines. Programs are in place to manage and protect T&E species on Robinson property, should they be identified.

There is no designated critical habitat for endangered species on the Robinson site or along associated transmission lines. The transmission corridors also do not cross any State or Federal parks, wildlife refuges, or wildlife management areas. The transmission corridors are maintained by mowing, trimming of undesirable vegetation from the sides of the corridors, and by use of non-restricted use herbicides. Under normal circumstances, the mowing and herbicide schedule follows a three-year cycle. CP&L participates with the U.S. Department of Agriculture Natural Resources Conservation Service, SCDNR, and other organizations in a

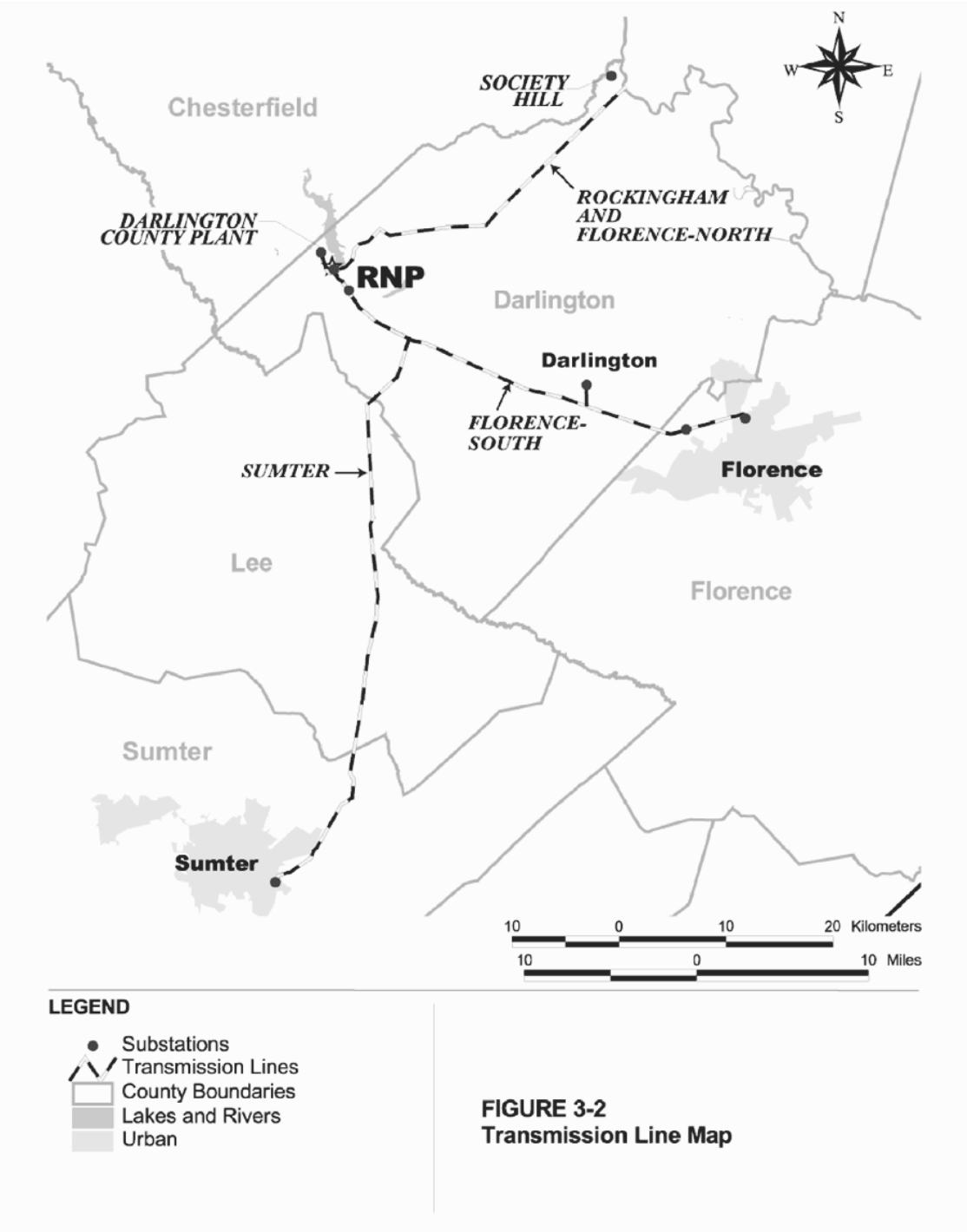

Figure 2. Robinson Site (RNP) and Associated Transmission Lines

wildlife management program designed to help landowners whose property is crossed by transmission line corridors create productive habitat for wildlife.

List of Species

The NRC has identified seven species listed as threatened or endangered under the Federal Endangered Species Act and one candidate species with the potential to be affected by this action (Table 1). The NRC is unaware of any other species proposed for listing by the FWS or National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries) [formerly National Marine Fisheries Service (NMFS)] or species that may warrant listing in the future, but have no current statutory protection under the Endangered Species Act, that occur on the Robinson site or along associated transmission line rights-of-way.

Table 1. Federal Endangered, Threatened, and Candidate species for Chesterfield, Darlington, Florence, Lee, and Sumter Counties. This list was based on information received from the FWS (FWS, 2001b), NOAA Fisheries, and the SCDNR.

Scientific Name	Common Name	Federal Status[(a)]	Determination
Invertebrates			
Lasmigona decorata	Carolina heelsplitter	E	no effect
Fish			
Acipenser brevirostrum	shortnose sturgeon	E	no effect
Acipenser oxyrinchus	Atlantic sturgeon	C	no effect
Birds			
Haliaeetus leucocephalus	bald eagle	T	no effect
Picoides borealis	red-cockaded woodpecker	E	not likely to adversely affect
Plants			
Oxypolis canbyi	Canby's dropwort	E	not likely to adversely affect
Schwalbea americana	chaffseed	E	not likely to adversely affect
Lysimachia asperulaefolia	rough-leaved loosestrife	E	not likely to adversely affect

(a) E = endangered, T = threatened, C = candidate
Sources: Based on FWS [*http://endangered.fws.gov*], and Southeast Regional Office and NOAA Fisheries [http://caldera.sero.nmfs.gov/protect/sc_cand.htm]

Species Evaluated

Terrestrial Species

1. *Haliaeetus leucocephalus,* Bald eagle.

Bald eagles are Federally listed as threatened. Bald eagles are occasionally observed at Lake Robinson (CP&L 1998), but there are no known eagle nests in the vicinity of the impoundment (SCDNR 2001a). Bald eagles are generally found in close proximity to impoundments, rivers, and coastal areas (FWS 2001a). Bald eagles are known to nest in Florence County (SCDNR 2001b), but there are no known nests in the vicinity of the Robinson site or the associated transmission line corridors (SCDNR 2001a). Therefore, the NRC staff has determined that the proposed license renewal would have no effect on the bald eagle.

Within the past decade various species of waterfowl and birds of prey (including at least 70 bald eagles) in the SE United States, have died from a condition now known as avian vacuolar myelinopathy (AVM). Although the actual cause of death has not been determined, it appears that waterfowl and their predators are being killed by an environmental toxin that produces brain lesions (Interagency AVM Website 2003). AVM has been identified at numerous lakes in the southern United States and is often associated with the introduced aquatic plant hydrilla (*Hydrilla verticillata*) and one or more species of blue-green algae. CP&L employees and contractors are aware of the problem and monitoring activities have not recorded any unexplained avian deaths at Lake Robinson and hydrilla is not known to occur there. There is no indication that activities associated with license renewal would have any effect on the presence of AVM at Lake Robinson.

2. *Picoides borealis*, Red-cockaded woodpecker

Red-cockaded woodpeckers are Federally listed as endangered and are known to occur in Darlington, Chesterfield, Lee, Sumter, and Florence Counties (SCDNR 2001b). Active nest cavities of this cooperative breeder occur in open, mature pine stands with sparse midstory vegetation (FWS 2001a). An active red-cockaded woodpecker colony is located in Sandhills State Forest, approximately 8.3 km (5.2 mi) northwest of the Robinson site (SCDNR 2001a). Two abandoned red-cockaded woodpecker cavity trees are located on the Robinson site near the Darlington County Plant (a gas turbine power plant owned by CP&L) which is approximately 1.6 km (1 mi) north of the Robinson site (Figure 2). Both of these cavity trees have been abandoned for many years. CP&L conducted a field survey for the red-cockaded woodpecker in 1999 throughout the Robinson site; the survey identified no active cavity trees and no foraging habitat for this species. CP&L requires surveys to be conducted when there is timber harvesting or clearing of pine trees at the site. In accordance with a Safe Harbor Agreement with the State of South Carolina, CP&L manages the site to maintain and enhance habitat for red-cockaded woodpeckers (CP&L 1999). There are no known active or abandoned cavity trees adjacent to Robinson-associated transmission line corridors (SCDNR 2001a). No individuals have been recorded, no active nests are present, there is no foraging habitat, and no new construction activities are expected during the renewal term. However, the NRC staff has determined that due to the proximity of active nest sites and the presence of abandoned nests on the Robinson site, the proposed license renewal of RNP may affect, but is not likely to

adversely affect the red-cockaded woodpecker.

3. *Oxypolis canbyi*, Canby's dropwort

Canby's dropwort is Federally listed as endangered. This perennial plant is known to occur in Lee, Sumter, and Florence Counties (SCDNR 2001b). This coastal plain species grows in wet meadows, wet pineland savannas, ditches, sloughs, and along the edges of cypress-pine ponds (FWS 2001a). There are no recorded occurrences of this species on the site or along the transmission line corridors associated with RNP (SCDNR 2001a). Because habitat for this species may exist within the site and/or transmission corridors and may even be maintained by CP&L activities, the NRC staff has determined that the proposed license renewal may affect, but is not likely to adversely affect the Canby's dropwort.

4. *Schwalbea americana*, Chaffseed

Chaffseed is Federally listed as endangered. Habitat for this perennial herb consists of open, moist flatwoods, fire-maintained savannas, ecotones between peaty wetlands and xeric sandy soils, and other open grass-sedge systems. Factors such as fire, mowing, or fluctuating water tables are necessary to maintain the open to partly open conditions that chaffseed requires (FWS 2001a). Chaffseed has been recorded in Lee, Florence, and Sumter Counties (SCDNR 2001b), but there are no recorded occurrences on the site or along the transmission line corridors associated with RNP (SCDNR 2001a). Because habitat for this species may exist within the site and/or transmission corridors and may even be maintained by CP&L activities, the NRC staff has determined that the proposed license renewal may affect, but is not likely to adversely affect the chaffseed.

5. *Lysimachia asperulifolia*, Rough-leaved loosestrife

Rough-leaved loosestrife is Federally listed as endangered. Habitat for this perennial herb consists of Carolina bays and the ecotones between longleaf pine uplands and pond pine pocosins, an upland swamp community type (FWS 2001a). The species has been recorded in Darlington County (SCDNR 2001b), but there are no recorded occurrences on the site or along the transmission line corridors associated with RNP (SCDNR 2001a). Because habitat for this species may exist within the site and/or transmission corridors and may even be maintained by CP&L activities, the NRC staff has determined that the proposed license renewal may affect, but is not likely to adversely affect the rough-leaved loosestrife.

Aquatic Species

1. *Acipenser brevirostrum,* shortnose sturgeon

Shortnose sturgeons are Federally listed as endangered. Shortnose sturgeon occur in most

major river systems along the eastern seaboard of the United States. In South Carolina they are found in the river systems that empty into Winyah Bay (including the Pee Dee River) and in the Santee/Cooper River complex (Figure 3). Shortnose sturgeon were documented in the Winyah Bay system during the late 1970's and early 1980's (Dadswell et al. 1984). Fed by the Waccamaw, Pee Dee, and Black Rivers, this coastal plain watershed produced over 100 collections of juveniles and adults during the study period. No data on population dynamics exist (NMFS 1998).

These anadromous fish live mainly in slower moving riverine waters or in nearshore marine waters, and migrate periodically into faster moving fresh water areas to spawn. Feeding and overwintering activities may occur in both fresh and saline habitats (NMFS 1998). The shortnose sturgeon is listed in Chesterfield, Darlington, Florence and Sumter Counties by the USFWS Southeast Regional Office on their website (FWS 1999), but the species is not known to occur in Black Creek. Typically, the first dam on the river marks the upstream limit of the shortnose sturgeon population's range (Kynard 1997). Thus, it is assumed that the impoundments at Prestwood Lake and Lake Robinson, which lack fish passage facilities, prevent sturgeon from accessing Lake Robinson and from being impacted by RNP cooling water intake effects, such as impingement and entrainment.

Because shortnose sturgeon do not inhabit Lake Robinson or Black Creek in the region above Prestwood Lake, the NRC staff has determined that the proposed license renewal would have no effect on the shortnose sturgeon.

2. *Acipenser oxyrinchus,* Atlantic sturgeon

Atlantic sturgeons were listed in 1988 as a candidate for Federal listing by NMFS. Candidate species are not protected under the Endangered Species Act, but concerns about their status indicate that they may warrant listing in the future. This designation was reiterated in 1998 when an exhaustive status review of the species was conducted, detailing the biology, analysis of threats, conservation efforts, and recommendations for further studies (NMFS/FWS 1998). NOAA Fisheries has retained the Atlantic sturgeon on its list of candidate species to monitor the sturgeon's status and the implementation and effectiveness of protective measures.

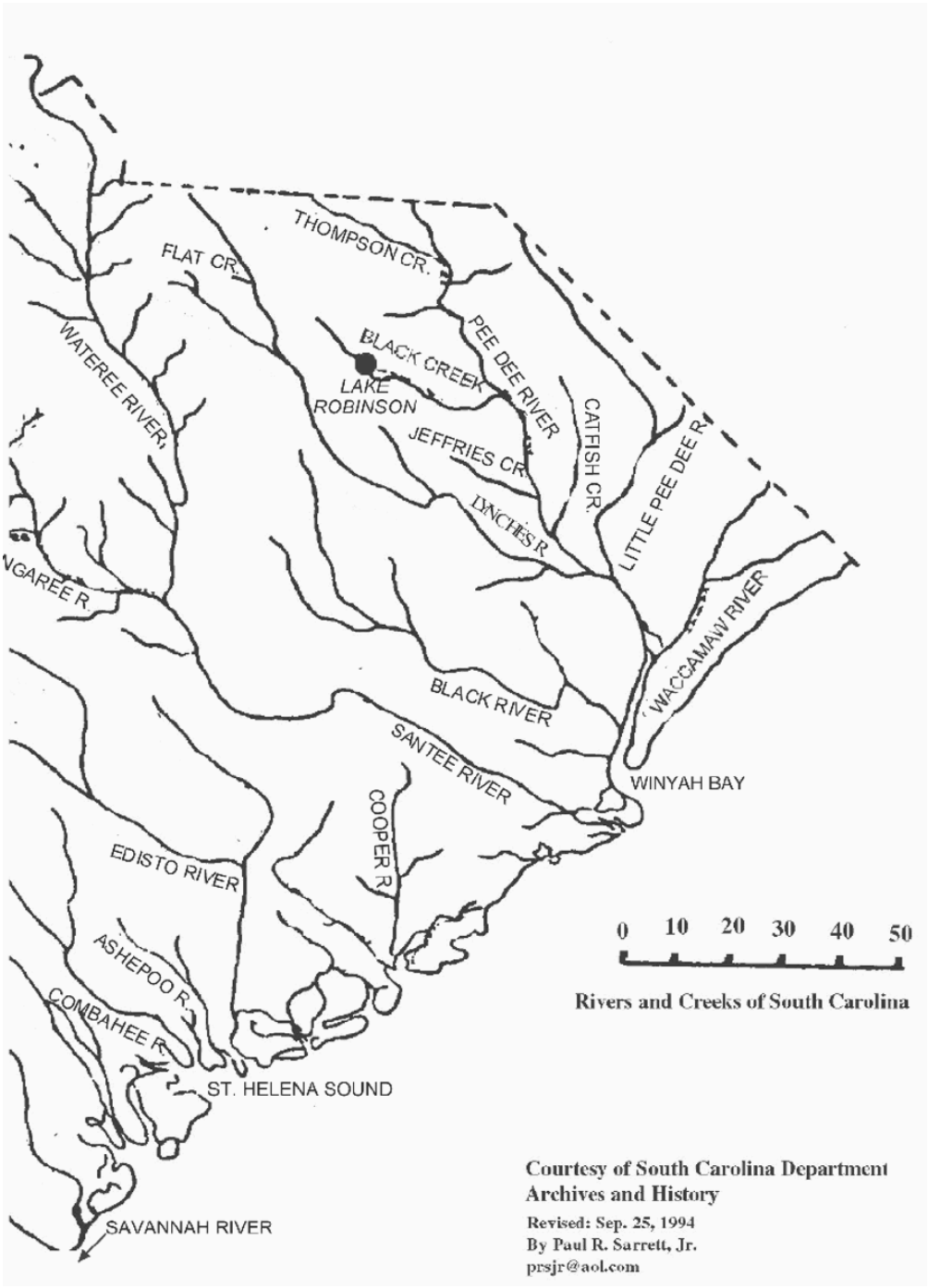

Figure 3. The Pee Dee River and its Tributaries

Because juvenile Atlantic sturgeon leave their apparent natal river at 2-5 years of age and may wander extensively, visiting other rivers and estuaries, direct evidence for existence of a population in a specific river requires capture of very young fish (age 0-1) or mature fish on the spawning grounds. In South Carolina there appear to be populations in the Savannah River, one or more of the rivers flowing into St. Helena Sound (Ashepoo, Combahee, and Edisto Rivers), the Santee River, one or more Winyah Bay rivers (Pee Dee, Waccamaw, and Black), and probably the Cooper River (Figure 3) (SCDNR 2003). Specifically, the 1998 status report stated that captures of age 1 juveniles from the Waccamaw River during the early 1980's suggests that a reproducing population of Atlantic sturgeon may persist in that river, although the fish could have been from the nearby Pee Dee River (Collins and Smith 1997). It is possible that the Pee Dee and Black Rivers support spawning populations.

