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 unless onsite disposal of demolition debris is utilized.
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 683 MW(e) from RNP by approximately 14 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.

(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 to LARGE	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. Summary of Environmental Impacts of Coal-Fired Generation Using Once-Through Cooling at the Robinson Site and an Alternate Greenfield Site (continued)

	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. Summary of Environmental Impacts of Coal-Fired Generation Using Once-Through Cooling at the Robinson Site and an Alternate Greenfield Site (continued)

		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

- **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

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 683 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) 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

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.

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).

40 CFR Part 50.

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 socioeconomic 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.

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.

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

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.

- **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 683 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.

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
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.

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 (continued)

	Robinson Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
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.

- **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.

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

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.

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 683 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.

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, 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, 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

- **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.

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 683 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.

DOE has a performance target that by 2003, two second-generation fuel cell technologies using molten carbonate and solid oxide technology, respectively, will be commercially available in sizes up to approximately 3 MW at a cost of $1000 to $1500 per kW of installed capacity (DOE 2002b). 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. Some fossil plants are slated for retirement, principally because of difficulty in meeting air emission requirements (CP&L 2002a). 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 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;

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 to LARGE	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.

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

	Robinson Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
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.
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.

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

	Robinson Site		Alternate Greenfield Site	
Impact Category	**Impact**	**Comment**	**Impact**	**Comment**
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.

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.

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

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

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

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

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

40 CFR Part 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 Plants* (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 2003). 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 draft supplemental environmental impact statement (SEIS) for RNP. The public comments received during the scoping process are provided in Appendix A, Part I, of this draft SEIS.

The staff will hold two public meetings in Hartsville, South Carolina, in June 2003, to describe the preliminary results of the NRC environmental review and to answer questions to provide

(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 on this draft SEIS. When the comment period ends, the staff will consider and address all of the comments received. These comments will be addressed in Appendix A, Part II, of the final SEIS.

This draft SEIS includes the NRC staff's preliminary analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse effects. It also includes the staff's preliminary 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 draft SEIS documents the staff's evaluation of all 92 environmental issues considered in the GEIS. The staff considered the environmental impacts associated with alternatives to license renewal and compared the environmental impacts of license renewal and the alternatives. The alternatives to license renewal that were considered include the no-action 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 draft 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 draft SEIS. Four of the Category 2 issues and environmental justice apply to both refurbishment and to operation during the renewal term and are only discussed in this draft SEIS in relation to operation during the renewal term. For all 16 Category 2 issues and environmental justice, the staff concludes that the potential environmental effects are of SMALL significance in the context of the standards set forth in the GEIS. In addition, the staff determined that appropriate Federal health agencies have not reached a consensus on the existence of chronic adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required. For severe accident mitigation alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on its review of the SAMAs and the IPEEE report for RNP and the plant improvements already made, the staff has identified two new SAMAs not previously identified by CP&L that are cost-beneficial. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

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

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 draft 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 reactors, 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 each of the two units 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 during the scoping process, the preliminary 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 to LARGE	MODERATE to LARGE	MODERATE	MODERATE to LARGE	MODERATE	MODERATE to LARGE	MODERATE to LARGE	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 LARGE	SMALL	SMALL to LARGE
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 LARGE	SMALL to LARGE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE
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 LARGE	SMALL to MODERATE	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 Part 51. Code of Federal Regulations, *Title 10, Energy,* Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

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

Carolina Power & 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). 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.

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). 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.

U.S. Nuclear Regulatory Commission (NRC). 2003. *Environmental Impact Statement Scoping Process: Summary Report - H.B. Robinson Steam Electric Plant, Unit No. 2, Darlington County, South Carolina.* December 2002, Washington, D.C.

