

4.0 Environmental Impacts of Operation

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

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

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

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

This chapter addresses the issues related to operation during the renewal term that are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, and are applicable to the St. Lucie Units 1 and 2. Section 4.1 addresses issues applicable to the St. Lucie cooling system. Section 4.2 addresses issues related to transmission lines and onsite land use. Section 4.3 addresses the radiological impacts of normal operation, and Section 4.4 addresses issues related to the socioeconomic impacts of normal operation during the renewal term. Section 4.5 addresses issues related to groundwater use and quality, while Section 4.6 discusses the impacts of renewal-term operations on threatened or endangered species. Section 4.7 addresses potential

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

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

4.1 Cooling Systems

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to the St. Lucie Units 1 and 2 cooling system operation during the renewal term are listed in Table 4-1. Florida Power and Light Company (FPL) stated in the Environmental Report (ER) that there is no new and significant information associated with the renewal of St. Lucie Units 1 and 2 that would warrant additional plant-specific analysis of the remaining Category 1 issues applicable to St. Lucie Units 1 and 2 (FPL 2001a). The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all Category 1 issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-1. Category 1 Issues Applicable to the Operation of the St. Lucie Units 1 and 2 Cooling System During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)	
Altered current patterns at intake and discharge structures	4.2.1.2.1; 4.3.2.2; 4.4.2
Temperature effects on sediment transport capacity	4.2.1.2.3; 4.4.2.2
Scouring caused by discharged cooling water	4.2.1.2.3; 4.4.2.2
Discharge of chlorine or other biocides	4.2.1.2.4; 4.4.2.2
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4; 4.4.2.2
Discharge of other metals in wastewater	4.2.1.2.4; 4.3.2.2; 4.4.2.2
Water use conflicts (plants with once-through cooling systems)	4.2.1.3
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Accumulation of contaminants in sediments or biota	4.2.1.2.4; 4.3.3; 4.4.3; 4.4.2.2
Entrainment of phytoplankton and zooplankton	4.2.2.1.1; 4.3.3; 4.4.3
Cold shock	4.2.2.1.5; 4.3.3; 4.4.3

Table 4-1. (cont'd)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
Thermal plume barrier to migrating fish	4.2.2.1.6;4.4.3
Distribution of aquatic organisms	4.2.2.1.6; 4.4.3
Gas super saturation (gas bubble disease)	4.2.2.1.8; 4.4.3
Low dissolved oxygen in the discharge	4.2.2.1.9; 4.3.3; 4.4.3
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.2.2.1.10; 4.4.3
Stimulation of nuisance organisms	4.2.2.1.11; 4.4.3
HUMAN HEALTH	
Noise	4.3.7

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

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

Altered current patterns have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff’s site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of altered current patterns at intake and discharge structures during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff’s site visit, the scoping process, or its evaluation of other

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available information. Therefore, the staff concludes that there are no impacts of temperature effects on sediment transport capacity during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of scouring caused by discharged cooling water during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Compliance with the National Pollutant Discharge Elimination System (NPDES) permit for St. Lucie Units 1 and 2 has also been demonstrated (FDEP 2002). Therefore, the staff concludes that there are no impacts of discharge of chlorine or other biocides during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information including the NPDES (FDEP 2000) permit for St. Lucie Units 1 and 2. Therefore, the staff concludes that there are no impacts of discharges of sanitary wastes and minor chemical spills during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information including the NPDES permit (FDEP 2000) for St. Lucie Units 1 and 2 and the survey of aquatic environments potentially affected by the cooling canal system (Ecological Associates 2001). Therefore, the staff concludes that there are no impacts of discharges of other metals in wastewater during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of water use conflicts for plants with once-through cooling systems during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of available information, including the survey of aquatic environments potentially affected by

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the cooling canal system (Ecological Associates 2001). Therefore, the staff concludes that there are no impacts of accumulation of contaminants in sediments or biota during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of entrainment of phytoplankton and zooplankton during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of cold shock during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of thermal

plume barriers to migrating fish during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on distribution of aquatic organisms during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of gas supersaturation during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other

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available information. Therefore, the staff concludes that there are no impacts of low dissolved oxygen during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of stimulation of nuisance organisms during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of noise during the renewal term beyond those discussed in the GEIS.

The Category 2 issues related to cooling system operation during the renewal term that are applicable to St. Lucie Units 1 and 2 are listed in Table 4-2 and are discussed in the following sections.