Because Atlantic sturgeon are not present in the upper reaches Black Creek due to the creek's small size and because of the lack of fish passage facilities at the Prestwood Lake or Lake Robinson dams, the Atlantic sturgeon will not be impacted by continued operation of RNP. Thus, the NRC staff has determined that the proposed license renewal would have no effect on the Atlantic sturgeon.

3. *Lasmigona decorata,* Carolina heelsplitter

Prior to a 1987 FWS survey, the Carolina heelsplitter had not been recorded in the state since the mid-19th century (Keferl and Shelly 1988 as cited in FWS 1993, Keferl 1991 as cited in FWS 1993). This Federally listed (endangered) freshwater mussel was historically found in South Carolina in the Pee Dee River system (Clarke 1985 as cited in FWS 1993, Keferl and Shelly 1988 as cited in FWS 1993, Keferl 1991 as cited in FWS 1993). The FWS conducted intensive surveys between 1987 and 1990 and found only two surviving populations of the Carolina heelsplitter in the Pee Dee River system; the Goose Creek and Lynches River/Flat Creek populations (Figure 3) (Keferl 1991 as cited in FWS 1993). The population nearest the plant was found in the Lynches River 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 (1987-1990) and 2 individuals were found in the Lynches River (both found in 1990). Because the Carolina heelsplitter populations exist only in other tributaries to the Pee Dee River and not in Black Creek, the NRC staff has determined that the proposed license renewal would have no effect on the Carolina heelsplitter.

Conclusions

The NRC has identified seven species listed as threatened or endangered under the Federal Endangered Species Act and one candidate species with the potential to be affected by the license renewal of RNP. There will be no major refurbishment, construction or replacement

activities associated with this action. The NRC has determined that license renewal for RNP will have no effect on the bald eagle, shortnose sturgeon, Atlantic sturgeon, and the Carolina heelsplitter and may affect, but is not likely to adversely affect the red-cockaded woodpecker, Canby's dropwort, chaffseed, and the rough-leaved loosestrife.

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July 7, 2003

Dr. Rodger E. Stroup, Director
South Carolina Department of Archives
and History
Archives and History Center
8301 Parklane Road
Columbia, SC 29223

SUBJECT: H.B. ROBINSON STEAM ELECTRIC PLANT, NO. 2, LICENSE RENEWAL REVIEW AND NATIONAL HISTORIC PRESERVATION ACT, SECTION 106 REVIEW PROCESS

Dear Dr. Stroup:

The U.S. Nuclear Regulatory Commission (NRC) is evaluating an application submitted by Carolina Power and Light Company (CP&L) for the renewal of the operating license for the H.B. Robinson Steam Electric Plant, Unit 2 (RNP), located approximately 5 miles west-northwest of Hartsville, South Carolina, on the southwest shore of Lake Robinson in Darlington County. The application for renewal was submitted by CP&L on June 17, 2002, pursuant to NRC requirements of Title 10 of the *Code of Federal Regulations*, Part 54 (10 CFR Part 54). The current operating license will expire July 31, 2010. As part of its review of the proposed action, the NRC staff has prepared a site-specific draft Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The SEIS will include analyses of relevant environmental issues, including potential impacts on historic and cultural resources from refurbishment activities, and for the extended period of operation.

The Agency official (the Director, Office of Nuclear Reactor Regulation) has determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environs which may be impacted by post-license renewal land disturbing operation or projected refurbishment activities associated with the proposed action. The staff views the APE for the Robinson license renewal application as including the Robinson site and the immediate environs.

On May 31, 2001, CP&L sought feedback from the South Carolina State Historic Preservation Office (SHPO) regarding license renewal at RNP. In its letter, CP&L stated that there are no plans to substantially alter current operations over the license renewal period, and that no substantive disturbance of land is anticipated. On August 8, 2001, the South Carolina SHPO responded to the CP&L letter and stated, "It does not appear, based on the information provided, that any properties listed on or determined eligible for inclusion in the National Register of Historic Places will be affected. Since the license renewal does not involve new construction, archaeological sites should not be affected."

R. Stroup 2

During our independent review, the NRC staff met with Mr. Chad Long of your office on September 26, 2002, to discuss the potential impacts of the proposed RNP license renewal. The staff conducted a review of several existing literature and electronic database sources, along with direct contacts with your office, the South Carolina Institute of Archaeology and Anthropology, and the Darlington County Historian. The results indicate that this undertaking will have no effect on historic properties. For your reference, we have enclosed our cultural resources narrative (Enclosure 1). We have also issued the draft SEIS for the proposed RNP license renewal action for public comment on May 5, 2003 (Enclosure 2). A copy of the draft SEIS was forwarded to Dr. Marta Matthews of your office.

Pursuant to 36 CFR 800.4, please state whether there are any changes to your August 8, 2001, determination letter to CP&L. We also request your comments regarding our preliminary determination provided above. On June 25, 2003, the NRC held two public meetings in Hartsville, South Carolina to discuss the preliminary conclusions in the draft Robinson-specific supplement to the GEIS and to accept public comments on the document. Comments must be received no later than July 30, 2003. If you have any questions or require additional information, please contact Richard Emch, the NRC Environmental Project Manager for the RNP license renewal project, at 301-415-1590 or RLE@nrc.gov.

Sincerely,
/**RA**/
Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No.: 50-261

Enclosures: As stated

cc w/o encl.: See next page

U.S. NUCLEAR REGULATORY COMMISSION (NRC)
OFFICE OF NUCLEAR REACTOR REGULATION
DIVISION OF REGULATORY IMPROVEMENT PROGRAMS

HISTORIC AND ARCHAEOLOGICAL RESOURCES REPORT NARRATIVE H.B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2 LICENSE RENEWAL

June 2003

HISTORIC AND ARCHAEOLOGICAL RESOURCES REPORT NARRATIVE
H.B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2 LICENSE RENEWAL

Project Description

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. The proposed Federal action is the renewal of the Operating License (OL) for the H.B. Robinson Steam Electric Plant, Unit No. 2 (RNP) for an additional 20 years. The current OL will expire July 31, 2010. RNP, 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 (Attachment 1, see maps [Figures 2-1 through 2-3] in enclosed DSEIS). It is located on the shore of Lake Robinson in Darlington County.

This report presents the findings of the Section 106 review conducted to establish whether any historic properties will be affected by the proposed license renewal of RNP.

Area of Potential Effect

RNP is located in Darlington County, South Carolina. It is situated on the southwest shore of Lake Robinson, which was created by CP&L in 1959 to serve as a source of cooling water for power production. The site is in a sparsely populated, largely rural area, with a few houses situated across Lake Robinson from the plant site.

Two generating units are located on the RNP 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.

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. Due to the construction of RNP, an area with a 0.5-km (0.3 mi) radius has been heavily disturbed and consists of numerous buildings, parking areas, landscaped areas, and roads. 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 448 km^2 (173 mi^2) of the Black Creek drainage were impounded in 1958 to create Lake Robinson. The 11-km (7-mi) long lake was originally built to provide cooling water for the coal plant, but was sized to accommodate future plant additions. 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 sparsely 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.

Continued operation of RNP would have a beneficial effect on any potential unknown or

undiscovered historic or archaeological resources for the duration of the license renewal period by restricting access to the site.

In conjunction with this license renewal action, CP&L does not plan to undertake a major refurbishment activity in the site vicinity or along the transmission lines expressly constructed to connect the plant to the electrical grid when the plant was initially licensed. Therefore, the area of potential effect (APE) for this license renewal action is the area at the power plant site and its immediate environs that may be impacted. Specifically, this area consists of the 0.4-km (0.25-mi) radius exclusion area boundary. The exclusion area is owner-controlled land surrounding the reactor building that is posted and access is controlled at all times.

Notifications and Public Involvement

On May 31, 2001, CP&L wrote to the South Carolina State Historic Preservation Office (SHPO) requesting comment on the RNP license-renewal process and on the determination by CP&L that the continued operation of RNP will not have an adverse effect on historic or cultural resources (Attachment 2). In a response dated August 8, 2001, the South Carolina SHPO stated that based on the information provided, license renewal should not affect historic properties nor archaeological sites (Attachment 3). It should be noted, however, that there is no record of any archaeological surveys having been conducted on the RNP site to assist the SHPO in the determination.

Eight Native American tribes or groups were contacted by letter on August 30, 2002, notifying them of the proposed action and the public meetings, providing an opportunity to comment on cultural resource issues pertaining to RNP, and inviting them to participate in the National Environmental Policy Act (NEPA) process. The following Tribes were contacted: (1) the Lumbee Tribe, (2) the Beaver Creek Band of Pee Dee Indians, (3) the Catawba Indian Nation, (4) the Chaklokowas Indian People of the Chickasaw Nation, (5) the Natchez Pee Dee Indian Tribe of Orangeburg, (6) the Pee Dee Indian Nation of Beaver Creek, (7) the Pee Dee Indian Nation, and (8) the Santee Indian Nation of South Carolina.

The NRC public involvement process is conducted in accordance with NEPA. Section 102 (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 51. 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 operating license (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.

The staff published a notice of intent to prepare an Environmental Impact Statement and conduct scoping in the *Federal Register* on August 22, 2002. An environmental site audit was conducted from September 24 - 26. On September 26, 2002, NRC staff met with Chad Long at the South Carolina SHPO's office and performed a review of the archaeological site files. Two public scoping meetings were held on September 25, 2002, in Hartsville, South Carolina. The NRC invited Federal, State, Tribal and local government agencies to participate in the scoping process by providing oral comments at the public meetings and/or submitting written comments by October 25, 2002. Comments received during the 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*.

The Draft Supplemental Environmental Impact Statement (SEIS) regarding license renewal at RNP was issued in May 5, 2003. A *Federal Register* notice of availability of the draft Supplement 13 to the GEIS was published on May 14, 2003. A copy of the draft SEIS is enclosed with this package (Attachment 1). Two public meetings regarding the draft SEIS will be held on June 25, 2003 in Hartsville, South Carolina. The public comment period will end on July 30, 2003. The Final SEIS will be issued in January 2004. Information regarding license renewal and documents associated with license renewal at RNP can be viewed at the NRC website www.nrc.gov.

Identification of Historic Properties

To assess known and potential historic and archaeological resources at the APE, several existing literature and database sources were consulted, along with direct contacts with the South Carolina Department of Archives and History, the South Carolina Institute of Archaeology and Anthropology, and the Darlington County Historian. In addition, electronic database searches were conducted at the National Park Service's National Register of Historic Places Information System and the Historic American Buildings Survey/Historic American Engineering Record listings.

The Final Environmental Statement (FES) (NRC 1975) related to the operation of RNP stated that there are no known historical sites or archaeological remains on the RNP plant site. A further review of the 1972 National Register of Historic Places listings and subsequent monthly supplements discloses no historic sites present on site (NRC 1975). Two historic places were identified within approximately 20 miles of RNP. The Coker Experimental Farms, which is located west of Hartsville, South Carolina on Highway 151, and the Jacob Kelley house, which is three miles west of Hartsville, South Carolina (NRC 1975).

In conjunction with the FES, the South Carolina Department of Archives and History commented on June 1, 1973 that there will be no interference with historic properties in the area, and since there are no further plans for construction, the presumption is that there will be no effect to historic properties (Attachment 4). Also in conjunction with the FES, the U.S. Department of the Interior commented on July 6, 1973 that the proposed action will not directly affect any existing or proposed unit of the National Park System or any registered National Historic, Natural, or Environmental Education Landmark or any site now in process or registration as a landmark" (Attachment 5). Also, attached is the U.S. Geological Survey (USGS) topographic map of the site (Attachment 6).

Examination of the National Register listings in 2002 did not disclose any listed or potentially eligible properties on or adjacent to the APE. Twenty-five sites were located within a 10-km (6-mi) radius of the APE; 24 of these sites were clustered in or near the town of Hartsville, and one in the Town of McBee in Chesterfield County.

Review of archaeological and historic site files at the South Carolina Department of Archives and History and the South Carolina Institute of Archaeology and Anthropology indicated that no prehistoric or historic properties have been recorded at the APE itself. No formal archaeological surveys have been conducted at the plant nor the lake. However, two surveys (*An Intensive Archeological Survey of the South Carolina 151 Highway Widening Project*, Cable and Cantley 1979; *Woodland Occupation in the Upper Coastal Plain of South Carolina: An Archeological Reconnaissance of the Carolina Power and Light Company's Lake Robinson to Sumter 230 kV Transmission Line Corridor*, Canouts et al.) were conducted in the general

vicinity of the APE. The closest site in the Cable and Cantley survey occurred 1.6 km (1 mi) south of the APE and the Canouts et al. survey began adjacent to the APE and proceeded southeast. Information about the archaeological sites located near the APE is summarized in Table 1.

For the Cable and Cantley survey, one 10.7 km x 38.1 m (6.7 mi x 125 ft) transect was surveyed within 1.6 km (1 mi) of the APE and only one site (38-CT-6) was identified within that transect. Site 38-CT-6 is a prehistoric site located west of the APE along S.C. Highway 151, which runs northwest-southeast of the APE (Cable and Cantley 1979)

The second survey, performed in 1980 by Canouts et al., was conducted along the Lake Robinson-to-Sumter transmission line right-of-way, running southeast from the APE (Canouts et. al 1984). This survey recorded two prehistoric sites (38-DA-35; 38-DA-47), one multi-component site (38-DA-48), and one prehistoric isolated find (IF-3) within a 10-km (6-mi) radius of the APE. Site 38-DA-48 is situated in the transmission line right-of-way within 1.6 km (1 mi) of the APE.

Table 1 Archaeological Sites Located Near the APE

Site Number	Description	National Register Status	Location	Survey Project
38-DA-48	A light scatter of historic materials occurs at the crest of a ridge above Black Creek. Plain and decorated whiteware, green glass, and a kaolin pipestem fragment and one chert flake were among the several artifacts recovered from the site.	Not Evaluated	Southeast of and within 1.6-km (1 mi) radius of APE	Canouts, et al.
38-DA-35	Several quartz, rhyolite and chert flakes and three biface fragments were located in the sandy bottomland along Beaverdam Creek	Not Evaluated	Southeast of and outside 1.6-km (1 mi) radius of APE	Canouts, et al.
38-DA-47	A sherd and lithic scatter occurs on a ridge slope above Beaverdam Creek. Included in the artifact collection are several cord marked, fabric impressed and plain sherds; basalt, chert, rhyolite and quartz flakes; and a biface.	Not Evaluated	Southeast of and outside 1.6-km (1 mi) radius of APE	Canouts, et al.
IF-3	Two lithic flakes and a biface fragment were located on an unnamed tributary of Beaverdam Creek.	Not Evaluated	Southeast of and outside 1.6-km (1 mi) radius of APE	Canouts, et al.

38-CT-6	Plain chert, quartz, slate, flow banded rhyolite denticulate, preforms, end scrapers, side scrapers, quartz crystal projectile point, unifacial tools.	Not Evaluated	West of and within 1.6-km (1 mi) radius of APE	Cable and Cantley

Two archaeological sites are located within a 1.6-km (1 mi) radius of the APE. 38-DA-48 is southeast of the APE along the Lake Robinson-to-Sumter transmission line corridor and 38-CT-6 is west of the APE. Neither site has been evaluated for inclusion on the National Register of Historic Places. Site 38-DA-48 is a multi-component site with historic artifacts dating to the 19th century. This site consists of 53 historic ceramic artifacts split between plain and decorated whiteware, as well as, some pearlware and one prehistoric chert flake. Site 38-CT-6 is a prehistoric site that consists mainly of prehistoric lithics; four unifacial tools, one other flake tool, two projectile points, two preforms/flake blanks, one bipolar core, and a large amount of debitage. The other three sites listed in Table 1 are located over 1.6-km (1 mi) from the APE.