Appendix A

Comments Received on the Environmental Review

Appendix A

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.1.1 Questions about the License Renewal Process

A.1.2 General Support of License Renewal at RNP

A.1.3 Comments Concerning the Environment

A.1.4 Comments Concerning Water Quality and Aquatic Ecology

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.*

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	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]	
Mary Ann Parkhurst		Task Leader
Beverly Miller		Deputy Task Leader
William Sandusky		Air Quality
Michael Scott		Socioeconomics
Susan Sargeant		Aquatic Ecology
Jerry Martin		Radiation Protection
Daniel Tano		Cultural Resources
Paul Hendrickson		Land Use, Related Federal Programs, Alternatives
Lance Vail		Water Use, Hydrology
Susan K. Ennor and Cary Counts		Technical Editor
Trina Russell and Debbie Schulz		Document Production

Name	Affiliation	Function or Expertise
	ARGONNE NATIONAL LABORATORY[b]	
Gus Williams		Water Use, Hydrology
	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 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 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)

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 Southeastern Regional Office (SERO), St. Petersburg, Florida

Re/Max Professionals, Florence, South Carolina

Appendix D

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
State Historic Preservation Office (Nancy Brock)	Carolina Power and Light Company	August 8, 2001
Nuclear Regulatory Commission (Pao-Tsin Kuo)	Fish and Wildlife Service	December 9, 2002
Fish and Wildlife Service	Nuclear Regulatory Commission	December 19, 2002

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	051702 011 042K	05/20/02	06/30/03	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	

Table E-1. Federal, State, Local, and Regional Licenses, Permits, Consultations, and Other Approvals for Robinson Unit 2 (continued)

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
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.
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	07/31/02	07/31/03	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

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

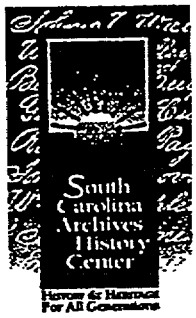
We also recommend you contact the S.C. Department of Natural Resources (SCDNR), Data Manager, Wildlife Diversity Section, Columbia, SC 29202, concerning known populations of federal and/or state endangered or threatened species, and other sensitive species in the project area. Additional habitat information 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