Table 4-2. Category 2 Issues Applicable to the Operation of the St. Lucie Units 1 and 2 Cooling System During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
AQUATIC ECOLOGY (FOR PLANTS WITH ONCE-THROUGH AND COOLING POND HEAT-DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	4.2.2.1.2; 4.3.3	B	4.1.1
Impingement of fish and shellfish	4.2.2.1.3; 4.3.3	B	4.1.2
Heat shock	4.2.2.1.4; 4.3.3	B	4.1.3

4.1.1 Entrainment of Fish and Shellfish in Early Life Stages

Impacts on fish and shellfish resources resulting from entrainment are a Category 2 issue. The impacts of entrainment are SMALL at many plants, but they may be MODERATE or LARGE impacts at some plants. Also, ongoing restoration efforts may increase the number of fish susceptible to intake effects during the license renewal period (NRC 1996). Information to be ascertained includes (1) the type of cooling system (whether once-through or cooling pond) and (2) the current Clean Water Act Section 316(b) determination or equivalent state documentation.

As indicated in Section 2.1.3, Cooling and Auxiliary Water Systems, St. Lucie Units 1 and 2 have a once-through heat-dissipation system. Potential entrainment at St. Lucie Units 1 and 2 was estimated from monitoring data taken at six stations in the ocean near the intake and stations in the intake and discharge canals during preoperational and early operational monitoring for Unit 1 (NRC 1982a). The most common larval fishes in the area of the intake were herrings and anchovies of the family Clupeidae (NRC 1982a). Under normal conditions, it was estimated that 0.4 percent (on average) of the fish eggs and larvae passing the site would be entrained during two-unit operation. Under extreme conditions, less than 4 percent of the fish eggs and larvae passing the intake would be entrained. Based on this assessment, the NRC concluded that entrainment losses under two-unit operation would not represent a significant impact to the local fisheries (NRC 1982a).

As indicated in the current Industrial Wastewater Facility Permit No. FL0002208-Major for St. Lucie Units 1 and 2 (FDEP 2000), both units have documentation of Clean Water Act

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Section 316(b) compliance indicating that the existing intake structure reflects the best technology available for minimizing environmental impacts at the plant.

The staff has reviewed the available information, and based on the results of entrainment studies and the operating history of the St. Lucie Units 1 and 2 intake structure, concludes that the potential impacts of entrainment of fish and shellfish in the early life stages in the cooling-water intake system are SMALL. During the course of the Supplemental Environmental Impact Statement (SEIS) preparation, the staff considered mitigation measures for the continued operation of St. Lucie Units 1 and 2 along with cumulative impacts of past, current, and future activities at the site. Continued operation for an additional 20 years was considered, as were all of the specific effects on the environment (whether or not "significant"). Based on the assessment to date, the staff concludes that the measures in place at St. Lucie Units 1 and 2 (e.g., placement of the intake pipes) mitigate impacts related to entrainment, and no new mitigation measures are warranted.

4.1.2 Impingement of Fish and Shellfish

The impacts on fish and shellfish resources resulting from impingement are a Category 2 issue. Impingement impacts are SMALL at many plants, but might be MODERATE or LARGE at a few plants. Information to be ascertained includes (1) type of cooling system (whether once-through or cooling pond) and (2) current Clean Water Act 316(b) determination or equivalent state documentation.

St. Lucie Units 1 and 2 have a once-through heat-dissipation system. The NRC summarized impingement sampling carried out at St. Lucie Unit 1 during 1976 through 1978, as directed by the Unit 1 operating license (OL) (NRC 1982a). During this period, 226 24-hour collections were made of fish and shellfish trapped on the traveling intake screens. Assuming continuous operation, annual impingement rates were estimated at 34,000 (1978) to 131,000 (1976) finfish, and 26,000 (1976) to 37,000 (1978) shellfish. Over the course of the entire study, the mean numbers of finfish and shellfish impinged per 24-hour period were 222 and 82 individuals, respectively. Corresponding mean total weights per 24-hour period were 1.7 kg (3.7 lb) and 0.5 kg (1.1 lb), respectively. The most commonly impinged species groups were anchovy (*Anchoa* sp.), grunt (Haemulidae), jack (Carangidae), croaker (*Micropogonias* sp.), mojarro (Gerreidae), shrimp (Panaeidae), and blue crab (*Callinectes sapidus*). The length of over 80 percent of the impinged fish was 8 cm (~6 in.) or less, and virtually all of the impinged shrimp were 4 cm (~3 in.) or less in length. In January 1979, the U.S. Nuclear Regulatory Commission (NRC) issued an amendment to the Unit 1 OL deleting the requirement for impingement monitoring. It was concluded that impingement losses at Unit 1 were insignificant when compared to the fish populations in the site vicinity and (for shrimp) the number caught commercially off of Florida's east coast (NRC 1982b).