Examination of the 1840 Wiley Warren Plat for 223 Acres on Black Creek, Darlington District, shows the location of the Wiley Warren family farm located on what is now the RNP site. A copy of this plat is located at the South Carolina Department of Archives and History. Any structures that were part of the farm have been destroyed. There reportedly was a family cemetery located on the same knoll as the RNP visitor center.[1] No surface evidence of the cemetery was visible due to the site being grassed over; however the possibility for intact archaeological evidence of historic use in the APE remains. Secondary State Route 23, the Old Camden Road, passes east-west to the south of the APE; this road was called the Road to Camden on historical maps and is also of historical value. The Segars Farm complex is located on private land 2 miles south and east of the APE. This complex was a resort area in the early 20th century. In 2003, this complex was deemed eligible for the National Register of Historic Places.

Findings

Based on the following operational expectations and correspondence received including the following:

1) the expectation that operations at the H. B. Robinson Steam Electric Plant, Unit 2 during the proposed license renewal period will continue within the bounds of previously analyzed conditions, as evaluated in the FES (NRC 1975) and commented on by the South Carolina Department of Archives and History (Attachment 4) and the U.S. Department of the Interior (Attachment 5) as well as the historic and archaeological properties analysis,

2) recent correspondence with the South Carolina SHPO (Attachments 2 and 3), and

3) the representation by CP&L that there are no plans for new construction or to substantially alter current operations over the license renewal period,

---

[1] Personal communication with Horace Fraser Rudisill, Darlington County Historian, September 25, 2002.

the NRC staff concludes that there will be no adverse effect on historic properties within the APE, and no additional mitigation is warranted.

Attachments

1. Draft Supplemental Environmental Impact Statement for the renewal of the Operating License for the H.B. Robinson Steam Electric Plant, Unit No. 2.
2. May 31, 2001, CP&L letter to the South Carolina SHPO requesting its comment on the RNP license-renewal process and on the determination by CP&L that the continued operation of RNP will not have an adverse effect on historic or cultural resources.
3. August 8, 2001 South Carolina SHPO letter to CP&L stated that based on the information provided, license renewal should not affect historic properties nor archaeological sites.
4. June 1, 1973, letter from South Carolina SHPO to CP&L stated that there will be no interference with historic properties in the area since there were no further plans for construction at the RNP site.
5. July 6, 1973, letter from U.S. Department of the Interior to U.S. Atomic Energy Commission regarding comments on environmental considerations for H. B. Robinson Steam Electric Plant, Unit 2.
6. USGS Topographic Map.

References

Cable, J. S. and C. E. Cantley. 1979. *An Intensive Archeological Survey of the South Carolina 151 Highway Widening Project.* University of South Carolina Institute of Archaeology and Anthropology. Columbia, South Carolina.

Canouts, V., M. A. Harmon, and W. H. Monteith. 1984. *Woodland Occupation in the Upper Coastal Plain of South Carolina: An Archeological Reconnaissance of the Carolina Power and Light Company's Lake Robinson to Sumter 230-kV Transmission Line Corridor.* University of South Carolina Institute of Archaeology and Anthropology. Columbia, South Carolina.

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

U.S. Nuclear Regulatory Commission (NRC), 1975. *Final Environmental Statement Related to the Operation of H.B. Robinson Steam-Electric Plant, Unit 2; Carolina Power and Light Company*. Docket No. 50-261, Washington D.C.

The South Carolina Archives & History Center
History & Heritage For All Generations

August 7, 2003

5/4/03
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(6)

Mr. Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

RECEIVED
SEP -3 PM 3:48
Rules and Directives Branch

RE: H.B. Robinson Steam Electric Plant, No. 2 (RNP), License Renewal Review and National Historic Preservation Act, Section 106 Review Process

Dear Mr Kuo:

We have reviewed the Generic Environmental Impact Statement for the above-referenced project and would like to offer the following comments.

Our major comments regarding archaeological sites are in response to section 4.4.5. This section notes that the SC SHPO in May of 2001 wrote that license renewal should not affect historic properties or archaeological sites (which of course can be historic properties). Our office now has new information, both from this draft EIS, and other sources, that raises concerns for us. While it appears that the operation of RNP is unlikely to undergo major changes during the new license period, we would like a clearer understanding of the types of activities that are on-going and where they occur. We would also recommend a greater effort to identify likely resources that could be affected by these activities. Finally, we believe that the best way to carefully manage resources, and potential resources, is to develop a Programmatic Agreement. This should be done prior to relicensing. The PA should direct the development of a Cultural/Historic Resources Management Plan (or Historic Properties Management Plan) and define activities that the SHPO would need to review.

Technical comments are attached separately. These comments are provided to assist you with your responsibilities pursuant to Section 106 of the National Historic Preservation Act, as amended. If you have any questions, please contact me at (803) 896-6169. Thank you.

Sincerely,
Marta Matthews
Marta Matthews
Review and Compliance Coordinator
State Historic Preservation Office

encl.

E-EIDS = ADH-03

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Template = ADM-013

Cdd = RBRich (RLE)

TECHNICAL COMMENTS

The following comments pertain to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants regarding H.B. Robinson Steam Electric Plant, Unit No. 2

1. Is this EIS just for the Plant and immediate property or the whole lake, etc. as shown in Fig. 2-3? I assume it is the whole thing. We would like to see the project (and APE) plotted on a topographic-based map.

2. Does the land that CP&L leases out fall under FERC regulation? If so, how are activities on those lands reviewed for effects to historic properties?

3. Under 2.2.9.1, include a discussion of the Segars Mill Farm property under Euro-American Historic Period. Our office has just learned about this property and determined it eligible for the National Register of Historic Places. The families that lived here played an important role in the Hartsville area history.

4. Under 2.2.9.2, there may not have been sites near the project that were considered to be eligible or potentially eligible for the National Register earlier, but I know, with our review of Segars Mill Farm, that there are now. Several Native American sites on the farm tract also appear to be eligible, but need more testing. This indicates, too, that with a comprehensive survey, more sites would likely be identified.

5. We believe that an effort needs to be made to locate the Wiley Warren family cemetery (2.2.9.2) – this should not wait for ground-disturbing activities. Also additional work needs to be done to locate and evaluate resources associated with the other farm properties known to have been in the project area.

6. Is the Old Camden Road likely to be affected by the project in any way?

7. The definition of areas of low, moderate and high probability is reasonable, but pretty general. We would like to see these more carefully defined, and procedures put in place for how to proceed with undertakings in the higher probability areas.

8. We concur with the recommendations on page 4-32 in the paragraph beginning on line 24. But, again, the language is too vague. What does "care should be taken mean"? Let's describe how care will be taken. What are "normal operational and maintenance activities"? A partial list is included, but these are pretty general categories that could include a wide variety of undertakings. How will property managers know what to do when? We absolutely agree that forested areas are particularly high probability and vulnerable. There should be a plan to identify and manage the resources in them.

August 18, 2003

Mr. Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Washington, DC 20555-0001

RE: HB Robinson Steam Electric Plant, No. 2
License Renewal and National Historic Preservation Act
Darlington, Chesterfield Counties

Dear Mr. Kuo:

We have reviewed the report entitled *Historic and Archaeological Resources Report Narrative* for the above-referenced project, which we received July 17. Based on the information provided, we have several concerns as to whether historic properties have been adequately documented. Therefore, we cannot concur with your determination that no historic properties will be affected by the relicensing process.

Section 106 of the National Historic Preservation Act requires the federal agency to determine the area of potential effects (APE) within which historic properties may be affected. We do not agree with your delineation of the APE to include only "the power plant site and its immediate environs." We believe that an APE should be drawn to include the impoundment, which is used as a cooling pond for the nuclear power plant. The fluctuation in impoundment levels can have an effect on archaeological sites on the shoreline. There is precedent for establishing an APE to include the shoreline of the cooling pond as shown in the Cultural Resources Report for the Virgil Summer NRP Relincensing.

Once the APE has been established, usually in consultation with the State Historic Preservation Office, identification of historic properties within the APE should take place. It appears as though the NRC has undertaken adequate background research at both our office and the South Carolina Institute of Archaeology and Anthropology. That background research showed archaeological sites near the APE, as well as previously identified historic sites: the Wiley Warren Farm, the Old Camden Road, the Segars Farm Complex. It is also stated that "the possibility for intact archaeological evidence of historic use in the APE remains." That statement alone should take you to the next phase of survey work in order to determine if any historic property actually exists within the APE. Yet there is no evidence that any current surveys were undertaken as part of this research.

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We also question the purpose of supplying comments from both our office and the Department of the Interior that are almost thirty years old. A statement made in response to an "after-the-fact" environmental review from thirty years ago does not address issues that are known to be of concern now. Specifically, the review by the Department of the Interior, stated that although the project will not affect any sites currently listed as a National Historic Landmark, or part of the NPS, it clearly points out that no "interdisciplinary investigations of the development area by professionals was done," and therefore previously unknown cultural resources may have been lost since the plant was already constructed.

Our recommendations are as follows:

1. Expand the boundaries of the APE to include the shoreline of Lake Robinson.
2. Perform an advanced level of archaeological survey to locate sites that may be associated with the Wiley Warren Farm.
3. Evaluate potential effect to unidentified archaeological sites that may be affected by drawing water from the cooling pond for the nuclear reactor.

Once these recommendations have been completed, we suggest you submit a revised report to our office for review and comment.

We are providing these comments to assist you with your responsibilities pursuant to Section 106 of the National Historic Preservation Act, as amended. If you have any questions, please contact me at (803) 896-6169. Thank you.

Sincerely,

Marta Matthews

Marta Matthews
Review and Compliance Coordinator
State Historic Preservation Office

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Dr. N.
St. Petersburg, FL 33702
(727) 570-5312, FAX 570-5517
http://caldera.sero.nmfs.gov

OCT 7 2003 F/SER3:SKB

Mr. Pao-Tsin Kuo
Program Director, License Renewal and Environmental Impacts
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Kuo:

This is in response to your April 22, 2003, letter regarding the renewal of the operating license for the H.B. Robinson Nuclear Plant (RNP), Unit 2. We have reviewed the material submitted by the Nuclear Regulatory Commission (NRC) with respect to possible effects on the species listed and the critical habitat designated under the Endangered Species Act (ESA) under the purview of the National Marine Fisheries Service (NOAA Fisheries).

The RNP is located at the junction of Lake Robinson and Black Creek in Darlington County, South Carolina. Black Creek is a part of the Great Pee Dee River basin; Black Creek flows into the Great Pee Dee about 113 river kilometers (rkm) downstream from the project location. Black Creek enters into Prestwood Lake about 8 rkm downstream from the project location; Prestwood Lake is an impounded water body without fish passage facilities.

The endangered shortnose sturgeon (*Acipenser brevirostrum*) has been documented in the Great Pee Dee River; spawning has been verified via egg collection (Collins, 2002). NOAA Fisheries is not aware of any records of shortnose sturgeon in Black Creek. Furthermore, it is likely that the Prestwood Lake Dam precludes any passage of the shortnose sturgeon from the Great Pee Dee River into Lake Prestwood and further upstream to the project location (the fish and its spawning sites have been located well below the dam and project area).

Therefore, NOAA Fisheries concurs with your conclusion that the project will not affect shortnose sturgeon. This concludes the NRC's consultation responsibilities under section 7 of the ESA for the H.B. Robinson Nuclear Plant. Be advised that consultation must be reinitiated if a take occurs or new information reveals effects of the action not previously considered, or the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat in a manner or to an extent not previously considered, or if a new species is listed or critical habitat designated that may be affected by the identified action.

We look forward to continued cooperation with the NRC in conserving our endangered and threatened resources. If you have any questions, please contact Dr. Stephania Bolden, fishery biologist, at (727) 570 - 5312, or by e-mail at stephania.bolden@noaa.gov.

Sincerely yours,

Roy E. Crabtree, Ph.D.
Regional Administrator

cc: F/SER4 (Brownell)
o:\section7\informal\sturgeon\H.B. Robinson
Ref: I\SER\2003\00580
File: 1514-22.M (NRC)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

October 17, 2003

Mr. Pao-Tsin Kuo
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: License Renewal at H.B. Robinson Steam Electric Plant, Unit 2 (RNP)
TAC No. MB5226, Docket No. 50-261
FWS Log No. 4-6-03-I-491

Dear Mr. Kuo:

The U.S. Fish and Wildlife Service (Service) has reviewed the Biological Assessment and your letter requesting our concurrence regarding the above referenced action in Chesterfield, Darlington, Florence, Lee, and Sumter Counties, South Carolina. We are submitting the following comments under provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*) and the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq.*).

According to the information provided, the renewed operating license would allow 20 additional years of plant operation beyond the current RNP licensed operating period of 40 years. No major refurbishment or replacement of important systems, structures, or components are expected during the RNP license renewal period. In addition, no construction activities are expected to be associated with the license renewal.

Based on our review and the information provided, the Service concurs with your determination that the proposed action is not likely to adversely affect the federally-listed red-cockaded woodpecker, Candby's dropwort, American chaffseed, or the rough-leaved loosestrife. We also concur with your determination that the proposed action will have no effect on the additional federally-listed species, under the jurisdiction of the Service, that were identified to have potential to occur within the project area. Therefore, the requirements of Section 7 of the Act have been fulfilled relative to the proposed action, and no further consultation is necessary at this time. However, obligations under Section 7 of the Act must be reconsidered if: (1) new information reveals that the proposed project may affect listed species in a manner or to an extent not previously considered, (2) the proposed project is subsequently modified to include activities which were not considered during this consultation; or (3) new species are listed or critical habitat designated that might be affected by the proposed project.

In accordance with provisions of the Fish and Wildlife Coordination Act, the Service has also reviewed the subject project with regard to the effects the proposed action may have on waters of the U.S. and related fish and wildlife resources. Information provided revealed the presence of several streams within the proposed area. Erosion and sedimentation problems are likely to be exacerbated at areas where clearing removes deep-rooted vegetation. Therefore, to maintain the integrity of these aquatic resources during transmission line corridor maintenance, we recommend that at least a 25-foot buffer be left on both sides of any stream crossed or paralleled by a transmission line.

The above views and recommendations constitute the report of the Department of the Interior. If you require additional assistance, please contact Phil DeGarmo of my staff at 843-727-4707 x21.

Sincerely yours,

joseph F. Cockrell

Joseph F. Cockrell
Acting Field Supervisor

JFC/PMD/km

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 17, 2003

Dr. Rodger E. Stroup, Director
South Carolina Department of Archives
and History
Archives and History Center
8301 Parklane Road
Columbia, SC 29223

SUBJECT: H. B. ROBINSON STEAM ELECTRIC PLANT, NO. 2, LICENSE RENEWAL REVIEW AND NATIONAL HISTORIC PRESERVATION ACT, SECTION 106 REVIEW PROCESS

Dear Dr. Stroup:

This letter responds to your recommendations provided by letter dated August 18, 2003, regarding the license renewal for H. B. Robinson Steam Electric Plant, Unit 2 (H. B. Robinson). On July 7, 2003, in accordance with Title 36 of the *Code of Federal Regulations*, Part 800 (36 CFR 800), the NRC sought concurrence from the South Carolina State Historic Preservation Office (SHPO) regarding the license renewal at H. B. Robinson that the proposed undertaking will have no effect on historic properties. Enclosed with our letter was our Cultural Resources Narrative. Your office responded on August 18, 2003, and recommended the following actions be provided in a revised report in order to make an assessment of effect. The SHPO's recommendations were as follows:

1. Expand the boundaries of the APE to include the shoreline of Lake Robinson

2. Perform an advanced level of archaeological survey to locate sites that may be associated with the Wiley Warren Family Farm

3. Evaluate potential effects to unidentified archaeological sites that may be affected by drawing water from the cooling pond for the nuclear reactor

NRC staff and the staff from Pacific Northwest National Laboratory participated in a conference call with Ms. Marta Matthews, Review and Compliance Coordinator, and Ms. Valerie Marcil, Staff Archaeologist of the State Historic Preservation Office, on September 10, 2003, to discuss the SHPO recommendations. Enclosure 1 is a summary of that conference call. Regarding the first recommendation, the area of potential effect (APE) for the H. B. Robinson license renewal is confined to the area at the power plant site and its immediate environs that may be impacted by land disturbing operations incidental to this license renewal activity. The APE includes the cooling water intake structures, the cooling canal, and the shoreline of Lake Robinson between the intake structures and the discharge outfall. Regarding the second recommendation, no remnants of the Wiley Warren Family Farm are currently visible within the vicinity of the plant and the visitor's center, and no land disturbing operations are planned as part of license renewal that would impact buried remnants. Regarding the third recommendation, the level of

R. Stroup 2

Lake Robinson is normally controlled by Carolina Power and Light Company (CP&L) within a narrow band; therefore, there are no potential effects to unidentified archaeological sites along the shore of Lake Robinson. This information and technical information responsive to your earlier comments on the draft Supplemental Environmental Impact Statement were incorporated into the revised Historic and Archaeological Resources Report Narrative H. B. Robinson Steam Electric Plant, Unit No. 2 License Renewal (Enclosure 2). In addition, CP&L has committed to institute requirements and guidance for the preservation of historic, cultural, and archaeological resources in the Environmental Compliance Manual used by CP&L's nuclear plants. These results indicate that license renewal will have no effect on historic properties. Pursuant to 36 CFR 800.4(d)(1), we are providing documentation to support these findings, and we request your concurrence with our determination.