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

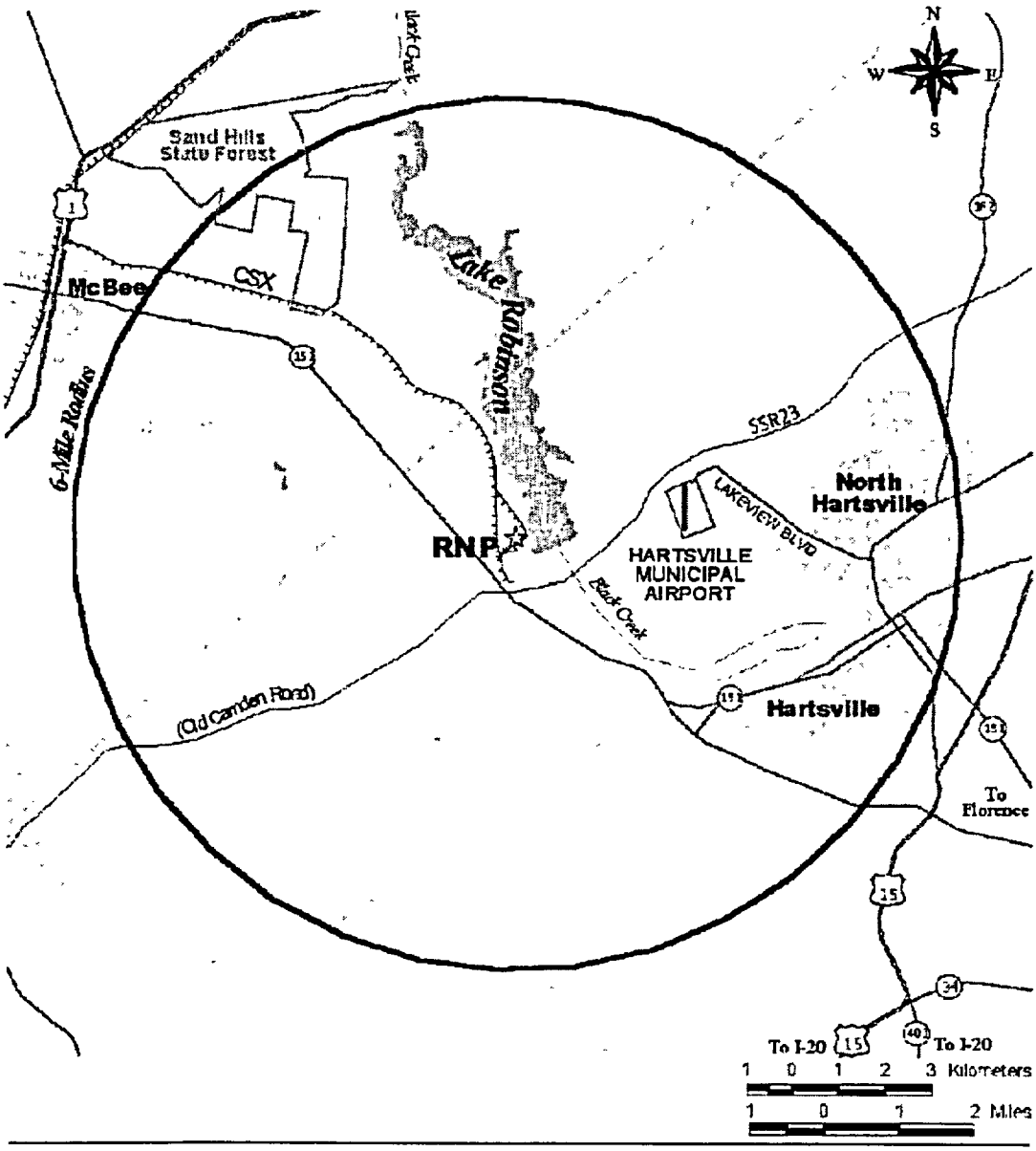


FIGURE 2-2
6-Mile Vicinity Map
Robinson Nuclear Plant

Figure 1. Location of Robinson Station, Unit 2, South Carolina Enclosure

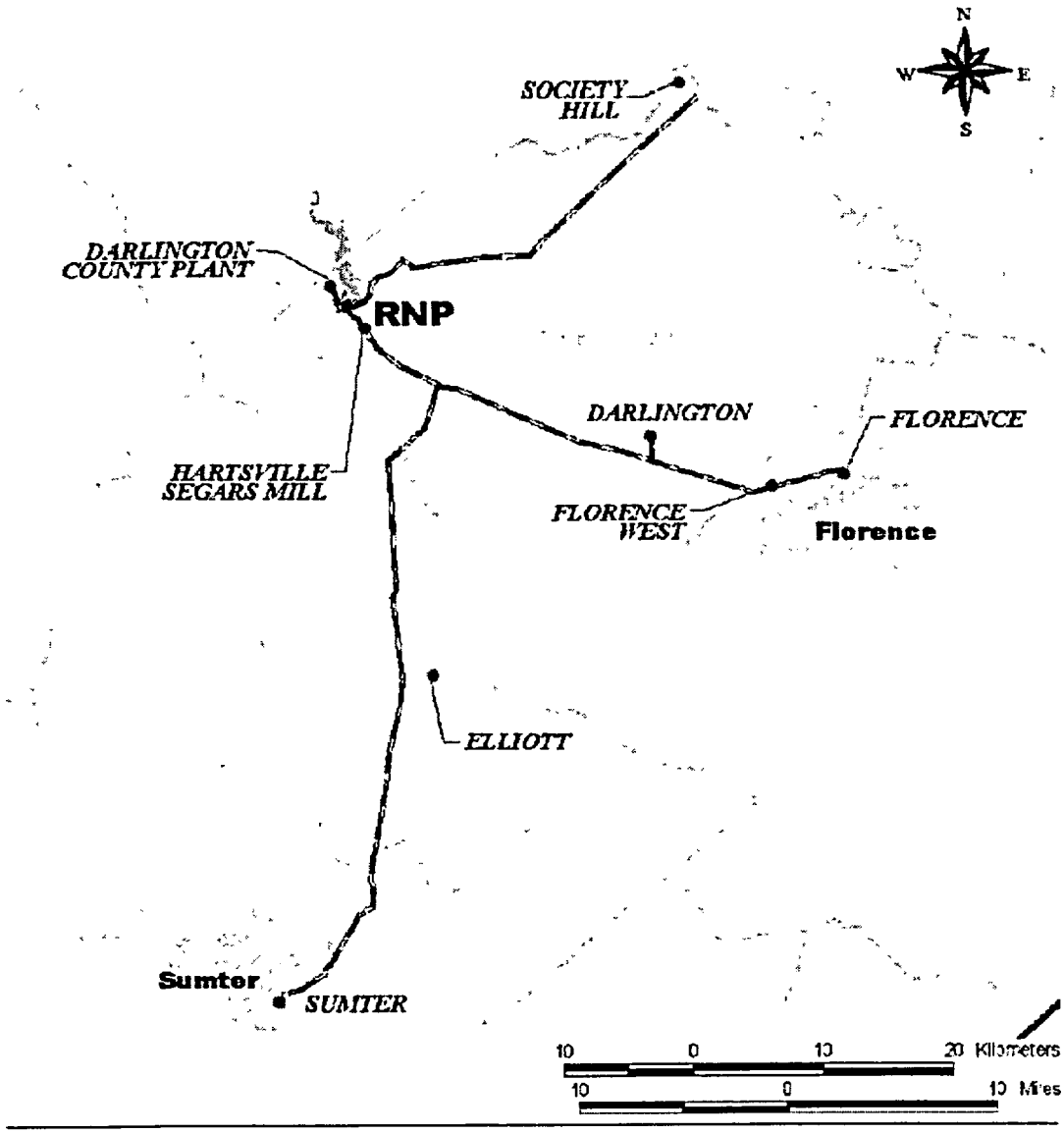


Figure 2. Vicinity of Robinson Station, Unit 2, and Transmission Line

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

Appendix E

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 miles) west-northwest of Hartsville, SC (Fig. 1). The nearest large city is Columbia, South Carolina, approximately 88 km (55 miles) west-southwest. The site is approximately 48 km (30 miles) south of the North Carolina border and 145 km (90 miles) from the Atlantic Ocean. The site encompasses more than 2,000 ha (5,000 acres) of CP&L property in northwestern Darlington and southwestern Chesterfield Counties, including the 827-ha (2,250-acre) Lake Robinson. Approximately 98 ha (243 acres) consist of generation and maintenance facilities, laydown areas, parking lots, roads, and mowed grass (Kiker 1996). The remaining portion of the site