The NRC acknowledged that startup of Unit 2 would double the intake flow volume and increase impingement rates over those measured during Unit 1 operation (NRC 1982b). It was projected that a doubling of the weight of organisms impinged would be equivalent to less than one-half of one percent of the commercial catch of fish and shellfish in either St. Lucie or Martin county. Based on this, the NRC concluded that even the combined estimates of Unit 1 and Unit 2 impingement would be insignificant when compared to local commercial landings. Additional impingement monitoring for Unit 2 was not required.

Applied Biology (1985) reported on intake canal gill-net sampling carried out annually from 1976 to 1984. The purpose of this program was to determine the extent of entrapment and accumulation of fish and shellfish in the intake canal, and whether this could represent an adverse impact to the communities in the site vicinity. It was concluded that fish and shellfish were not accumulating in the intake canal, based on an average catch rate for the study period of 3.5 to 12.5 fish per 30 m (98 ft) of gill net per day. There were peaks in some years due to influxes of blue runners (*Caranx crysos*), crevalle jacks (*C. hippos*), and smooth dogfish (*Mustelus canis*) in 1977, 1978, and 1984, respectively. The highest mean catch rate for the period occurred in 1980 and resulted from an influx of spot (*Leiostomus xanthurus*) into the intake canal. In spite of these sporadic influxes of some species into the canal, no accumulation was documented. It is possible that factors such as predation within the canal operate to keep the numbers low. Some of the fish entrapped in the intake canal were commercial species, but losses were negligible relative to the weight of commercial landings. Of particular note is that of three of the most important commercial species, only five Spanish mackerel (*Scomberomorus maculatus*), 10 king mackerel (*S. cavalla*), and 37 bluefish (*Pomatomus saltatrix*) were found in the intake canal over the 9-year study period. The low rate of entrapment was attributed to the velocity caps at the ocean intakes, which create horizontal currents that are more easily avoided by fish than vertical currents.

Pursuant to a special condition of the St. Lucie Unit 2 site certification issued by the Florida Department of Environmental Protection (FDEP) in compliance with Florida law (FDEP 1976), a mitigation program was implemented whereby FPL periodically traps fish from the intake canal, tags them, and releases them in the ocean. This program is carried out at the behest of the Florida Fish and Wildlife Conservation Commission (FFWCC). Although the special condition specified that this mitigation take place during construction of St. Lucie Unit 2, FPL has continued the program beyond the construction period. Collections are made on a quarterly to a monthly basis, with a goal of tagging and releasing 1000 fish per year. FPL cooperates with various institutions to provide specimens for display and research.

As indicated in the current Industrial Wastewater Facility Permit No. FL0002208 for St. Lucie Units 1 and 2 (FDEP 2000), St. Lucie Units 1 and 2 have documentation of Clean Water Act 316(b) compliance indicating that the existing intake structure reflects the best technology available for minimizing environmental impacts at the plant.

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The staff has reviewed the available information and, based on the results of impingement studies and the operating history of the St. Lucie Units 1 and 2 intake structure, concludes that the potential impacts of impingement of fish and shellfish on the debris screens of the cooling water intake system are SMALL. While preparing this SEIS, the staff considered mitigation measures for the continued operation of St. Lucie Units 1 and 2 along with cumulative impacts of past, current, and foreseeable future activities at the site. When continued operation for an additional 20 years was considered as a whole, all environmental impacts due to plant operation (whether or not "significant") were considered. Based on the assessment to date, the staff expects that the measures in place at St. Lucie Units 1 and 2 (e.g., intake screens and the placement of the intake pipes) will mitigate all impacts related to impingement and no new mitigation measures are warranted.