The Final SEIS for the H. B. Robinson license renewal action will be published in December 2003; it will reflect our interactions to date. If you have any questions or require additional information, please contact Richard L. Emch, Jr., the NRC Environmental Project Manager for the H. B. Robinson license renewal project, at 301-415-1590 or RLE@nrc.gov .

Sincerely,

SWest for /***RA***/

Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No.: 50-261

Enclosures: As stated

cc w/o encl.: See next page

DISTRIBUTION: See next page
Accession nos.:
1. Letter to R. Stroup w/Encl. 2: Historic and Archaeological Resources Report Narrative: **ML033230282**
2. Encl. 1 to letter to R. Stroup: Conference call summary: **ML032820198**
2. Att. 1. to Report: CP&L Ltr. to So. Carolina SHPO: **ML021700129** (pge. 110)
3. Att. 2. to Report: So. Carolina SHPO Ltr to CP&L: **ML021700129** (pge. 113)
4. Att. 3. to Report: CD: Robinson Pictures: **ML033180579**
5. Att. 4. to Report: Archaeological, Cultural, and Historic Resources: **ML033180546**

October 8, 2003

NOTE TO: FILE

FROM: Richard Emch, Senior Project Manager /RA/
Environmental Section
License Renewal and Environmental Impacts Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF TELECONFERENCE WITH THE SOUTH CAROLINA STATE HISTORIC PRESERVATION OFFICE IN SUPPORT OF THE STAFF'S REVIEW OF THE H.B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2 LICENSE RENEWAL APPLICATION

On Wednesday, September 10, 2003, representatives of the U.S. Nuclear Regulatory Commission (NRC) conducted a teleconference with representatives from the Office of the South Carolina State Historic Preservation Officer (SHPO) . The following people participated in the teleconference:

Marta Matthews	SC SHPO
Valerie Marcil	SC SHPO
Richard Emch	NRC
Jennifer Davis	NRC
Alicia Williamson	NRC
Dan Tano	Pacific Northwest National Laboratory (PNNL)
Beverly Miller	PNNL
Mary Ann Parkhurst	PNNL

The purpose of the teleconference was to discuss comments contained in two letters to the NRC from the SC SHPO's office dated August 7 and 18, 2003, regarding the license renewal application for H.B. Robinson, Unit 2. The first letter dated August 7, 2003, provided the SC SHPO's comments about the environmental impact statement, draft NUREG-1437 Supplement 13. The second letter dated August 18, 2003, provided comments about the "Historic and Archaeological Resources Report Narrative for the H.B, Robinson Steam and Electric Plant, Unit No. 2, License Renewal," which the NRC sent to the SC SHPO by letter dated July 7, 2003. Since the SC SHPO is involved in consultation on both the H.B. Robinson and V.C. Summer license renewal applications, the NRC explained the differences in the way the lakes/reservoirs are used at Robinson and Summer. Lake Robinson is not used for pumped storage, and the lake water level varies very little (generally within a one-foot band). Then the extent of the area of potential effect (APE) of the Federal action -license renewal- was discussed. The APE for license renewal is the power plant site and its immediate environs.

Enclosure 1

Ms. Matthews and Ms. Marcil explained their concerns about future ground-disturbing activities being conducted on the overall site including the lakeshore. The site is owned by Carolina Power and Light Company (CP&L) and almost no surveys have been done for cultural and historical resources on that land. They were particularly interested in the land at the lakeshore around the lake and the land around the visitors center, where the remains of the Wiley-Warren farm and cemetery may be located. Also, they expressed concern about the ground-disturbing activities on land leased by CP&L to private citizens around the lakeshore. For these reasons, the SC SHPO wants the entire lakeshore included in the APE.

The NRC indicated that the impact on hidden potential cultural and historic resources on the site from the additional 20 years of nuclear plant operation under license renewal -the federal action- would be quite small.

The NRC acknowledged the SC SHPO's concerns and agreed to discuss these concerns with CP&L and arrange another teleconference with the SC SHPO to resolve the concerns.

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
DIVISION OF REGULATORY IMPROVEMENT PROGRAMS

HISTORIC AND ARCHAEOLOGICAL RESOURCES REPORT NARRATIVE H.B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2 LICENSE RENEWAL

Amended Report

October 2003

Enclosure 2

HISTORIC AND ARCHAEOLOGICAL RESOURCES REPORT NARRATIVE
H.B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2 LICENSE RENEWAL

Project Description

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. The proposed Federal action is the renewal of the Operating License (OL) for the H.B. Robinson Steam Electric Plant, Unit No. 2 (RNP) for an additional 20 years. The current OL will expire July 31, 2010. RNP, owned by Carolina Power and Light (CP&L) now known as Progress Energy, is located in northeastern South Carolina, approximately 8 km (5 mi) west-northwest of Hartsville, South Carolina (see Figures 2-1 through 2-3 in the DSEIS). The RNP site encompasses approximately 2435 ha (6020 ac) of CP&L property in northwestern Darlington and southwestern Chesterfield Counties, including the 911-ha (2250-ac) Lake Robinson.

Two generating units are located on the RNP site: Unit 1 is a coal-fired plant that has been operating since 1960, and Unit 2, referred to as Robinson Nuclear Plant, is a single-unit nuclear plant. The nuclear steam supply system for RNP is a pressurized water reactor (PWR) with three steam generators. Cooling water for both units comes from Lake Robinson, an impoundment of Black Creek that the NRC has categorized as a cooling pond. The intake structures for Units 1 and 2 are both located on the shore of Lake Robinson, near the generator facilities. Heated effluent from both facilities is discharged to the impoundment through a cooling canal at a discharge point located approximately 6.4 km (4 mi) upstream from the dam and cooling water intake structures. The combined circulating water flow for the two units averages 2.476×10^6 m^3/day (654 million gallons per day).

The 11-km (7-mi) long Lake Robinson was created in 1958 when the upper 448 km^2 (173 mi^2) of the Black Creek drainage was impounded to provide cooling water for the coal-fired plant. However, the lake was sized to accommodate heat loads from future plant additions. In addition to functioning as a cooling pond, the lake is used for recreation and supports a modest fishery. The lake level is controlled by CP&L, and operating procedures call for the elevation to be maintained between 67.3 and 67.5 m (220.7 and 221.5 ft), a range of 0.24 m (0.8 ft). Under extreme conditions such as severe drought, the lake level may vary outside this range. The shoreline starting at the dam and extending to near the end of the discharge canal is covered with riprap made up of large boulders to maintain shoreline stability near the plant. Maintaining the lake surface elevation within a tight range minimizes shoreline erosion that might damage unidentified historic and archaeological resources.

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 sparsely 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. 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.

In conjunction with this proposed license renewal action for RNP, CP&L does not plan to undertake a major refurbishment activity in the site vicinity.

This report presents the findings of the Section 106 review conducted to establish whether any historic properties would be affected by the proposed license renewal of RNP.

Area of Potential Effect

The area of potential effect (APE) is confined to the area at the power plant site and its immediate environs that may be impacted by land disturbing operations incidental to this license renewal activity. The APE includes the cooling water intake structures, the cooling canal, and the shoreline of Lake Robinson between the intake structures and the discharge outfall (see the U.S. Geological Survey [USGS] topographic map of the site provided with the July 7, 2003, letter).

Notifications and Public Involvement

On May 31, 2001, CP&L wrote to the South Carolina State Historic Preservation Office (SHPO) requesting comment on the RNP license renewal process and on the determination by CP&L that the continued operation of RNP will not have an adverse effect on historic or cultural resources (Attachment 1). In a response dated August 8, 2001, the South Carolina SHPO stated that, based on the information provided, license renewal should not affect historic properties nor archaeological sites (Attachment 2). It should be noted, however, that there is no record of any archaeological surveys having been conducted on the RNP site.

The NRC public involvement process is conducted in accordance with the National Environmental Policy Act (NEPA), which 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. In 10 CFR 51.20(b)(2), the Commission requires preparation of an EIS or a supplement to an EIS for renewal of a nuclear reactor. 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.

The staff published a "Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping" in the *Federal Register* on August 22, 2002. Eight Native American tribes or groups were contacted by letter dated August 30, 2002, notifying them of the proposed action and the public meetings, providing an opportunity to comment on cultural resource issues pertaining to RNP, and inviting them to participate in the NEPA process. The following Tribes were contacted: (1) the Lumbee Tribe, (2) the Beaver Creek Band of Pee Dee Indians, (3) the Catawba Indian Nation, (4) the Chaklokowas Indian People of the Chickasaw Nation, (5) the Natchez Pee Dee Indian Tribe of Orangeburg, (6) the Pee Dee Indian Nation of Beaver Creek, (7) the Pee Dee Indian Nation, and (8) the Santee Indian Nation of South Carolina.

An environmental site audit was conducted from September 24-26, 2002, and on September 26, NRC staff met with Chad Long of the South Carolina SHPO's office to review the archaeological site files. Two public scoping meetings were held on September 25, 2002, in Hartsville, South Carolina. The NRC invited Federal, State, Tribal, and local government agencies to participate in the scoping process by providing oral comments at the public

meetings and/or submitting written comments by October 25, 2002. Comments received during the 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.*

The draft supplemental environmental impact statement (SEIS) regarding license renewal at RNP was issued on May 5, 2003. A Notice of Availability of the draft SEIS (Supplement 13 to the GEIS) was published in the *Federal Register* on May 14, 2003. A copy of the draft SEIS was enclosed with the July 7, 2003, package to the SHPO. Two public meetings regarding the draft SEIS were held on June 25, 2003, in Hartsville, South Carolina, and the public comment period ended on July 30, 2003. The final SEIS will be issued in December 2003. Information regarding license renewal and documents associated with license renewal at RNP can be viewed at the NRC website www.nrc.gov.

Identification of Historic Properties

In an effort to identify historic properties that may be located in the APE, several existing literature and database sources were consulted, along with direct contacts with the South Carolina Department of Archives and History, the South Carolina Institute of Archaeology and Anthropology, and the Darlington County Historian. In addition, electronic database searches were conducted at the National Park Service's National Register of Historic Places Information System and the Historic American Buildings Survey/Historic American Engineering Record listings.

Examination of a historic map at the South Carolina Department of Archives and History, entitled "1840 Wiley Warren Plat for 223 Acres on Black Creek, Darlington District," shows the location of the Wiley Warren Family Farm on the current RNP site. There reportedly was a family cemetery located on the same knoll as the RNP visitor center.[1] A site visit to RNP indicates that much of the APE was heavily disturbed by construction of RNP and associated facilities, and the site now consists of numerous buildings, parking areas, landscaped areas, and roads. A CD containing pictures taken of the area around the visitor's center during construction is enclosed with this report (Attachment 3). Structures that may have been part of the farm are no longer visible. No surface evidence of the cemetery was visible because the site has been grassed over. The map also shows Secondary State Route 23, the Old Camden Road, passing in an east-west direction to the south of the APE; this road was called the Road to Camden on historical maps and is also of historical value.

Review of archaeological and historic site files at the South Carolina Department of Archives and History and the South Carolina Institute of Archaeology and Anthropology indicated that the APE has not been surveyed for cultural resources. However, two surveys (*An Intensive Archeological Survey of the South Carolina 151 Highway Widening Project*, Cable and Cantley 1979; *Woodland Occupation in the Upper Coastal Plain of South Carolina: An Archeological Reconnaissance of the Carolina Power and Light Company's Lake Robinson to Sumter 230 kV Transmission Line Corridor*, Canouts et al. 1984) were conducted in the general vicinity of the APE. The closest site identified in the Cable and Cantley survey is located 1.6 km (1 mi) south of the plant, and the Canouts et al. survey began adjacent to the APE and proceeded

[1] Personal communication with Horace Fraser Rudisill, Darlington County Historian, September 25, 2002.

southeast. Information about the archaeological sites located near the APE is summarized in Table 1.

For the Cable and Cantley survey, one 10.7-km x 38.1-m (6.7-mi x 125-ft) transect was surveyed within 1.6 km (1 mi) of the plant, and only one site (38-CT-6) was identified within that transect. Site 38-CT-6 is a prehistoric site located west of the APE along S.C. Highway 151, which runs northwest-southeast, west of the APE (Cable and Cantley 1979)

The second survey, performed in 1980 by Canouts et al. (1984), was conducted along the Lake Robinson-to-Sumter transmission line right-of-way, running southeast from the APE. This survey recorded two prehistoric sites (38-DA-35; 38-DA-47), one multi-component site (38-DA-48), and one prehistoric isolated find (IF-3) within a 10-km (6-mi) radius of the plant. Site 38-DA-48 is situated in the transmission line right-of-way within 1.6 km (1 mi) of the plant.

Table 1 Archaeological Sites Located Near the APE

Site Number	Description	National Register Status	Location	Survey Project
38-DA-48	A light scatter of historic materials occurs at the crest of a ridge above Black Creek. Plain and decorated whiteware, green glass, a kaolin pipestem fragment, and one chert flake were among the several artifacts recovered from the site.	Not Evaluated	Southeast of and within 1.6-km (1-mi) radius of the plant	Canouts et al. 1984
38-DA-35	Several quartz, rhyolite, and chert flakes and three biface fragments were located in the sandy bottomland along Beaverdam Creek	Not Evaluated	Southeast of and outside 1.6-km (1-mi) radius of the plant	Canouts et al. 1984
38-DA-47	A sherd and lithic scatter occurs on a ridge slope above Beaverdam Creek. Included in the artifact collection are several cord marked, fabric impressed, and plain sherds; basalt, chert, rhyolite, and quartz flakes; and a biface.	Not Evaluated	Southeast of and outside 1.6-km (1-mi) radius of the plant	Canouts et al. 1984
IF-3	Two lithic flakes and a biface fragment were located on an unnamed tributary of Beaverdam Creek.	Not Evaluated	Southeast of and outside 1.6-km (1-mi) radius of the plant	Canouts et al. 1984

38-CT-6	Plain chert, quartz, slate, flow banded rhyolite denticulate, preforms, end scrapers, side scrapers, quartz crystal projectile point, unifacial tools.	Not Evaluated	West of and within 1.6-km (1-mi) radius of the plant	Cable and Cantley 1979

Two archaeological sites are located within a 1.6-km (1-mi) radius of the plant. Site 38-DA-48 is located southeast of the APE along the Lake Robinson-to-Sumter transmission line corridor, and 38-CT-6 is west of the APE. Neither site has been evaluated for inclusion on the National Register of Historic Places. Site 38-DA-48 is a multi-component site with historic artifacts dating to the 19th century. This site consists of 53 historic ceramic artifacts split between plain and decorated whiteware, as well as some pearlware and one prehistoric chert flake. Site 38-CT-6 is a prehistoric site that consists mainly of prehistoric lithics: four unifacial tools, one other flake tool, two projectile points, two preforms/flake blanks, one bipolar core, and a large amount of debitage. The other three sites listed in Table 1 are located over 1.6 km (1 mi) from the plant.

Examination of the National Park Service's National Register of Historic Places Information System did not disclose any listed or eligible properties on or adjacent to the APE. Twenty-six sites were located within a 10-km (6-mi) radius of the plant; 24 of these sites were clustered in or near the town of Hartsville, and one site was in the Town of McBee in Chesterfield County. Of particular note is the Segars Farm complex located on private land about 3 km (2 mi) south and east of the Plant. This complex was a resort area in the early 20th century. In 2003, this complex was deemed eligible for the National Register of Historic Places.

Amendments to CP&L's Environmental Compliance Manual

In a letter dated November 12, 2003, CP&L made a commitment to the NRC to amend the Environmental Compliance Manual used at RNP to provide guidance regarding the preservation of historic, cultural, and archaeological resources (Attachment 4). The amendment will include the following elements: (1) a statement of the need to protect historic, cultural, and archaeological resources during land disturbing activities; (2) an assessment or evaluation before starting activities that could impact resources listed, or eligible for listing, on the National Register of Historic Places; (3) guidance to stop work any time an unexpected discovery is made and consult with the Environmental Services Section, which will in turn consult with the SHPO, if deemed appropriate before resuming work; (4) no assessment is required if land disturbing activities are restricted to areas previously disturbed during construction; and (5) examples of historic, cultural, and archaeological resources which may be encountered.

Findings

During the NRC review, the staff examined existing literature and database sources, consulted with the South Carolina Department of Archives and History, the South Carolina Institute of Archaeology and Anthropology, and the Darlington County Historian. The staff identified no sites within the APE. In addition, the staff invited the public and potentially affected Native American tribes to participate and comment.

CP&L does not plan to undertake a major refurbishment activity either in the site vicinity. CP&L has committed to implementing an amendment to the Environmental Compliance Manual used

at RNP to ensure that potential historic, archaeological, and cultural resources that have not yet been identified or discovered are protected.