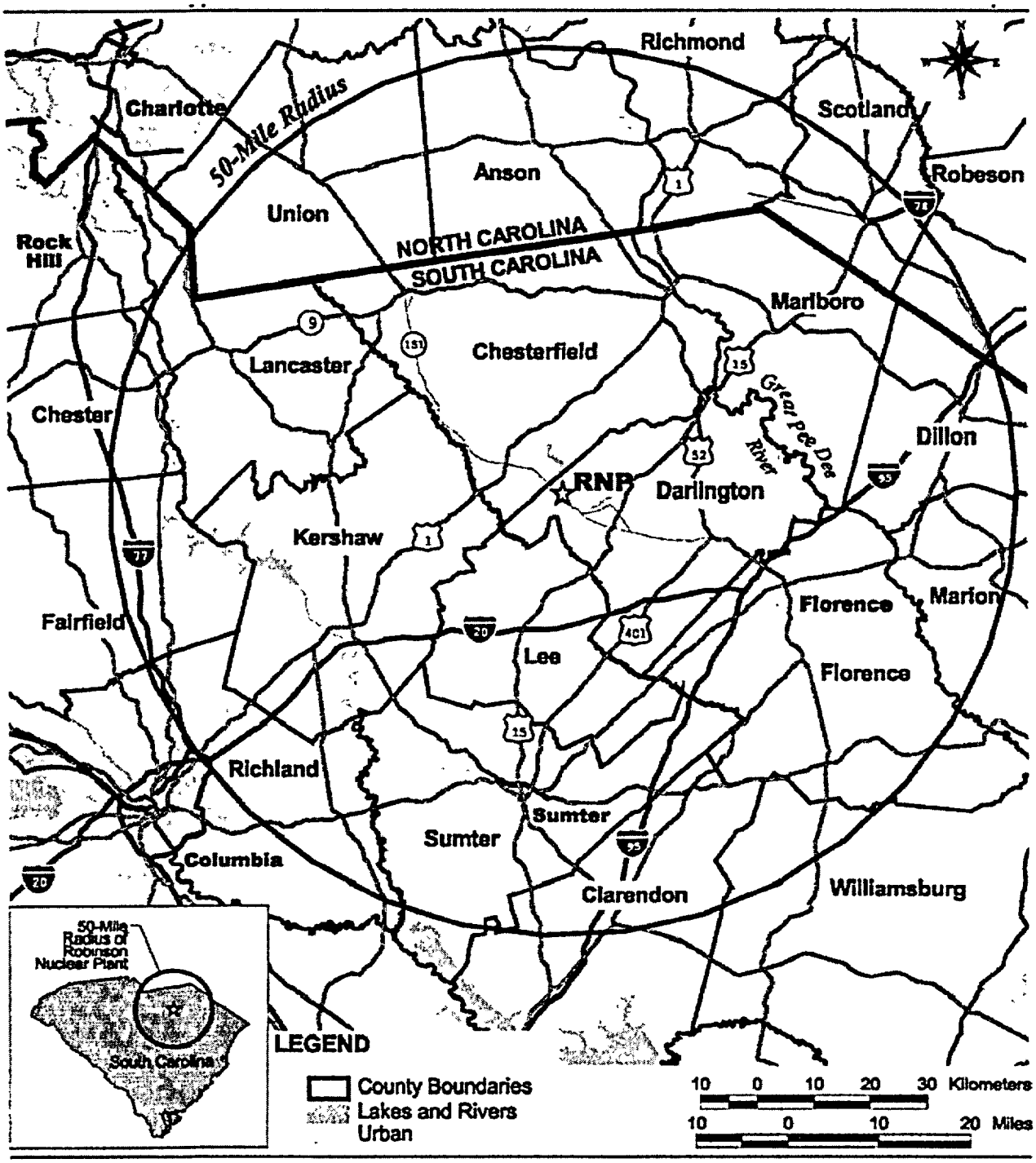


Figure 1. Robinson Site (RNP) and Surrounding Area

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 (*Quercas 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 miles) 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 miles) 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 miles) 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 (Fig. 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 wildlife management program designed to help landowners whose property is crossed by transmission line corridors create productive habitat for wildlife.