4.1.3 Heat Shock

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

St. Lucie Units 1 and 2 have a once-through heat-dissipation system (FPL 2001a). Before startup of both Units 1 and 2, extensive thermal plume modeling studies were conducted, as summarized by the NRC (NRC 1982b) and its predecessor agency, the U.S. Atomic Energy Commission (AEC 1973). These studies described rapidly rising, buoyant thermal plumes from the diffuser discharges with resulting surface temperatures less than the 36°C (97°F) surface water limitation in the Water Quality Standards (FDEP 1996). Potential interaction of the thermal plume with benthic, planktonic, and nektonic (fish and sea turtles) communities was evaluated and projected to be minimal. No detectable impact was predicted due to scouring of the benthic community, plume entrainment of plankton (including fish eggs and larvae), or heat shock to adult fish or turtle hatchlings. As indicated in Section 3(C)(1) of the Fact Sheet associated with the current Industrial Wastewater Facility Permit No. FL0002208-Major for St. Lucie Units 1 and 2 (FDEP 2000), the thermal discharge from the plant complies with Florida Water Quality Standards without recourse to a Clean Water Act Section 316(a) variance.

The staff has reviewed the available information, and, based on the conditions of the NPDES permit and the operating history of St. Lucie Units 1 and 2 discharge, concludes that the potential impacts of discharging heated water from the cooling water intake system are SMALL. While preparing the SEIS, the staff considered mitigation measures for the continued operation of St. Lucie Units 1 and 2 along with cumulative impacts of past, current, and future activities at the site. When continued operation for an additional 20 years was considered as a whole, all

environmental impacts due to plant operation (whether or not "significant") were considered. Based on the assessment to date, the staff expects that the measures in place at St. Lucie Units 1 and 2 (e.g., the placement of the discharge pipes) will mitigate all impacts related to heat shock and no new mitigation measures are warranted.

4.2 Transmission Lines

The Final Environmental Statements (FESs) for St. Lucie Units 1 and 2 (AEC 1973, 1974) describe three transmission lines that connect the plant with the transmission system. These transmission lines are all in a single right-of-way that covers approximately 310 ha (766 ac) over a total right-of-way length of approximately 18 km (11 mi). Tree trimming is normally required only at mid-span or when exotic species such as Australian pine (*Casuarina equisetifolia*) invade the tower pads or right-of-way. Herbicides are used occasionally, primarily applied to individual trees or shrubs to prevent re-sprouting, although broadcast applications are used to control exotic grasses. FPL only uses nonrestricted-use herbicides, and all applications are performed under the supervision of licensed applicators. Mowing follows a 5-year cycle. FPL uses a computer database to prepare management prescriptions for each section of transmission line right-of-way that incorporates known management concerns and environmental sensitivities.

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to transmission lines from St. Lucie Units 1 and 2 are listed in Table 4-3. FPL stated in its ER (FPL 2001a) that it is not aware of any new and significant information associated with the renewal of the OLs for St. Lucie Units 1 and 2. The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those Category 1 issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

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

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

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Table 4-3. Category 1 Issues Applicable to the St. Lucie Transmission Lines During the Renewal Term

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

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, consultation with the U.S. Fish and Wildlife Service (FWS) and the FFWCC, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of power line right-of-way maintenance during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff's site visit, the scoping process, consultation with the FWS and FFWCC, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of bird collisions with power lines during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of electromagnetic fields on flora and fauna during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff's site visit, the scoping process, consultation with the FWS and FFWCC, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of power line rights-of-way on flood plains and wetlands during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no air quality impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no onsite land-use impacts during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of power line rights-of-way during the renewal term beyond those discussed in the GEIS.

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

Table 4-4. Chronic Effects of Electromagnetic Fields and GEIS Category 2 Issue Applicable to the St. Lucie Transmission Lines During the Renewal Term

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

4.2.1 Electromagnetic Fields – Acute Effects

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

Three 230-kV transmission lines were constructed to connect St. Lucie Units 1 and 2 to the transmission system. The transmission lines run approximately 18 km (11 mi) from the plant switchyard to the Midway substation in a single corridor. After the lines leave the St. Lucie substation they run west across the Indian River (Intracoastal Waterway) and then turn northward for the final 2.4 km (1.5 mi). Over the Intracoastal Waterway, the minimum transmission-line clearance is 27 m (90 ft), and over the remainder of the river the clearance is 18 m (60 ft). Over land, the minimum transmission-line clearance is 6.7 m (22 ft). The St. Lucie 230-kV lines are the only lines in the corridor for most of the route. However, several other 230-kV lines and a 500-kV line not associated with St. Lucie share the corridor for approximately 2.4 km (1.5 mi) near the Midway substation.