Due to the extensive disturbance present in the APE, and given the lack of substantial land altering aspects of this licence renewal, the NRC staff concludes this project will have no effect on historic properties. It is unlikely that subsurface archaeological remains associated with the Wiley Warren Family Farm are intact or eligible for listing on the National Register of Historic Places.

6

Attachments

1. May 31, 2001, CP&L letter to the South Carolina SHPO requesting its comment on the RNP license renewal process and on the determination by CP&L that the continued operation of RNP will not have an adverse effect on historic or cultural resources. (Page E-2 of the Environmental Report; Page 110 of Accession No. ML021700129)

2. August 8, 2001, South Carolina SHPO letter to CP&L stated that based on the information provided, license renewal should not affect historic properties nor archaeological sites. (Page E-5 of the Environmental Report; Page 113 of Accession No. ML021700129)

3. CD containing pictures taken of the area around the visitor's center during construction of RNP. (Accession No. ML033180579)

4. November 12, 2003, CP&L letter to NRC regarding commitment to amend Environmental Compliance Manual for the protection of archaeological, cultural, and historic resources. (Accession No. ML033180546)

References

Cable, J. S. and C. E. Cantley. 1979. *An Intensive Archeological Survey of the South Carolina 151 Highway Widening Project.* University of South Carolina Institute of Archaeology and Anthropology. Columbia, South Carolina.

Canouts, V., M. A. Harmon, and W. H. Monteith. 1984. *Woodland Occupation in the Upper Coastal Plain of South Carolina: An Archeological Reconnaissance of the Carolina Power and Light Company's Lake Robinson to Sumter 230-kV Transmission Line Corridor.* University of South Carolina Institute of Archaeology and Anthropology. Columbia, South Carolina.

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

Carolina Power & Light (CP&L). 1999. Robinson Impoundment Operation. Hartsville, South Carolina.

Carolina Power and Light (CP&L). 2003. Letter to NRC regarding commitment to amend Environmental Compliance Manual. Hartsville, South Carolina.

U.S. Nuclear Regulatory Commission (NRC), 1975. *Final Environmental Statement Related to the Operation of H.B. Robinson Steam-Electric Plant, Unit 2; Carolina Power and Light Company.* Docket No. 50-261, Washington D.C.

Matthews, Marta. 2003. Letter regarding H.B. Robinson Steam Electric Plant, No. 2 (RNP). License Renewal Review and National Historic Preservation Act, Section 106 Review Process. State Historic Preservation Office. Columbia, South Carolina.

Attachment 1

CP&L
Progress Energy

Serial: RNP-RA/01-0072

MAY 31 2001

Ms. Nancy Brock
State Historic Preservation Office - Review and Compliance
South Carolina Department of Archives and History
Archives & History Center
8301 Parklane Road
Columbia, SC 29223

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
REQUEST FOR INFORMATION ON
HISTORIC AND ARCHAEOLOGICAL RESOURCES

Dear Ms. Brock:

Carolina Power & Light (CP&L) Company is preparing an application to the U. S. Nuclear Regulatory Commission (NRC) to renew the operating license for the H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2, which expires on July 31, 2010. CP&L intends to submit this application for license renewal by the fourth quarter of 2002. As part of the license renewal process, the NRC requires, in 10 CFR 51.53(c)(3)(ii)(K), that applicants "assess whether any historic or archaeological properties will be affected by the proposed project." The NRC may also request an informal consultation with your office at a later date in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470) and the Federal Advisory Council on Historic Preservation regulations (36 CFR 800). By contacting you early in the application process, CP&L hopes to identify any issues that need to be addressed or any information that your office may need to expedite the NRC consultation.

CP&L has operated HBRSEP, Unit No. 2 and associated transmission lines, shown on the enclosed Figure 1, since 1970. The plant is in Darlington County, South Carolina, approximately 4.5 miles west northwest of the city of Hartsville, South Carolina. The plant is situated on the southwest shore of Lake Robinson, which was created by CP&L in 1959 to serve as a source of cooling water for power production. The plant site encompasses approximately 4800 acres including the lake.

Ms. Nancy Brock
State Historic Preservation Office
Serial: RNP-RA/01-0072
Page 2 of 2

The Robinson Plant is connected to the regional electric transmission grid by 230 kilovolt transmission lines with intrasystem tie points at Darlington, SC, at Rockingham, NC, at Sumter, SC, at Florence, SC, and two lines that connect to CP&L's Darlington County plant which is located near HBRSEP.

Using the National Register Information System (NRIS) on-line database, a list of sites on the National Register of Historic Places within a six-mile radius of the plant has been compiled. CP&L also has visited your office to review relevant materials. In addition, the project has been discussed with the South Carolina Institute of Archaeology and Anthropology, and files have been reviewed to identify archaeological sites in the vicinity of the plant.

CP&L believes that the operation of HBRSEP, Unit No. 2, through the license renewal term of an additional 20 years, will not have an adverse effect on historic or cultural resources in the region. There are no plans to substantially alter current operations over the license renewal period. No substantive additional disturbance of land is anticipated.

Please notify us of any concerns you may have about historic or archaeological properties in the site vicinity or confirming the conclusion that operation of HBRSEP over the license renewal term would have no effect on any historic or archaeological properties in South Carolina. Area maps are enclosed to aid you in locating HBRSEP. CP&L would appreciate a response by July 31, 2001. A copy of this letter and your response will be included in the license renewal application that will be submitted to the NRC. This request was discussed with you in a telephone conference with Mr. Jan S. Kozyra, CP&L, on May 29, 2001.

If you have any questions concerning this matter, please contact Mr. Kozyra at 843-857-1872.

Sincerely,

B. L. Fletcher, III
Manager – Regulatory Affairs

Enclosures

c: Mr. H. Porter, DHEC

Attachment 2

August 8, 2001

Mr. B. L. Fletcher, III
Manger – Regulatory Affairs
Robinson Nuclear Plant
3581 W. Entrance Road
Hartsville, SC 29550

Re: Robinson Nuclear Plant
Darlington County

Dear Mr. Fletcher:

Thank you for your letter of May 31, which we received by fax transmittal on August 8, regarding the proposed renewal of the operating license for the Robinson Nuclear Plant in Darlington County.

It does not appear, based on the information provided, that any properties listed on or determined eligible for inclusion in the National Register of Historic Places will be affected. Since the license renewal does not involve new construction, archaeological sites should not be affected.

These comments are provided as evidence of your consultation with the State Historic Preservation Office. If you have questions, please don't hesitate to call me at 803/896-6169.

Sincerely,

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

S. C. Department of Archives & History • 8301 Parklane Road • Columbia • South Carolina • 29223-4905 • (803) 896-6100 • www.state.sc.us/scdah

Attachment 4

Progress Energy

10 CFR 54.23

Serial: RNP-RA/03-0147

NOV 12 2003

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23

ARCHAEOLOGICAL, CULTURAL, AND HISTORIC RESOURCES

Ladies and Gentlemen:

By letter dated June 14, 2002, Carolina Power & Light (CP&L) Company, now doing business as Progress Energy Carolinas, (PEC) Inc., submitted an application for renewal of the Operating License for the H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2, which is also referred to as the Robinson Nuclear Plant (RNP).

The South Carolina State Historic Preservation Office (SHPO) has expressed concern, in their letter to Mr. P. T. Kuo, NRC, dated August 7, 2003, about the protection of Archaeological, Cultural, and Historic (AC&H) Resources. This concern arose as a result of their review of the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437), Supplement 13, Draft Report for Comment. This letter is to confirm that PEC is developing guidance regarding AC&H Resources to be incorporated into the Environmental Compliance Manual prior to the end of 2004. The guidance as currently envisioned will include the following elements:

1. A statement of the need to protect AC&H Resources during land disturbing activities,

2. A requirement for an assessment or evaluation before starting activities that could impact resources listed, or eligible for listing, on the National Register of Historic Places,

3. A requirement to stop work and consult with the PEC Environmental Services Section (ESS) if workers discover unexpected AC&H Resources at any time. ESS will consult with the SHPO, if deemed appropriate, before resuming work,

4. A discussion of examples of AC&H Resources that could be encountered, and

5. No assessment is required if land disturbing activities are restricted to areas of the site previously disturbed during construction.

Progress Energy Carolinas, Inc.
Robinson Nuclear Plant
3581 West Entrance Road
Hartsville, SC 29550

Attachment I provides an Affirmation in accordance with 10 CFR 50.30(b).

If you have any questions concerning this matter, please contact Mr. C. T. Baucom.

Sincerely,

J. F. Lucas
Manager - Support Services - Nuclear

JSK/jsk

c: Mr. T. P. O'Kelley, Director, Bureau of Radiological Health (SC)
Mr. L. A. Reyes, NRC, Region II
Mr. C. P. Patel, NRC, NRR
NRC Resident Inspectors, HBRSEP
Attorney General (SC)
Mr. S. K. Mitra, NRC, NRR
Mr. R. L. Emch, NRC, NRR
Mr. R. M. Gandy, Division of Radioactive Waste Management (SC)

United States Nuclear Regulatory Commission
Attachment I to Serial: RNP-RA/03-0147
Page 1 of 1

AFFIRMATION

The information contained in letter RNP-RA/03-0147 is true and correct to the best of my information, knowledge and belief; and the sources of my information are officers, employees, contractors, and agents of Progress Energy Carolinas, Inc. I declare under penalty of perjury that the foregoing is true and correct.

Executed on: November 12, 2003

J. W. Moyer
Vice President, HBRSEP, Unit No. 2

Appendix F

GEIS Environmental Issues Not Applicable to H.B. Robinson Steam Electric Plant, Unit 2

Appendix F

GEIS Environmental Issues Not Applicable to H.B. Robinson Steam Electric Plant, Unit 2

Table F-1 lists those environmental issues listed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996, 1999)[(a)] and 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are not applicable to H.B. Robinson Steam Electric Plant, Unit No. 2 (RNP), because of plant or site characteristics.

Table F-1. GEIS Environmental Issues Not Applicable to RNP

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)			
Altered salinity gradients	1	4.2.1.2.2 4.4.2.2	The RNP cooling system does not discharge to an estuary.
Water use conflicts (plants with once-through cooling system)	1	4.2.1.3	RNP uses a cooling pond. This issue is addressed for cooling ponds in Section 4.5.2.
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING TOWER BASED HEAT DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	1	4.3.3	RNP does not have cooling towers.
Impingement of fish and shellfish	1	4.3.3	RNP does not have cooling towers.
Heat shock	1	4.3.3	RNP does not have cooling towers.
GROUNDWATER USE AND QUALITY			
Groundwater use conflicts (potable and service water, and dewatering; plants that use <100 gpm)	1	4.8.1.1 4.8.1.2	RNP uses more than 100 gpm groundwater.
Groundwater-use conflicts (Ranney wells)	2	4.8.1.4	RNP does not have or use Ranney wells.
Groundwater quality degradation (Ranney wells)	1	4.8.2.2	RNP does not have or use Ranney wells.

(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.

Table F-1. GEIS Environmental Issues Not Applicable to RNP (continued)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
GROUNDWATER USE AND QUALITY			
Groundwater quality degradation (saltwater intrusion)	1	4.8.2.1	Not applicable due to the location of RNP.
Groundwater quality degradation (cooling ponds in salt marshes)	1	4.8.3	Not applicable due to the location of RNP.
TERRESTRIAL RESOURCES			
Cooling tower impacts on crops and ornamental vegetation	1	4.3.4	RNP does not use cooling towers.
Cooling tower impacts on native plants	1	4.3.5.1	RNP does not use cooling towers.
Bird collisions with cooling towers	1	4.3.5.2	RNP does not use cooling towers.
HUMAN HEALTH			
Microbiological organisms (occupational health)	1	4.3.6	RNP does not use cooling towers.

F.1 References

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

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

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

Appendix G

Severe Accident Mitigation Alternatives

Appendix G

NRC Staff Evaluation of Severe Accident Mitigation Alternatives (SAMAs) for H.B. Robinson Steam Electric Plant, Unit 2, in Support of License Renewal Application

G.1 Introduction

Carolina Power and Light (CP&L) submitted an assessment of SAMAs for H.B. Robinson Steam Electric Plant, Unit 2 (RNP) as part of the Environmental Report (ER) (CP&L 2002). This assessment was based on the most recent RNP Probabilistic Safety Analysis (PSA) model of record, a plant-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System (MACCS2), and insights from the Robinson Individual Plant Examination of External Events (IPEEE) (CP&L 1995). In identifying and evaluating potential SAMAs, CP&L considered SAMA analyses for other plants and advanced light water reactor designs, including Calvert Cliffs, Hatch, Watts Bar, and CE System 80+, and other documents that discuss potential plant improvements, such as NUREG-1560 (NRC 1997a). CP&L identified 266 potential SAMA candidates. (A list of 268 SAMAs is provided in the ER, but two of the 268 were cited as "not used".) This list was reduced to 10 unique SAMA candidates by eliminating SAMAs that were not applicable to RNP due to design differences or had high implementation costs. (A set of nine candidate SAMAs is identified in the ER; one additional SAMA was identified as a result of a model correction made while responding to a staff request for additional information.) CP&L assessed the costs and benefits associated with each of the potential SAMAs and concluded that none of the candidate SAMAs evaluated would be cost-beneficial for RNP.

Based on a review of the SAMA assessment, the NRC issued a request for additional information (RAI) to CP&L by letter dated October 23, 2002 (NRC 2002b). Key questions concerned: dominant risk contributors at RNP and the SAMAs that address these contributors, the impact on dose consequences if all release categories were considered rather than just large early release categories, the potential impact of uncertainties and external event initiators on the study results, and detailed information on several specific candidate SAMAs. CP&L submitted additional information on January 2 and 20, 2003 in response to the RAIs (CP&L 2003a, 2003b). In these responses, CP&L provided tables containing importance measures for various events and their relationship to evaluated SAMAs, results of a revised screening based on consideration of all release categories, and a sensitivity assessment to address uncertainties in the SAMA identification and screening results. CP&L's responses addressed most of the staff's concerns and reaffirmed that none of the SAMAs would be cost-beneficial.

The staff further pursued concerns related to PSA peer review findings and potential plant improvements to address dominant seismic and fire risk contributors. As a result, the staff identified two cost-beneficial SAMAs associated with seismic and fire events. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation, and therefore need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

An assessment of SAMAs for RNP is presented below.

G.2 Estimate of Risk for RNP

CP&L's estimates of offsite risk at RNP are summarized in Section G.2.1 of this Appendix. The summary is followed by the staff's review of CP&L's risk estimates in Section G.2.2 of this Appendix.

G.2.1 CP&L's Risk Estimates

Two distinct analyses are combined to form the basis for the risk estimates used in the SAMA analysis: (1) the Robinson Level 1 and 2 PSA model, which is an updated version of the Individual Plant Examination (IPE) (CP&L 1992), and (2) a supplemental analysis of offsite consequences and economic impacts (essentially a Level 3 PSA model) developed specifically for the SAMA analysis. The Level 1 and 2 PSA used as the basis for the SAMA analysis is the most recent PSA model of record, referred to as MOR99, with minor corrections as identified in Section F.2 of the ER. This model reflects the plant configuration as of Refueling Outage 17 and plant-specific data as of December 1995.

The baseline core damage frequency (CDF) for the purpose of the SAMA evaluation is approximately 4.3×10^{-5} per year, and the baseline large early release frequency (LERF) is approximately 5.6×10^{-6} per year. The CDF and LERF are based on the risk assessment for internally-initiated events. CP&L did not include the contribution of risk from external events within the RNP risk estimates, nor did it account for the potential risk reduction benefits associated with external events by including an uncertainty margin (such as a factor of two) in the SAMA screening process. It is CP&L's position that the existing IPEEE and fire evaluations have already addressed potential plant improvements related to these areas (CP&L 2002). This is discussed further in Section G.2.2. CP&L did perform a sensitivity assessment of the internal events analysis to address uncertainties, including consideration of the impact on the results if the 95th percentile value of the internal events CDF was used.

The breakdown of CDF by initiating event/accident class is provided in Table G-1. As shown in this table, transients (which include anticipated transients without scram) and loss of offsite

power are dominant contributors to the CDF. Bypass events (i.e., ISLOCA and SGTR) contribute about 11 percent to the total internal events CDF.

Table G-1. RNP Core Damage Frequency

Initiating Event/Accident Class	CDF (Per Year)	% Contribution to CDF
Loss of Offsite Power (LOOP)	1.04×10^{-5}	24
Transients	1.99×10^{-5}	46
Loss-of-Coolant Accident (LOCA)	4.75×10^{-6}	11
Steam Generator Tube Rupture (SGTR)	3.46×10^{-6}	8
Interfacing Systems LOCA (ISLOCA)	1.30×10^{-6}	3
Others	3.46×10^{-6}	8
Total CDF (from internal events)	**4.32×10^{-5}**	**100**

The Level 2 PSA model is based on the containment event tree and source terms from the IPE (CP&L 1992). The conditional probabilities, fission product release fractions, and release characteristics associated with each release category were provided in response to an RAI (CP&L 2003a).