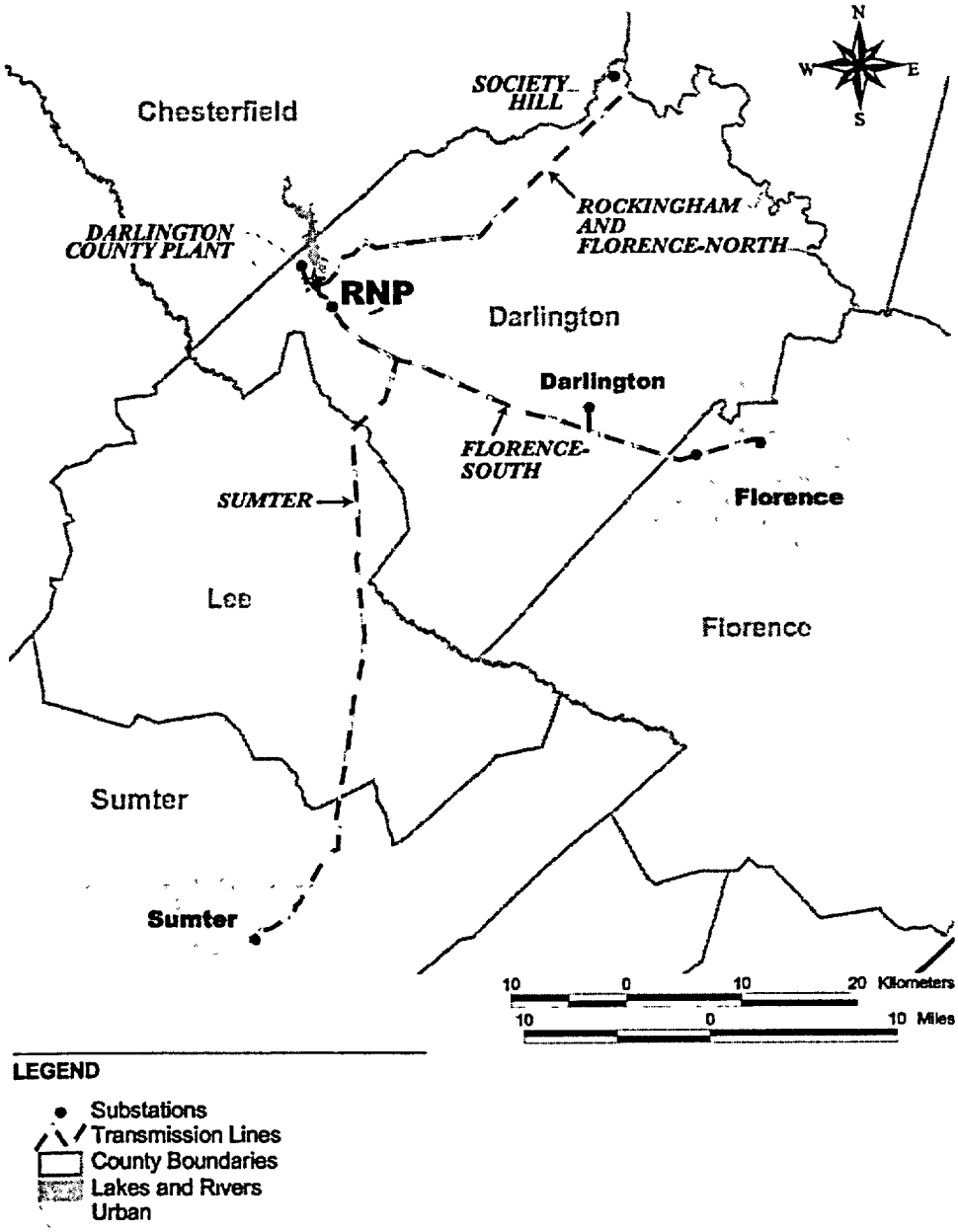


Figure 2. Robinson Site (RNP) and Associated Transmission Lines

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 miles) 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 mile) north of the Robinson site (Fig. 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 (Fig. 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).