The St. Lucie transmission lines were constructed before the NESC was adopted; therefore, FPL evaluated the potential electric shock impacts from the transmission lines using guidance developed by the Electric Power Research Institute (EPRI 1987), and the EPRI ENVIRO computer code (EPRI 1994). In the evaluation, a 20-m (65-ft)-long tractor-trailer was assumed to be parked beneath the 230-kV lines. The maximum steady-state current was estimated to be 2.3 mA. The analysis was repeated for the section of the corridor where the St. Lucie transmission lines share the corridor with a 500-kV line. For this section of corridor, the maximum steady-state current was estimated to be 4.5 mA. In both cases, the maximum steady-state current is below the NESC limit of 5 mA.

The calculations described above are specifically for a tractor-trailer parked beneath the transmission line. The FPL staff also considered the potential electric shock impacts for various classes of boats passing beneath the transmission lines crossing the Indian River. The FPL staff concluded that the potential impacts for boats were less than those for trucks.

On the basis of the results of these calculations, the staff concludes that the impact of the potential for electric shock is SMALL and additional mitigation is not warranted.

4.2.2 Electromagnetic Fields – Chronic Effects

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

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

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

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

4.3 Radiological Impacts of Normal Operations

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to St. Lucie Units 1 and 2 in regard to radiological impacts are listed in Table 4-5. FPL stated in its ER (FPL 2001a) that it is not aware of any new and significant information associated with the renewal of the St. Lucie OLS. No significant new information has been identified by the staff during its independent review. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For these issues, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

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

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

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

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

The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of radiation exposures to the public during the renewal term beyond those discussed in the GEIS.

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

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

The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of occupational radiation exposures during the renewal term beyond those discussed in the GEIS.

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

4.4 Socioeconomic Impacts of Plant Operations During the License Renewal Period

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to socioeconomic impacts during the renewal term are listed in Table 4-6. FPL stated in its ER (FPL 2001a) that it is not aware of any new and significant information associated with the renewal of St. Lucie Units 1 and 2 OLS. The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS (NRC 1996). For these issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

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

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

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

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

The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on public safety, social services, and tourism and recreation during the renewal term beyond those discussed in the GEIS.

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

Only impacts of small significance are expected.

The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on education during the renewal term beyond those discussed in the GEIS.

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

No significant impacts are expected during the license renewal term.

The staff has not identified any significant new information during its independent review of the ER (FPL 2001a), the staff’s site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no aesthetic impacts during the renewal term beyond those discussed in the GEIS.

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

No significant impacts are expected during the license renewal term.

The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff’s site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no aesthetic impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

Table 4-7 lists the Category 2 socioeconomic issues, which require plant-specific analysis, and environmental justice, which was not addressed in the GEIS. These issues are discussed in Sections 4.4.1 through 4.4.6.

Table 4-7. Environmental Justice and GEIS Category 2 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
SOCIOECONOMIC			
Housing impacts	4.7.1	I	4.4.1
Public services: public utilities	4.7.3.5	I	4.4.2
Offsite land use (license renewal term)	4.7.4	I	4.4.3
Public services, transportation	4.7.3.2	J	4.4.4
Historic and archaeological resources	4.7.7	K	4.4.5
Environmental justice	Not addressed ^(a)	Not addressed ^(a)	4.4.6

(a) Guidance related to environmental justice was not in place at the time the GEIS and the associated revision to 10 CFR Part 51 were prepared. Therefore, environmental justice must be addressed in the licensee’s ER and the staff’s environmental impact statement.

4.4.1 Housing Impacts During Operations

Impacts on housing are considered SMALL when a small or not easily discernible change in housing availability occurs. Impacts are considered MODERATE when there is discernible but short-lived reduction in available housing units because of project-induced migration. Impacts

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are considered LARGE when project-related housing demands result in very limited housing availability and would increase rental rates and housing values well above normal inflation (NRC 1996).

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

In 2000, the population living within 32 km (20 mi) of St. Lucie Units 1 and 2 was estimated to have been approximately 345,000 (FPL 2001a). This total converts to a population density of about 215 persons/km² (550 persons/mi²) living on the land area within a 32-km (20-mi) radius of St. Lucie.^(a) This concentration falls into the GEIS sparseness Category 4 (i.e., having greater than or equal to 46 persons/km² [120 persons/mi²]).