The offsite consequences and economic impact analyses use the MACCS2 code, Version 2, to determine the offsite risk impacts on the surrounding environment and public. Inputs for this analysis include plant-specific and site-specific input values for core radionuclide inventory, source term and release characteristics, meteorological data, projected population distribution, emergency response evacuation modeling, and economic data.

In the ER, CP&L estimated the dose to the population within 80 km (50 mi) of the Robinson site to be approximately 0.058 person-Sv (5.8 person-rem) per year based on consideration of only those release categories that would contribute to large early release frequency. In response to an RAI, CP&L estimated the dose from all release categories (both LERF and non-LERF contributors) to the same population to be 0.107 person-Sv (10.68 person-rem) per year (CP&L 2003a). The breakdown of the total population dose by containment release mode is summarized in Table G-2. Bypass events (ISLOCA and SGTR) and late containment failures dominate the population dose at RNP.

The CDF and population dose estimates used in the SAMA analysis are best-estimate values. The impact of uncertainties on the SAMA analysis is discussed in Section G.6.2.

Table G-2. Breakdown of Population Dose by Containment Release Mode

Containment Release Mode	Population Dose (Person-Rem[(a)] Per Year)	% Contribution
SGTR	2.33	22
ISLOCAs	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

G.2.2 Review of CP&L's Risk Estimates

CP&L's determination of offsite risk at RNP is based on the following three major elements of analysis:

- the Level 1 and 2 risk models that form the bases for the 1992 IPE and 1995 IPEEE submittals (CP&L 1992, 1995).
- the modifications to the IPE model that have been incorporated in the Robinson PSA.
- the MACCS2 analyses performed to translate fission product release frequencies from the level 2 PSA model into offsite consequence measures.

Each of these analyses was reviewed to determine the acceptability of CP&L's risk estimates for the SAMA analysis, as summarized below.

The staff's review of the Robinson IPE is described in an NRC report dated February 1994 (NRC 1994b). In that review, the staff evaluated the methodology, models, data, and assumptions used to estimate the CDF and characterize containment performance and fission product releases. The staff concluded that CP&L's analysis met the intent of Generic Letter 88-20 (NRC 1988); that is, the IPE was of adequate quality to be used to look for design or operational vulnerabilities. The staff's review primarily focused on the licensee's ability to examine RNP for severe accident vulnerabilities and not specifically on the detailed findings or quantification estimates. Overall, the staff believed that the Robinson IPE was of adequate quality to be used as a tool in searching for areas with high potential for risk reduction and to assess such risk reductions, especially when the risk models are used in conjunction with insights, such as those from risk importance, sensitivity, and uncertainty analyses.

A comparison of risk profiles between the IPE and the PSA used in the SAMA analysis indicates a decrease of approximately 2.8 x 10^{-4} per year in the total CDF – over a factor of seven reduction in the CDF. The reduction is attributed to plant and modeling improvements that have been implemented at RNP since the IPE was submitted. A summary listing of those changes to the PSA model that resulted in the greatest reduction in the total core damage frequency were provided in response to an RAI (CP&L 2003a). These changes include:

- Updated LOCA and LOOP frequencies using a methodology developed by the Electric Power Research Institute
- Revised assumptions used for screening criteria for identification of latent human interactions
- Incorporated new and revised flooding procedures to aid the operator in identifying sources of flooding and potential isolation measures
- Added shutdown diesel generator emergency plant procedure to direct operating crew to align equipment as needed to the dedicated shutdown bus
- Permanently aligned the steam-driven auxiliary feedwater pump for self-cooling mode
- Installed strainers in each safety injection pump's recirculation line to prevent plugging by foreign material
- Installed cross connects between the steam generator pilot operated relief valve (PORV) instrument air header and the steam dump nitrogen accumulator
- Performed updates to the model related to transient induced safety relief valve LOCA, battery depletion events, high head pumps during recirculation, inclusion of all three charging pumps, as well as others.

The changes from the IPE version to the current PSA are significant. However, the reported safety improvements made to the plant since the IPE and subsequently incorporated into the MOR99 version, combined with PSA modeling and input changes made to the PSA also appear to be significant. Twenty-four changes were listed in the RAI response (CP&L 2003a). Many contributed to reducing the relatively high IPE sequences such as transients (1.38 x 10^{-4} per year) and LOCAs (7.5 x 10^{-5} per year). For example, modeling changes reduced LOCA and LOOP frequencies. Also plant changes such as permanently aligning the steam-driven auxiliary feedwater pump for self-cooling improved the plant's capabilities under station blackout (SBO) conditions. Thus, the overall reduction in CDF, although large, appears reasonable.

The IPE CDF value for RNP is higher than most of the original IPE values estimated for other pressurized water reactors (PWRs) with a large dry containment. Figure 11.6 of NUREG-1560 shows that the IPE-based total internal events CDF for three-loop Westinghouse plants ranges from 7×10^{-5} to 4×10^{-4} per reactor-year (NRC 1997a). It is recognized that other plants, in addition to RNP, have reduced the values for CDF subsequent to the IPE submittals, due to modeling and hardware changes. The CDF results for RNP are sufficiently reduced that the overall risk from this unit is now comparable to other plants of similar vintage and characteristics.

The staff considered the peer reviews performed for the Robinson PSA and the potential impact of the review findings on the SAMA evaluation. In response to an RAI (CP&L 2003a), CP&L described the previous reviews, the most significant of which was the Westinghouse Owners Group peer certification review of 2001. The only significant finding was that " ... the core damage frequency model is presently qualified at a cutoff of 4.00×10^{-9}. Many probabilistic risk assessments (PRAs) are qualified using a much lower cutoff..." While this deficiency can be significant for some PRA applications, for example, for exploring risk-achievement worth values, it is not problematic for SAMA applications.

One of the findings of the Westinghouse peer certification review was that CP&L should evaluate the use of an upgraded reactor coolant pump (RCP) seal model. The staff also had concerns regarding the current RCP seal model and had previously identified in the Safety Evaluation Report on the IPE that there was an incorrect assumption in the model regarding the time to seal failure. In an RAI (NRC 2002b), the staff noted that the Robinson PSA does not utilize the Rhodes RCP seal model endorsed by NRC, and asked CP&L to assess the risk and SAMA-analysis impact of using the current model compared to the Rhodes model. In the response (CP&L 2003b), CP&L noted that the current model more accurately reflects procedures and hardware in place to mitigate station blackout and fire initiators that lead to RCP seal LOCAs (i.e., restoration of seal cooling and use of the dedicated shutdown diesel). The Rhodes model assumes RCP seal failures occur much earlier than the current model, and prior to the time at which these procedures and hardware can be effectively implemented. Use of the Rhodes model would increase the benefit of RCP seal-related SAMAs that avoid creating a RCP seal LOCA, since the model precludes taking advantage of in-place procedures and hardware. However, CP&L is currently implementing an RCP seal enhancement that addresses some RCP seal LOCA concerns (but does not address the time to failure issue). Specifically, CP&L has installed high temperature O-rings in two of the three RCPs, and installation of the improved seals in the third RCP is scheduled for spring 2004. Further RCP seal cooling hardware improvements are not likely to be cost-beneficial since previous SAMA cost estimates indicate the costs of modifications to safety-related systems and piping to be at least $1 million. This is equivalent to the estimated benefit if all severe accident risks at RNP were completely eliminated. Use of the Rhodes model would also have the effect of reducing the estimated benefit of certain other SAMAs related to post-accident recovery actions as

discussed later. Based on the peer review recommendations, CP&L is considering modifying the current RCP seal LOCA model and will consider any insights from the Rhodes model, as well as any available model including the Westinghouse Owner's Group 2000 model, at that time (NRC 2003a).

Given that the Westinghouse peer certification review found no weaknesses in the PSA critical to performing SAMA analyses, that the use of an alternative RCP seal model is not expected to result in identification of additional improvements related to RCP seal LOCAs (beyond the improved RCP seals already being installed at RNP), that CP&L satisfactorily addressed staff questions regarding the PSA (CP&L 2003a), and that the CDF falls within the range of contemporary CDFs for Westinghouse three-loop plants, the staff concludes that the PSA is of sufficient quality to support the SAMA evaluation.

CP&L submitted an IPEEE in June 1995 (CP&L 1995), in response to Supplement 4 of Generic Letter 88-20. CP&L did not identify any fundamental weaknesses or vulnerabilities to severe accident risk in regard to the external events related to seismic, fire, or other external events. The RNP hurricane, tornado and high winds analyses show that the plant is adequately designed or procedures exist to cope against the effects of these natural events. Additionally, the Robinson IPEEE demonstrated that transportation and nearby facility accidents were not considered to be significant vulnerabilities at the plant. However, a number of areas were identified for improvement in both the seismic and fire areas. In a letter dated September 28, 2000, (NRC 2000), the staff concluded that the submittal met the intent of Supplement 4 to Generic Letter 88-20, and that the licensee's IPEEE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities.

The seismic IPEEE uses a full scope seismic margins analysis (SMA). This method is qualitative and does not provide the means to determine the numerical estimates of the CDF contributions from seismic initiators. However, since RNP has a plant-level "high confidence of low probability of failure" (HCLPF) value significantly greater than its design basis, it can be qualitatively expected from the SMA that the seismic CDF is relatively low (NRC 2002a).

A number of actions were taken by CP&L as part of the IPEEE evaluation of seismic risk. The staff's review of the IPEEE submittal notes that the seismic review team (SRT) identified 33 issues related to maintenance, housekeeping, or interactions, and that 21 of these issues required repair or modification improvements (NRC 2000). More specifically, 32 individual Safe Shutdown Equipment List (SSEL) components, grouped into 27 categories, were identified as having minor interaction, housekeeping, or maintenance issues that will be resolved through routine maintenance activities. Such work-ticket items are listed in Tables 3-1 and 3-2 of the IPEEE submittal. Also, 34 specific SSEL components, grouped into 21 categories, were identified as requiring repairs or modifications. These items are listed in Table 3-3 of the IPEEE submittal. Sixteen (16) issues involving electrical raceways required work-ticket maintenance or

modifications to restore the raceways to an acceptable condition. These items, although not identified individually, are discussed in Section 5.8.1 of Appendix A of the IPEEE submittal and in Table 7-1 of the licensee's Unresolved Safety Issue (USI) A-46 Seismic Adequacy Evaluation Report. The licensee also identified the potential for an ISLOCA resulting from combined seismic failures of two motor-operated valves (MOVs) in the RHR system (RHR-750 and RHR-751) due to the presence of cast-iron in the valve yokes. No specific modification was proposed with respect to these valves. However, the licensee evaluated this issue and in 1998 developed related procedural enhancements in accordance with severe accident management guidelines.

The staff notes that the HLCPF value for the aforementioned valves was estimated to be 0.28g in the IPEEE, which is below the 0.3g Review Level Earthquake used in the seismic margins analysis. Given that a seismically-induced failure of these valves could lead to an ISLOCA, the staff questioned CP&L regarding the risk reduction that might be achieved through a modification of the valves. Based on information provided by CP&L, and further evaluation, the staff identified a cost-beneficial improvement to address this risk contributor. This is discussed further in Section G.6.2.

The licensee's overall approach in the IPEEE fire analysis is similar to other fire analysis techniques, employing a graduated focus on the most important fire zones using qualitative and quantitative screening criteria. The fire zones or compartments were subjected to at least two screening stages. In the first stage, a zone was screened out if it was found to not contain any safety-related equipment. In the second stage, a CDF criterion of 1×10^{-6} per year was applied. Plant information gathered for Appendix R compliance was extensively used in the fire IPEEE. The screening methodology applied by the licensee makes less and less conservative assumptions until a fire zone is screened out, the results do not indicate a vulnerability, or a vulnerability is identified and addressed. This type of analysis will always produce a conservative result. The IPEEE fire CDF was originally determined to be 2.22×10^{-4} per year, but in response to IPEEE RAIs, was reduced 9.23×10^{-5}/year (NRC 2002a). This reduction was due to plant procedure changes and modifications, reducing the probability of control room fires, DC cabinet fires, and yard transformer fires (CP&L 2003a) For example, open conduits emerging from the top of motor control center (MCC) "A" and MCC "B" were sealed to avert the formation of a hot gas layer from a fire in the battery room sufficient to prevent effective fire suppression. While these improvements are noted, the remaining fire CDF is still relatively high. In a response to an RAI (CP&L 2003a), CP&L stated that further actions to reduce risk are not warranted. CP&L bases this conclusion on the fact that the CDFs for fire are screening values and conservative.

In response to a staff request, CP&L provided additional information regarding conservatisms in the fire CDF (CP&L 2003c). These include:

- no credit given for procedures to restore offsite power to Bus E-2
- no credit given for procedures to recover functions powered by motor control center (MCC) 5
- no credit given for procedures to restore power using undamaged equipment in several additional scenarios.

CP&L estimates that these conservatisms overstate the fire CDF by at least 2.4×10^{-5} per year, and that the actual fire CDF would be less than 6.8×10^{-5}. Further, the use of the current internal events PSA, in lieu of the updated version of the IPE, would result in a lower estimated fire CDF because the CDF for the current PSA is lower than in the updated IPE. Thus, the fire IPEEE analysis is expected to be conservative and the fire CDF would be less than previously reported and similar in magnitude to the CDF for internal events.

To determine if there were any additional potentially cost-beneficial SAMAs, the staff reviewed the Robinson Fire IPEEE, the resulting staff and technical evaluation reports, and the licensee's November 30, 1995 letter to the NRC (CP&L 1995b) that identified a number of plant modifications and procedural improvements to address the IPEEE risk-significant contributors. The staff confirmed that the licensee had taken measures to address each of the major fire sequences. One of the risk-significant fire contributors involves an explosive transformer fire in the switchyard that results in a loss of both offsite power and the dedicated shutdown diesel generator (IPEEE Fire Scenario 26-1). The transformers of concern, the auxiliary and startup transformers, are in relatively close proximity (about 20 feet) to a conduit associated with the dedicated shutdown diesel generator that is routed on the outside of the turbine building. The licensee has established procedures for fire fighting actions in the switchyard that emphasize the need to cool the dedicated shutdown diesel generator conduit so as to avoid heat damage to the cables. This response, for which there must be sufficient time for the fire brigade to recognize and implement the required actions after detecting a fire associated with these transformers prior to cable damage, is credited in reducing the CDF associated with these fires from about 2.4×10^{-5} per year to about 7.0×10^{-6} per year. An alternative to the licensee's current approach that is not dependent on the available response time and actions of the fire brigade and would effectively eliminate the scenario would be to install a radiant heat shield along the conduit to protect it from the heat resulting from the transformer fire. Based on information provided by CP&L, the staff determined that this could be a cost-beneficial SAMA even at the current CDF value that credits the actions of the fire brigade. This is discussed further in Section G.6.2.

The staff notes that additional SAMAs to reduce the fire risk contributors might be viable at RNP. However, given that the original fire CDF has already been reduced by over a factor of 3 through a combination of hardware and procedure changes, and that the plant meets Appendix R fire requirements, it is unlikely that further modifications (beyond that mentioned above) would both substantially reduce risk and remain cost-beneficial.

The risk associated with other external events at RNP is small and it is dominated by high winds, which were evaluated by the licensee as having a CDF contribution of approximately 10^{-5} per year. Wind-induced loss of offsite power and wind-generated missile strikes on exposed, co-located diesel fuel oil transfer pumps were identified in the IPEEE as the dominant contributors to "other" external events by CP&L.

The contribution of these external events to total risk would be bounded by the SAMA sensitivity assessment to address uncertainties in the internal events analysis(discussed in Section G.6.2) if: (1) the total contribution from external events is on the same order of magnitude as the contribution from internal events and (2) there are no external event vulnerabilities that can be eliminated or mitigated by cost-effective SAMAs. As noted above, CP&L has previously made modifications specifically addressing external event vulnerabilities, and further improvements are not expected to be cost-effective (with the exception of the RHR valve and shutdown diesel conduit heat shield modifications mentioned above). Accordingly, the staff finds CP&L's consideration of external events to be acceptable.

The staff reviewed the process used by CP&L to extend the containment performance (Level 2) portion of the PSA to an assessment of offsite consequences (essentially a Level 3 PSA). This included consideration of the source terms used to characterize fission product releases for the applicable containment release category and the major input assumptions used in the offsite consequence analyses. The MACCS2 code was utilized to estimate offsite consequences. Plant-specific input to the code includes the RNP reactor core radionuclide inventory, emergency evacuation modeling, release category source terms from the Robinson IPE, site-specific meteorological data, and projected population distribution within a 80 km (50 mi) radius for the year 2030. This information is provided in Appendix F of the ER (CP&L 2002).