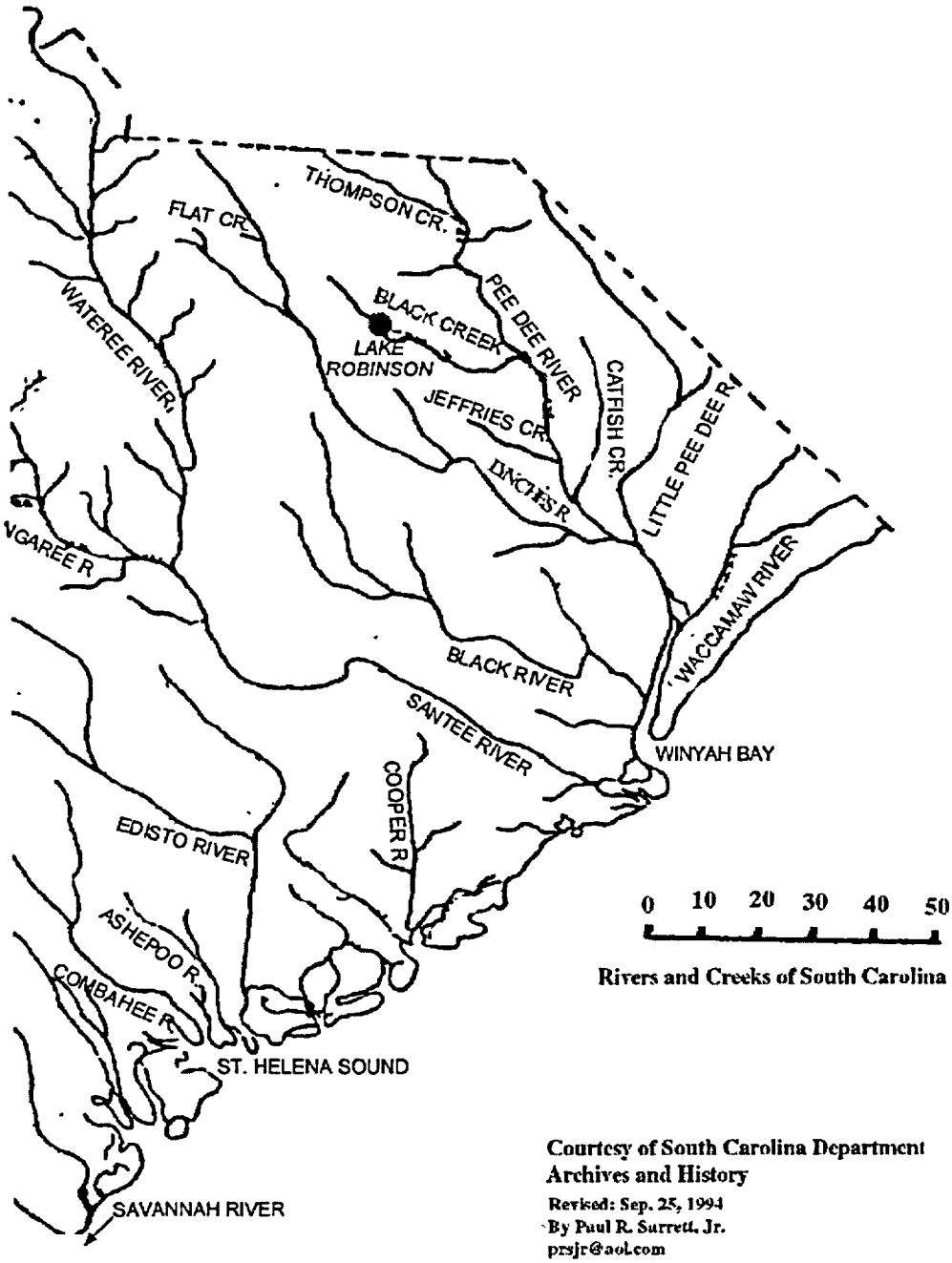


Figure 3. The Pee Dee River and its Tributaries

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.

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 (Fig. 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 (Fig. 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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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

NRC Staff Evaluation of Severe Accident Mitigation Alternatives (SAMAs) for H.B. Robinson Steam Electric Plant, Unit 2, in Support of License Renewal Application

1.0 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.

2.0 Estimate of Risk for RNP

CP&L's estimates of offsite risk at RNP are summarized in Section 2.1 of this Appendix. The summary is followed by the staff's review of CP&L's risk estimates in Section 2.2 of this Appendix.

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 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 G2-1. 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.

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).

Table G2-1. 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 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 G2-2. Bypass events (ISLOCA and SGTR) and late containment failures dominate the population dose at RNP.

Table G2-2. 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

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 6.2.

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 2.8×10^{-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 (1.38×10^{-4} per year) and LOCAs (7.5×10^{-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 SER 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 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 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 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 mile) 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.

3.0 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.

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, or
- 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, six 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 nine 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 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 6.2.

The 10 remaining SAMAs were further evaluated and subsequently eliminated in the Phase 2 evaluation, as described in Sections 4.0 and 6.0 below.

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 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 6.2.

4.0 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 G4-1 and detailed in Section 6.1 through 6.9 of Appendix F to the ER (CP&L 2002). Table G4-1 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 6.0.

Table G4-1. 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

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 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.

5.0 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.

6.0 Cost-Benefit Comparison

CP&L's cost-benefit analysis and the staff's review are described in the following sections.

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 G4-1. 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.

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 G6-1 below). 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 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.

Table G6.1. 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}

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.

7.0 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 G4-1. 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.

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Docket No. 50-261

11. ABSTRACT *(200 words or less)*

This draft 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) to renew the OL for H.B. Robinson Steam Electric Plant, Unit No. 2 for an additional 20 years under 10 CFR Part 54. This draft SEIS includes th e NRC staff's analysis that considers and weighs the environmental impacts of the proposed action, the environmental impa cts of the alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the staff's preliminary recommendation regarding the proposed action.

The NRC staff's preliminary recommendation is that the Commission determine tha t the adverse environmental impacts of license renewal for H.B. Robinson Steam Electric Plant, Unit No. 2 are not so g reat that preserving the option of license renewal for energy-planning decision makers would be unreasonable. The recomme ndation is based on (1) the analysis and findings in the GEIS; (2) the Environmental Report submitted by CP&L; (3) consu ltation with Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's considera tion of the public comments received during the scoping process.

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