An estimated 1,180,000 people live within 80 km (50 mi) of the St. Lucie site (FPL 2001a), equating to a population density of around 117 persons/km² (300 persons/mi²) on the available land area.^(b) Applying the GEIS proximity measures (NRC 1996), St. Lucie Units 1 and 2 are classified as Category 4 (i.e., having more than or equal to 73 persons/km² [190 persons/mi²] within 80 km [50 mi] of the site). According to the GEIS, these sparseness and proximity scores identify the nuclear units as being located in a high-population area.

10 CFR Part 51, Subpart A, Appendix B, Table B-1, states that impacts on housing availability are expected to be of SMALL significance at plants located in a high-population area where growth-control measures are not in effect. The St. Lucie site is located in a high-population area. Martin and St. Lucie counties are not subject to growth-control measures that would limit housing development.

SMALL impacts result when no discernible change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and no housing construction or conversion is required to meet new demand (NRC 1996). The GEIS assumes that an additional staff of 60 permanent per-unit workers might be needed during the license renewal period to perform routine maintenance and other activities. FPL has performed some

(a) These numbers differ from those presented in the ER (FPL 2001a). In their calculations presented in the ER, FPL took the surface area in the 32-km (20-mi) and 80-km (50-mi) radii and distributed the population evenly within the circles. However, the circles encompass a large area of the Atlantic Ocean. The staff assumed that the ocean encompasses half the area for the 32-km (20-mi) and 80-km (50-mi) circles. As such, the population concentrations were adjusted, resulting in higher population concentrations than those reported in the ER.

(b) Note that these conclusions differ from FPL's ER for the reasons stated in footnote (a).

major construction activities at St. Lucie (e.g., Unit 1 steam generator replacement and velocity cap repair [FPL 2001a]). Other major refurbishment or replacement actions during the license renewal period have not been identified by FPL, and as a result, employment will not change as a result of such activities. Thus, FPL concludes that there are no impacts to housing from license renewal activities (FPL 2001a). However, to establish an upper bound on possible increased employment during the license renewal term for the purposes of impact analysis, FPL assumed the hiring of 60 additional permanent workers, although FPL currently has no plans to add additional full-time staff. The hiring of 60 additional employees would result in 78 indirect jobs, or an increased demand for a total of 138 housing units (FPL 2001a). Using the fact that 83 percent of its employees live in Martin and St. Lucie counties (see Table 2-5), FPL concluded that a demand for 115 housing units would be created in the two counties. Using the GEIS guidance of 60 additional workers per unit, FPL's estimates would be doubled. The demand for the housing units could be met with the construction of new housing or use of existing, unoccupied housing. In 2000, St. Lucie and Martin counties had a total of 156,733 housing units (see Table 2-6) and vacancy rates in both counties were more than 15 percent. The increase in projected housing units would not create a discernible change in housing availability, rental rates, or housing values; or spur new construction or conversion. As a result, FPL concluded that the impacts would be SMALL, and mitigation measures would not be necessary or effective (FPL 2001a).^(a)

The staff reviewed the available information relative to housing impacts, FPL's conclusions, and conclusions drawn from using assumptions on employment given in the GEIS. Based on this review, the staff concludes that the impact on housing during the license renewal period would be SMALL, and additional mitigation is not warranted.

4.4.2 Public Services: Public Utility Impacts During Operations

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

(a) The FPL estimate of 138 housing units (115 units for Martin and St. Lucie counties) is likely to be an extreme "upper bound" estimate. Most of the potentially new jobs would likely be filled by existing area residents, thus creating no, or little, net demand for housing.

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Analysis of impacts on the public water supply system considered both plant demand and plant-related population growth. Section 2.2.2 describes the St. Lucie Units 1 and 2 permitted withdrawal rate and actual use of water. FPL plans no refurbishment at St. Lucie Units 1 and 2, so plant demand would not change beyond current demands (FPL 2001a).

In the ER FPL assumed, for the purposes of impact analysis only, an increase of 60 license renewal employees, the generation of 138 new jobs, and a net overall population increase of approximately 339 as a result of those jobs.^(a) The plant-related population increase would require an additional 64 to 102 m³/d (1.7×10^{-2} to 2.7×10^{-2} MGD) of water (FPL 2001a). Using the GEIS assumption of 60 additional workers per unit, the FPL estimates would be doubled. However, both estimates are within the total residual capacity of all water treatment plants greater than 3.8×10^3 m³/d (1 MGD) serving Martin and St. Lucie counties (see Table 2-8). Thus, the staff concludes that the impact of increased water use resulting from the potential increase in employment is SMALL, and mitigation is not warranted.