In the ER, CP&L estimated the dose consequences to be 0.058 person-Sv (5.8 person-rem) per year based on consideration of only those (six) release categories that would contribute to LERF. In addition to the six LERF release categories, there are seven release categories which would not contribute to LERF but could still have significant offsite consequences. In response to a staff request, CP&L estimated the offsite doses from all release categories. The total offsite dose is estimated to be approximately 0.107 person-Sv (10.7 person-rem) per year, with 0.058 person-Sv (5.8 person-rem) per year from LERF-related release categories and 0.049 person-Sv (4.9 person-rem) per year from non-LERF-related release categories. This total offsite dose estimate was used in the subsequent SAMA evaluation. Table 1.f-1 of the

response to the RAI provides a break out of the source term by release category (CP&L 2003a). The source terms used for the SAMA evaluation are comparable to that used in the IPE. The staff concludes that the assignment of source terms and release categories is acceptable for use in the SAMA analysis.

The applicant used site-specific meteorological data processed from hourly measurements for 1998 calendar year as input to the MACCS2 code. Data from this year was selected because it was found to result in the largest doses based on the analysis of data from 1995 through 1999. Therefore, the staff considers use of the 1998 data in the base case to be conservative.

The population distribution the applicant used as input to the MACCS2 analysis was estimated for the year 2030, based on the NRC geographic information system (GIS) for 1990 (NRC 1997b), and the population growth rates were based on 1990 and 2000 county-level census data. The staff considers the methods and assumptions for estimating population reasonable and acceptable for purposes of the SAMA evaluation.

The emergency evacuation model was modeled as a single evacuation zone extending out 16 km (10 mi) from the plant. It was assumed that 95 percent of the population would move at an average speed of approximately 0.28 meters per second with a delayed start time of 30 minutes. This assumption is conservative relative to the NUREG-1150 study (NRC 1990), which assumed evacuation of 99.5 percent of the population within the emergency planning zone. The evacuation assumptions and analysis are deemed reasonable and acceptable for the purposes of the SAMA evaluation.

Much of the site-specific economic data were provided by specifying the data for each of the 20 counties surrounding the plant, to a distance of 80 km (50 miles). In addition, generic economic data that are applied to the region as a whole were revised from the MACCS2 sample problem input when better information was available. These included per diem living expenses, relocation costs, value of farm and non-farm wealth, and fraction of farm wealth from improvements (e.g., buildings).

CP&L did not perform sensitivity analyses for the MACCS2 parameters, such as evacuation and population assumptions. However, sensitivity analyses performed as part of previous SAMA evaluations for other plants have shown that the total benefit of the candidate SAMAs would increase by less than a factor of 2 (typically about 20 percent) due to variations in these parameters. This change is small compared to the results of the uncertainty analysis and would not alter the outcome of the SAMA analysis. Therefore, the staff concludes that the methodology used by CP&L to estimate the offsite consequences for RNP, which includes the contribution from all release categories, provides an acceptable basis from which to proceed with an assessment of risk reduction potential for candidate SAMAs. Accordingly, the staff based its assessment of offsite risk on the CDF and offsite doses reported by CP&L.

G.3 Potential Plant Improvements

The process for identifying potential plant improvements, an evaluation of that process, and the improvements evaluated in detail by CP&L are discussed in this section.

G.3.1 Process for Identifying Potential Plant Improvements

CP&L's process for identifying potential plant improvements (SAMAs) consisted of the following elements:

- review of plant-specific improvements identified in the Robinson IPE and IPEEE
- review of SAMA analyses submitted in support of original licensing and license renewal activities for other operating nuclear power plants
- review of other NRC and industry documentation discussing potential plant improvements, e.g., NUREG-1560.

Based on this process, an initial set of 266 candidate SAMAs was identified, as reported in Table F-8 in Appendix F to the ER (a list of 268 SAMAs is provided in the ER, but two of the 268 were cited as “not used”). In Phase 1 of the evaluation, CP&L performed a qualitative screening of the initial list of SAMAs and eliminated SAMAs from further consideration using the following criteria:

- the SAMA is not applicable at RNP due to design differences,
- the SAMA is sufficiently similar to other SAMAs, and as such is combined with another SAMA
- the SAMA has already been implemented at RNP
- the SAMA does not provide a significant safety benefit.

Based on this screening, 218 SAMAs were eliminated leaving 48 for further evaluation. Of the 218 SAMAs eliminated, 55 were eliminated because they were not applicable to RNP, 57 were similar and combined with other SAMAs, 87 were eliminated because they already had been implemented at RNP, 6 were determined to not provide a significant safety benefit, 4 were eliminated because they were related to design changes that must be implemented prior to construction, and 9 were eliminated because they were evaluated as part of the IPEEE. A preliminary cost estimate was prepared for each of the 48 remaining candidates to focus on those that had a possibility of having a net positive benefit. A screening cutoff of $1.18M

(maximum averted risk or benefit) was then applied to the remaining candidates (see discussion in Section G.6.1). Thirty-nine of the 48 SAMAs were eliminated because their estimated cost exceeded this maximum averted risk, leaving nine candidate SAMAs for further evaluation in Phase 2. While responding to an RAI regarding the correlation of important events to evaluated SAMAs, CP&L noted an error in the initial review of the RNP risk reduction worth. This resulted in identification of one additional SAMA for further analysis.

In response to an RAI, CP&L re-evaluated the Phase 1 SAMAs using the 95th confidence level. The screening cutoff became $2.89M. When applied, 11 additional Phase 1 SAMAs were identified for further consideration. Table 4.c-1 of the response to the RAI contains the additional SAMAs and their subsequent disposition. None of the newly identified SAMAs were judged to be cost-beneficial (CP&L 2003a). See the discussion in Section G.6.2.

The 10 remaining SAMAs were further evaluated and subsequently eliminated in the Phase 2 evaluation, as described in Sections G.4 and G.6 below.

G.3.2 Review of CP&L's Process

CP&L's efforts to identify potential SAMAs focused primarily on areas associated with internal initiating events. The initial list of SAMAs generally addressed the accident categories that are dominant CDF contributors or issues that tend to have a large impact on a number of accident sequences at RNP.

The preliminary review of CP&L's SAMA identification process raised some concerns regarding the completeness of the set of SAMAs identified and the inclusion of plant-specific risk contributors. The staff requested clarification regarding the portion of risk represented by the dominant risk contributors. Because a review of the importance ranking of basic events in the PSA could identify SAMAs that may not be apparent from a review of the top cut sets, the staff also questioned whether an importance analysis was used to confirm the adequacy of the SAMA identification process. In response to the RAI, CP&L provided a tabular listing of the contributors with the greatest potential for reducing risk as demonstrated by the risk reduction worth (RRW) assigned to the event. CP&L used a cutoff of 1.033, and stated that events below this point would influence the CDF by less than 3.5 percent. This equates to an averted cost-risk (benefit) of approximately $30,000. CP&L also reviewed the LERF-based RRW events to determine if there were additional equipment failures or operator actions that should be included in the provided table. In addition, CP&L correlated the top RRW events with the SAMAs evaluated in the ER (CP&L 2003a). Based on these additional assessments, CP&L concluded that the set of 266 SAMAs evaluated in the ER address the major contributors to CDF and LERF, and that the review of the top risk contributors does not reveal any new SAMAs.

The staff questioned CP&L about lower cost alternatives to several of the SAMAs evaluated, including the use of diesel-driven battery chargers, direct-drive diesel power to auxiliary feedwater pumps, and the use of an automatic safety injection pump trip on low refueling water storage tank (RWST) level (NRC 2002b). In response to the RAI, CP&L determined the cost of diesel-driven battery chargers to be significantly greater than $1M over the 20 year license renewal period based on increased staffing requirements alone. The calculated benefit is only $47,000; therefore, this alternative was deemed not to be cost-beneficial (CP&L 2003a). Regarding the direct-drive diesel power to auxiliary feedwater pumps, CP&L calculated the averted cost-risk (benefit) to be $135,000, which is less than the estimated implementation cost of $200,000. Therefore, this alternative was deemed not to be cost-beneficial. In response to the third lower cost alternative, CP&L estimated the benefit to be $59,000 which is less than the minimum cost assumed for a hardware modification of $70,000. In conclusion, CP&L's determined that none of the lower cost alternatives suggested in the RAI would be cost-beneficial (CP&L 2003a).

The staff notes that the cost estimates for the latter two alternatives are within a factor of two of the estimated benefits, and that these alternatives could become cost-beneficial if their benefits in external events were also considered (e.g., if a factor of two multiplier were applied to the benefit to account for external events). However, if all cost factors are realistically included, such as surveillance and maintenance costs over the life of the plant, the implementation costs would be substantially higher, and greater than the estimated benefits. Accordingly, the staff agrees with CP&L's conclusion that these SAMAs would not be cost-beneficial.

The staff also questioned CP&L about modifications to RHR valves and heat shielding of dedicated shutdown diesel generator electrical conduit that could reduce the risk of seismically-induced interfacing system LOCAs and fire-induced station blackout events, respectively. This is discussed further in Section G.6.2.

The staff concludes that CP&L used a systematic and comprehensive process for identifying potential plant improvements for RNP primarily based on the internal events PSA. While explicit treatment of external events in the SAMA identification process was limited, the applicant stated that the absence of previously-identified external event vulnerabilities reasonably justifies examining primarily the internal events risk results for this purpose. Due to the limited review of external events, the staff performed a review of the RNP external events analyses to determine if there were any potentially cost-beneficial SAMAs. The staff review of the existing external events analyses for RNP revealed two new SAMAs not previously identified by CP&L that are cost-beneficial, as discussed in Section G.6.2.

G.4 Risk Reduction Potential of Plant Improvements

CP&L evaluated the risk-reduction potential of the 10 remaining SAMA candidates that were applicable to RNP. Each SAMA evaluation was performed in a bounding fashion in that the SAMA was assumed to completely eliminate the risk associated with the proposed enhancement. Such bounding calculations overestimate the benefit and are conservative.

CP&L used model re-quantification to determine the potential benefits. The CDF and LERF reductions were estimated using the current version of the Robinson PSA. The changes made to the model to quantify the impact of each SAMA are summarized in Table G-3 and detailed in Section F.6.1 through F.6.9 of Appendix F to the ER (CP&L 2002). Table G-3 lists the assumptions considered to estimate the risk reduction for each of the 10 SAMAs surviving the Phase 1 screening, the estimated risk reduction in terms of percent reduction in CDF and population dose, and the estimated total benefit (present value) of the averted risk. The determination of the benefits for the various SAMAs is discussed in Section G.6.

In response to an RAI, CP&L considered the uncertainties associated with the calculated CDF, and it was found that if the 95th percentile value of the CDF were to be utilized in the cost-benefit analysis, instead of the best-estimate CDF value, the benefits would be greater by about a factor of 2.5. The impact of a higher CDF value on the identification of potentially cost-beneficial SAMAs is discussed further in Section G.6.2.

The staff has reviewed CP&L's bases for calculating the risk reduction for the various plant improvements and concludes that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative. Accordingly, the staff based its estimates of averted risk for the various SAMAs on CP&L's risk reduction estimates.

Table G-3. SAMA Cost/Benefit Screening Analysis

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)
		CDF	Population Dose	
1 - Prevent charging pump flow diversion from the relief valves	Eliminate common cause failure of charging pump seal injection (equivalent event)	0	0	0
2 - Improve ability to cool the residual heat removal heat exchangers	Eliminate loss of decay heat removal	3	4	40,400
3 - Increase frequency for valve leak testing	Eliminate all possible ISLOCAs	3	30	141,000
4 - Improve main steam isolation valve(MSIV) design	Eliminate failure of MSIVs to close on demand and transfer closed during operation	0	0	0
5 - Install a digital feedwater upgrade	Eliminate loss of feedwater control	4	1	35,900
6 - Replace current pressurizer PORVs with larger ones such that only one is required for successful feed and bleed	Reduces the number of dependencies required for successful feed and bleed	2	1	17,900
7 - Implement a RWST make-up procedure	Operators are able to refill the RWST during all late core damage sequences	0.5	7	32,500
8 - Create automatic swap over to recirculation on RWST depletion	Reduce operator actions for aligning recirculation to very low values	5	4	58,900
9 - Train operations crew for response to inadvertent actuation signals	Eliminate common cause failures (simultaneous) for instrument buses 1 and 4 and instrument buses 2 and 3	0	0	0
10 - Prevent centrifugal charging pump flow diversion from relief valves	Reduce the frequency of the loss of RCP seal cooling if relief valve opening causes a flow diversion large enough to prevent RCP seal injection	5	7	72,000

G.5 Cost Impacts of Candidate Plant Improvements

CP&L estimated the costs of implementing the 10 SAMAs which were not initially screened out. Estimates that were taken from prior SAMA analyses were not adjusted to present-day dollars. For most of SAMAs considered, the cost estimates were significantly greater than the benefits calculated such that a detailed evaluation was not required and a specific dollar value was not reported. The minimum cost of making a procedural change (including training) was estimated at $30,000. The minimum hardware modification package was assumed to be $70,000. Detailed cost estimates were developed for the following four SAMAs:

SAMA	Description	Cost Estimate
3	Increase frequency for valve leak testing	>$280,000
7	Implement a RWST make-up procedure	$50,000
8	Create automatic swap over to recirculation on RWST depletion	$265,000
10	Prevent centrifugal charging pump flow diversion from relief valves	$430,000

The staff reviewed the bases for the applicant's cost estimates. For certain improvements, the staff also compared the cost estimates (presented in Table F-8 of Appendix F to the ER) to estimates developed elsewhere for similar improvements, including estimates developed as part of other licensees' analyses of SAMAs for operating reactors and advanced light-water reactors. A majority of the SAMAs were screened from further consideration on the basis that the expected implementation cost would be much greater than the estimated risk reduction benefit. This is reasonable for the SAMAs considered given the relatively small estimated benefit for the SAMAs (a maximum benefit of about $140K), and the large implementation costs typically associated with major hardware changes and hardware changes that impact safety-related systems. In previous SAMA evaluations the implementation costs for such hardware changes were generally estimated to be $1 million or more. The staff concludes that the cost estimates are sufficient and appropriate for use in the SAMA evaluation.

G.6 Cost-Benefit Comparison

CP&L's cost-benefit analysis and the staff's review are described in the following sections.

G.6.1 CP&L Evaluation

The methodology used by CP&L was based primarily on NRC's guidance for performing cost-benefit analysis, i.e., NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997c). The guidance involves determining the net value for each SAMA according to the following formula:

Net Value = (APE + AOC + AOE +AOSC) - COE

where,

APE = present value of averted public exposure ($)
AOC = present value of averted offsite property damage costs ($)
AOE = present value of averted occupational exposure costs ($)
AOSC = present value of averted onsite costs ($)
COE = cost of enhancement ($).

If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA and it is not considered cost-beneficial. CP&L's derivation of each of the associated costs is summarized below.

Averted Public Exposure (APE) Costs

The APE costs were calculated using the following formula:

APE = Annual reduction in public exposure (Δperson-rem/year)
x monetary equivalent of unit dose ($2,000 per person-rem)
x present value conversion factor (10.76 based on a 20-year period with a 7- percent discount rate).

As stated in NUREG/BR-0184 (NRC 1997c), it is important to note that the monetary value of the public health risk after discounting does not represent the expected reduction in public health risk due to a single accident. Rather, it is the present value of a stream of potential losses extending over the remaining lifetime (in this case, the renewal period) of the facility. Thus, it reflects the expected annual loss due to a single accident, the possibility that such an accident could occur at any time over the renewal period, and the effect of discounting these potential future losses to present value. For the purposes of initial screening, CP&L calculated an APE of approximately $230,000 for the 20-year license renewal period, which assumes elimination of all severe accidents.

Averted Offsite Property Damage Costs (AOC)

The AOCs were calculated using the following formula:

AOC = Annual CDF reduction
x offsite economic costs associated with a severe accident (on a per-event basis)
x present value conversion factor.

For the purposes of initial screening which assumes all severe accidents are eliminated, CP&L calculated an annual offsite economic risk of about $13,600 based on the Level 3 risk analysis. This results in a discounted value of approximately $146,000 for the 20-year license renewal period.

Averted Occupational Exposure (AOE) Costs

The AOE costs were calculated using the following formula:

AOE = Annual CDF reduction
x occupational exposure per core damage event
x monetary equivalent of unit dose
x present value conversion factor.

CP&L derived the values for averted occupational exposure from information provided in Section 5.7.3 of the regulatory analysis handbook (NRC 1997c). Best estimate values provided for immediate occupational dose (3300 person-rem) and long-term occupational dose (20,000 person-rem over a 10-year cleanup period) were used. The present value of these doses was calculated using the equations provided in the handbook in conjunction with a monetary equivalent of unit dose of $2,000 per person-rem, a real discount rate of 7 percent, and a time period of 20 years to represent the license renewal period. For the purposes of initial screening, which assumes all severe accidents are eliminated, CP&L calculated an AOE of approximately $16,400 for the 20-year license renewal period.

Averted Onsite Costs (AOSC)

Averted onsite costs (AOSC) include averted cleanup and decontamination costs and averted power replacement costs. Repair and refurbishment costs are considered for recoverable accidents only and not for severe accidents. CP&L derived the values for AOSC based on information provided in Section 5.7.6 of the regulatory analysis handbook (NRC 1997c).