The staff reviewed the available information relative to impacts on public utility services. Based on this review, the staff concludes that the impacts on public utility services during the license renewal period would be SMALL, and additional mitigation is not warranted.

4.4.3 Offsite Land Use During Operations

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

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

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

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

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

For the purpose of impact analysis, FPL has identified a maximum of 60 additional staff who could be employed during the license renewal term plus an additional 78 indirect jobs (total 138) in the community (FPL 2001a). As noted previously, the GEIS assumes a total of 120

(a) Calculated by assuming that the average number of persons per household is 2.46 in the State of Florida (138 jobs x 2.46 = 339) (USCB 2000).

additional staff for the entire plant, or 276 total jobs and households in the community. Section 3.7.5 of the GEIS (NRC 1996) states that if plant-related population growth is less than 5 percent of the study area's total population, offsite land-use changes would be small, especially if the study area has established patterns of residential and commercial development, a population density of at least 23 persons/km² (60 persons/mi²), and at least one urban area with a population of 100,000 or more within 80 km (50 mi). In this case, population growth will be less than 5 percent of the area's total population, the area has established patterns of residential and commercial development (see Table 2-9), a population density of well over 23 persons/km² (60 persons/mi²), but no urban area with a population of 100,000 or more within 80 km (50 mi). However, the combined populations of the cities of Port St. Lucie and Fort Pierce, which share a common boundary, exceed 100,000 (see discussion under Section 2.2.8.5, Demography). Consequently, the staff concludes that population changes resulting from license renewal are likely to result in SMALL offsite land-use impacts.

Tax revenue can affect land use because it enables local jurisdictions to be able to provide the public services (e.g., transportation and utilities) necessary to support development. Section 4.7.4.1 of the GEIS states that the assessment of tax-driven land-use impacts during the license renewal term should consider (1) the size of the plant's tax payments relative to the community's total revenues, (2) the nature of the community's existing land-use pattern, and (3) the extent to which the community already has public services in place to support and guide development. If the plant's tax payments are projected to be small relative to the community's total revenue, tax-driven land-use changes during the plant's license renewal term would be small, especially where the community has pre-established patterns of development and has provided adequate public services to support and guide development. Section 4.7.2.1 of the GEIS states that if tax payments by the plant owner are less than 10 percent of the taxing jurisdictions revenue, the significance level would be SMALL (NRC 1996). If the plant's tax payments are projected to be medium to large relative to the community's total revenue, new tax-driven land-use changes would be MODERATE.

St. Lucie County is the only local jurisdiction that receives personal and real property tax payments for St. Lucie Units 1 and 2. FPL's tax payments to the county for Units 1 and 2 averaged about 9.2 percent of the county's total property tax revenue over the 5 years between 1996 and 2000 (see Table 2-11). Both St. Lucie and Martin counties are operating under the State-required Growth Management Policy Plan and an established Urban Service Boundary (USB) requiring that adequate public services be provided to support new development. It is the policy of both counties that development is not to take place outside the USB. In combination, these two factors (lack of growth directly related to the presence of St. Lucie Units 1 and 2 and directed growth to stay within the USB) are expected to result in SMALL land-use impacts from taxes derived from St. Lucie.

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No adverse effects on offsite land use will occur because of license renewal. Consequently, the staff concludes that tax revenue changes resulting from license renewal are likely to result in SMALL offsite land-use impacts.

4.4.4 Public Services: Transportation Impacts During Operations

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

In 2002, most of the roadways within Martin and St. Lucie counties were operating at acceptable levels-of-service (LOS). As discussed in Section 2.2.8.2, both Martin and St. Lucie counties have as public policy the targeting of growth within the USB. Interstate 95 (I-95), State Road 70 (SR-70), the Florida Turnpike, and U.S. Highway 1 (US-1) serve as the main transportation routes for both counties and can be crowded during the busiest times of the day, particularly US-1 in Fort Pierce, Port St. Lucie, and Stuart. State Road A1A, providing access to the St. Lucie site on Hutchinson Island, carries a LOS designation of "A" in the vicinity of the site. North and south of the site, State Road A1A carries an LOS designation of "B" (FPL 2001a). Personal observations by staff during the site visit (April 1 to 5, 2002) showed State Road A1A to be relatively uncongested except during shift changes at St. Lucie Units 1 and 2 and at the southern and northern terminus of the road near Stuart/Port St. Lucie and Fort Pierce, respectively.