CP&L divided this cost element into two parts – the Onsite Cleanup and Decontamination Cost, also commonly referred to as averted cleanup and decontamination costs, and the replacement power cost.

Averted cleanup and decontamination costs (ACC) were calculated using the following formula:

ACC = Annual CDF reduction
x present value of cleanup costs per core damage event
x present value conversion factor.

The total cost of cleanup and decontamination subsequent to a severe accident is estimated in the regulatory analysis handbook to be $\$1.5 \times 10^9$ (undiscounted). This value was converted to present costs over a 10-year cleanup period and integrated over the term of the proposed license extension. For the purposes of initial screening, which assumes all severe accidents are eliminated, CP&L calculated an ACC of approximately $511,000 for the 20-year license renewal period.

Long-term replacement power costs (RPC) were calculated using the following formula:

RPC = Annual CDF reduction
x present value of replacement power for a single event
x factor to account for remaining service years for which replacement power is required
x reactor power scaling factor

For conservatism, CP&L based its calculations on the proposed power uprate value of 738 MWe. However, it did scale down from the 910 MWe reference plant in NUREG/BR-0184. Therefore, CP&L applied a power scaling factor of 738 MWe/910 MWe to determine the replacement power costs. For the purposes of initial screening, which assumes all severe accidents are eliminated, CP&L calculated an RPC of approximately $276,000 for the 20-year license renewal period.

Using the above equations, CP&L estimated the total present dollar value equivalent associated with completely eliminating severe accidents at RNP to be about $1,180,000.

CP&L's Results

If the implementation costs were greater than the maximum allowable benefit (MAB) of $1.18M, then the SAMA was screened from further consideration. Thirty-eight of the 48 SAMAs surviving the Phase 1 screening were eliminated from further consideration in this way. A more refined look at the costs and benefits was performed for the remaining 10 SAMAs. The benefit

results for the individual analysis of the 10 SAMA candidates are presented in Table G-3. As a result, all 10 SAMAs that were evaluated were eliminated because the cost was expected to exceed the estimated benefit.

CP&L performed sensitivity analyses to evaluate the impact of parameter choices on the analysis results (CP&L 2002, 2003a). The sensitivity analyses included the calculation of candidate SAMA benefits using a 3-percent discount rate as recommended in NUREG/BR-0184 (NRC 1997c). This sensitivity case resulted in less than a factor of 1.2 increase in the benefit calculation. Additionally, CP&L considered uncertainty by utilizing the 95th percentile PSA results. This analysis resulted in about a factor of 2.5 increase in the benefit calculation. These analyses did not change CP&L's conclusion that none of the candidate SAMAs would be cost-beneficial.

G.6.2 Review of CP&L's Cost-Benefit Evaluation

The cost-benefit analysis performed by CP&L was based primarily on NUREG/BR-0184 (NRC 1997c) and was executed consistent with this guidance.

In response to an RAI, CP&L considered the uncertainties associated with the calculated CDF (see Table G-4). If the 95th percentile values of the CDF were utilized in the cost-benefit analysis instead of the best-estimate CDF values cited above, the estimated benefits of the SAMAs would increase by about a factor of 2.5. CP&L revisited the set of SAMAs screened out in Phase 1 of the evaluation and identified 11 additional SAMAs that could be cost-beneficial using the 95th percentile values of the CDF. In Table 4.c-1 of the response to the RAI, CP&L discussed the cost of implementation and the averted cost-risk (benefit) for each of these additional SAMAs (CP&L 2003a). The averted cost-risk (benefit) was estimated by utilizing RRWs or the averted cost-risk for similar SAMAs, and then scaling this value by 2.45 in order to account for the 95th percentile PSA results. All 11 SAMAs were found to have implementation costs greater than

Table G-4. Uncertainty in the Calculated CDF for RNP

Percentile	CDF (per year)
5th	1.5×10^{-5}
50th	3.3×10^{-5}
mean	4.5×10^{-5}
95th	1.1×10^{-4}

their averted cost-risk (benefit), and thus, were eliminated from further consideration. The staff reviewed the information provided by the applicant in response to this RAI and agrees with the conclusion that none of the newly identified 11 Phase 2 SAMAs would be cost-beneficial.

CP&L revisited the cost-benefit analysis for the original 10 Phase 2 SAMAs and found that when the 95th confidence level is used, SAMAs 3 and 7 potentially become cost-beneficial (CP&L 2003a). SAMA 3 involves increasing the frequency for valve testing. This would result in a reduction in the ISLOCA initiating event frequency. According to Response 4.c to the RAI, an averted cost-risk (benefit) of $141,000 was originally calculated. Using the 95th percentile results, the averted cost-risk becomes $345,000 (CP&L 2003a). CP&L estimated the cost of implementation to be approximately $280,000. Because this amount is less than the estimated benefit, the SAMA appears to be cost-beneficial. In its RAI response (CP&L 2003a), CP&L noted that the averted cost-risk calculation is based on eliminating all risk modeled for the ISLOCA event, and further noted that increased testing may actually increase the event frequency rather than decrease it. CP&L reevaluated the risk assuming a 20% reduction in the frequency. The averted cost-risk becomes less than $69,000. CP&L noted that the cost of implementation was based on only one day of replacement power, and that no consideration was given to the costs of revising procedures or the manpower needed to perform the testing. The staff agrees with the applicant's assessment that this SAMA is not cost-beneficial.

SAMA 7 involves a change to a procedure for make-up to the RWST. According to Response 4.c to the RAI, an averted cost-risk (benefit) of $36,000 was originally calculated. Using the 95th percentile results, the averted cost-risk becomes $88,000 (CP&L 2003a). CP&L estimated the cost of implementation to be approximately $50,000. Based on this information, the SAMA appears to be cost-beneficial. In its RAI response (CP&L 2003a), CP&L noted that this SAMA has two different applications at RNP – a procedure enhancement, and a procedure enhancement coupled with a hardware modification. RNP currently has a normal operating procedure that directs refill of the RWST which is credited in the PSA. The enhancement considered in the SAMA evaluation is the incorporation of this procedure into the emergency operating procedures. In the ER submittal, CP&L assumed that the procedure enhancement results in a 100% reliability of the action (CP&L 2002). In its response to the RAI, CP&L states that this assumption is overly optimistic (CP&L 2003a), and reevaluated the averted cost-risk of the action assuming a 50% reduction in the failure rate currently credited in the PSA model. This resulted in an averted cost-risk of $40,000. CP&L pointed out that the result is based on the 95th percentile PSA results which are conservative. For the second option – a procedure enhancement coupled with a hardware modification – the hardware modification would be required to increase the make-up flow rate so that system could be used in small break LOCA or ISLOCA scenarios. While the benefit would increase, the cost of a hardware modification would be costly. If all of the risk from small break LOCA (SBLOCA) and ISLOCA are eliminated, the averted cost-risk would be $589,000 (CP&L 2003a). Again, CP&L notes that this assumption is over estimated. The cost for the associated hardware, larger pumps, greater

capacity boration equipment, larger piping and new power sources, would easily exceed the potential averted cost-risk when all cost factors are taken into consideration. Based on the above considerations, the staff agrees that this SAMA (either enhancement) is not cost-beneficial.

CP&L also performed a sensitivity analysis that addressed variations in discount rate. The use of a three-percent real discount rate (rather than seven percent used in the baseline) results in an increase in the maximum attainable benefit of 21 percent. The results of the sensitivity study are bounded by the uncertainty assessment described above, which considered an increase of a factor of almost 2.5.

The main objective of the containment analysis portion of the IPEEE was to identify seismic vulnerabilities that could result in early failure of containment functions. This includes consideration of containment integrity, containment isolation, and other containment functions. Generally, reactor containments are seismically rugged and have seismic capacities far above the review level earthquake (RLE). However, the potential for seismically-inducing an ISLOCA at or near the RLE would be of concern since these releases would result in both core damage and a direct release of fission products to the environment. In the IPEEE, the licensee identified the potential for a seismically-induced failure of two RHR valves (RHR-750 and 751). These valves were identified as having low ruggedness due to the presence of cast-iron in their yokes. There are two principal concerns associated with the potential failure of these two MOVs: (1) if either valve fails shut, the plant will have difficulty in establishing normal cold shutdown, as the functioning of the valves is required to establish a suction source for the RHR system; and (2) if both valves fail open, an ISLOCA may occur outside containment, as the valves are needed to maintain a high-to-low pressure system boundary during normal operations. The HCLPF value for these values was estimated to be 0.28g in the IPEEE, which is below the 0.3g screening value used in the seismic margins analysis. Because the failure of these valves could result in an ISLOCA that directly bypasses containment, and in view of the higher seismic hazard at the Robinson site relative to other sites that used the 0.3g RLE in the IPEEE, the staff requested that CP&L provide a more detailed assessment of the risk reduction benefits and costs to modify the RHR valves to increase their seismic capacity.

In response, CP&L indicated that a re-analysis was performed in 1998 reflecting the actual elevation of the RHR valves, and produced a revised HCLPF value of 0.39g for the valves (NRC 2003c). The 0.39g value placed the RHR valve yokes within the envelope of g values for the rest of the plant components; therefore, CP&L concluded that no modifications to the RHR valve yokes were warranted to reduce seismic risk. CP&L stated that the benefits of averted offsite economic costs would be approximately $40K based on the seismic hazard estimates provided in EPRI NP6395-D (NRC 2003e). At this higher HCLPF value, the staff estimates the potential contribution to CDF and LERF from seismically-induced failure of the valves be about 2×10^{-5} per year based on Livermore seismic hazard estimates for the Robinson site reported in

NUREG-1488 (NRC 1993), and estimates that elimination of the offsite costs associated with such a failure would have a benefit of approximately $1M. CP&L confirmed that the benefits of averted offsite economic costs would be approximately $1M based on NUREG-1488 seismic hazard estimates (NRC 2003e). The staff notes that the EPRI and Livermore seismic hazard estimates were developed by different groups of experts and that the broad range in results is reflective of the significant uncertainties in this area, particularly at higher g values. Both the EPRI and Livermore hazard estimates are considered by the NRC to be useful for decision making. Using the EPRI hazard frequencies, the staff estimates the benefits of the valve modification to be less than $100K (CP&L estimated $40K).

CP&L estimated the cost of replacing the valve yokes to be $105K, broken down as follows: $20K for parts, $40K for engineering, $14K for installation labor, and $31K for occupational dose based on $2000 per person-rem. These cost estimates appear reasonable. CP&L noted that the valve modification would require a full core offload, and depending on the particular outage, could involve additional costs of $240K to $1.2M (replacement power costs for extended outage) if the modification became critical path. However, CP&L acknowledged that there may be some future outage when yoke replacement could be performed and not be on critical path.

The staff concludes that modification of the RHR valves to increase their seismic capacity would be cost-beneficial based on the NUREG-1488 seismic hazard estimates, but does not appear to be cost-beneficial based on the EPRI seismic hazard estimates. Despite the fact that the revised HCLPF value is greater than the 0.3g RLE for RNP, this modification could be justified because failure of the RHR valves represent a unique risk contributor that would result in both core damage and containment bypass. Moreover, the cost-benefit ratio for the modification becomes most favorable if it can be performed during an outage in which the replacement would not be on critical path or would be performed in conjunction with other RHR valve maintenance.

To determine if there were any cost-beneficial SAMAs related to fire risk at RNP, the staff reviewed the Robinson Fire IPEEE, the resulting staff and technical evaluation reports, and the licensee's November 30, 1995, letter to the NRC (CP&L 1995b) that identified a number of plant modifications and procedural improvements to address the IPEEE risk-significant contributors. One of the risk-significant fire contributors involves an explosive transformer fire in the switchyard that results in a loss of both offsite power and the dedicated shutdown diesel generator (IPEEE Fire Scenario 26-1). The transformers of concern, the auxiliary and startup transformers, are in relatively close proximity (about 20 feet) to a conduit associated with the dedicated shutdown diesel generator that is routed on the outside of the turbine building. The licensee has established procedures for fire fighting actions in the switchyard that emphasize the need to cool the dedicated shutdown diesel generator conduit so as to avoid heat damage to the cables. This response, for which there must be sufficient time for the fire brigade to

recognize and implement the required actions after detecting a fire associated with these transformers prior to cable damage, is credited in reducing the CDF associated with these fires from about 2.4×10^{-5} per year to about 7.0×10^{-6} per year. An alternative to the licensee's current approach that is not dependent on the available response time and actions of the fire brigade and would effectively eliminate the scenario would be to install a radiant heat shield along the conduit to protect it from the heat resulting from the transformer fire. The staff identified that this could be a cost-beneficial SAMA even at the current CDF value that credits the actions of the fire brigade. In response to a staff request regarding this alternative, the applicant estimated that the averted costs from eliminating the scenario from the current CDF value would be worth about $150,000 while the cost to install the radiant heat shield would only be about $50,000. This clearly cost-beneficial SAMA would have the added benefit of not distracting the fire brigade from fighting the transformer fire to continuously cool the conduit.

The staff concludes that the costs of all of the SAMAs assessed would be higher than the associated benefits, with the exception of the RHR valve and dedicated shutdown diesel conduit heat shield modifications discussed above. This conclusion is supported by the uncertainty assessment and sensitivity analysis and upheld despite a number of additional uncertainties and non-quantifiable factors in the calculations, summarized as follows:

- Uncertainty in the internal events CDF was not initially included in the calculations, which employed best-estimate values to determine the benefits. The 95 percent confidence level for internal events CDF is approximately 2.5 times the best estimate CDF. Even upon considering the benefits at the 95th percentile value, no SAMAs were judged to be cost-beneficial. Therefore, consideration of CDF uncertainty is not expected to alter the conclusions of the analysis.

- External events were similarly not included in the RNP risk profile. However, given that the expected external events contribution to CDF is calculated in a conservative fashion and is expected to be on the same order of magnitude as the internal events contribution to CDF, a factor of two increase in the maximum attainable benefits to account for the external events should be conservative. Since this factor of two is less than the factor considered in the uncertainty assessment (a factor of 2.5), it is concluded that a more detailed assessment would not yield any new SAMAs.

- Risk reduction and cost estimates were generally found to be conservative. As such, uncertainty in the costs of any of the contemplated SAMAs would not likely have the effect of making them cost-beneficial.

G.7 Conclusions

CP&L compiled a list of 266 SAMA candidates using the SAMA analyses as submitted in support of licensing activities for other nuclear power plants, NRC and industry documents discussing potential plant improvements, and the plant-specific insights from the CP&L IPE, IPEEE, and current PSA model. A qualitative screening removed SAMA candidates that (1) were not applicable at RNP due to design differences, (2) were sufficiently similar to other SAMAs, and therefore combined with another SAMA, (3) had already been implemented at RNP, or (4) did not provide a significant safety benefit. A total of 218 SAMA candidates were eliminated based on the above criteria, leaving 48 SAMA candidates for further evaluation.

Using guidance in NUREG/BR-0184 (NRC 1997b), the current PSA model, and a Level 3 analysis developed specifically for SAMA evaluation, a maximum attainable benefit of about $1.18M, representing the total present dollar value equivalent associated with completely eliminating severe accidents at RNP. Thirty-eight of the 48 SAMAs were screened from further evaluation because their implementation costs were greater than this maximum attainable benefit. For the remaining 10 SAMA candidates, a more detailed conceptual design and cost estimate were developed as shown in Table G-3. The cost-benefit analyses showed that none of the 10 SAMA candidates were cost-beneficial.

The staff reviewed the CP&L analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by CP&L are reasonable and sufficient for the license renewal submittal. The unavailability of a seismic and fire PSA model precluded a detailed quantitative evaluation of SAMAs specifically aimed at reducing risk of these initiators; however, insights related to dominant risk contributors from these events were used to identify potential plant improvements and to estimate their approximate risk reduction benefits. Based on this evaluation, the staff identified two cost-beneficial SAMAs. These involve modification of RHR valve yokes to reduce the risk from seismically-induced interfacing system LOCAs, and installation of a radiant heat shield on the dedicated shutdown diesel generator electrical conduit to reduce the risk from fire-induced SBO events. Improvements realized as a result of the IPEEE process at RNP, and implementation of these cost-beneficial SAMAs would minimize the likelihood of identifying further cost-beneficial enhancements in these areas and the licensee's sensitivity assessment to address uncertainties in the internal events analysis is expected to bound the external events contributions.

Based on its review of the CP&L SAMA analysis, the staff concurs that none of the candidate SAMAs are cost-beneficial, except as noted above for the RHR valves and dedicated shutdown diesel generator conduit heat shield. This is based on conservative treatment of costs and

benefits. This conclusion is consistent with the low residual level of risk indicated in the Robinson PSA and the fact that RNP has already implemented many plant improvements identified from the IPE and IPEEE process. The staff concludes that installation of the heat shield would be cost-beneficial, and that modification of the RHR valves to increase their seismic capacity would also be cost-beneficial depending on the assumed seismic hazard estimates and the particular outage during which the modification would be implemented. 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. CP&L is further evaluating these two SAMAs and has not made any commitment to implement them.

G.8 References

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