St. Lucie and Martin counties experienced approximately 2.4 percent annual population growth over the last decade (see Table 2-7). The growth is not related directly to the presence of the St. Lucie Units 1 and 2. St. Lucie and Martin counties do not have growth-control measures that limit housing. Both counties are expected to grow about 20 percent in population over the next decade (Table 2-7). Land-use projections for both counties show that new residential, commercial, and industrial development is expected to take place east of the I-95 and Florida Turnpike corridors.

However, none of this expected growth is due directly to increases in employment at the St. Lucie site. St. Lucie Units 1 and 2 currently employ 929 workers (see Table 2-5) (FPL 2001a). During periods of refueling, once or twice a year, an additional 575 to 870 temporary workers are hired. The upper-bound potential increase in permanent staff during the license renewal term as set in the GEIS is 120 additional workers, or approximately 13 percent of the current permanent work force. The level of access to the St. Lucie site is over secondary, as opposed to primary, roads. Based on these facts, FPL concluded that the impacts on transportation during the license renewal term would be SMALL, and no mitigative measures would be warranted.

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

4.4.5 Historic and Archaeological Resources

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

In April 2001, FPL wrote to the Florida SHPO, requesting comments on the St. Lucie Units 1 and 2 license renewal process. In this letter, FPL determined that the continued operation of St. Lucie will have no impact on historic properties (FPL 2001b). In a response dated May 22, 2001, the Florida SHPO stated that the license renewal was not an undertaking that would affect historic properties (SHPO 2001).

However, the Florida SHPO cautioned that there was a moderate to high likelihood for the presence of significant prehistoric archaeological sites in the currently undeveloped portions of the St. Lucie site, as evidenced by the presence of the archaeological remains along Blind Creek at the northern end of the site boundary. Major refurbishment of the St. Lucie plant is not required during the license renewal period, so there will be no need to use currently undeveloped portions of the site for operations during the renewal period. Operation of St. Lucie Units 1 and 2, as planned under the application for license renewal, would protect undiscovered historic or archaeological resources on the site because the undeveloped natural landscape and vegetation would remain undisturbed, and access to the site would remain restricted.

However, care should be taken during normal operational and maintenance conditions to ensure that historic properties are not inadvertently impacted. These activities may include not only operation of the plant itself, but also land management-related actions such as recreational improvements, wildlife habitat enhancement, or maintaining/upgrading plant access roads through the plant site and on transmission line rights-of-way.

Based on the staff's cultural resources analysis and consultation, the claims made by the licensee that major refurbishment activities will not be undertaken related to the renewal of the

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St. Lucie Units 1 and 2 OLS, and the fact that operation will continue within the bounds of plant operations as evaluated in the FES (AEC 1973, 1974), the staff concludes that the potential impacts on historic and archaeological resources are SMALL, and no additional mitigation is warranted.

4.4.6 Environmental Justice

Environmental justice refers to a Federal policy that requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its actions on minority^(a) or low-income populations. The memorandum accompanying Executive Order 12898 (59 FR 7629) directs Federal executive agencies to consider environmental justice under the National Environmental Policy Act of 1969 (NEPA). The Council on Environmental Quality (CEQ) has provided guidance for addressing environmental justice (CEQ 1997). Although the Executive Order is not mandatory for independent agencies, the NRC has voluntarily committed to undertake environmental justice reviews. Specific guidance is provided in NRC Office of Nuclear Reactor Regulation Office Instruction LIC-203, Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues (NRC 2001).

The staff examined the geographic distribution of minority and low-income populations within 80 km (50 mi) of the St. Lucie site, employing the 1990 census (USCB 1991) for low-income populations^(b) and the 2000 census (USCB 2000) for minority populations. The populations within an 80-km (50-mi) radius of St. Lucie encompassed parts of 9 counties. The staff supplemented its analysis by field inquiries to county planning departments, social service agencies, agricultural extension personnel in St. Lucie and Martin counties, and a private social service agency in St. Lucie County.

For the purpose of the staff's review, a minority population is defined to exist if the percentage of each minority, or aggregated minority category within the census block groups^(c) potentially affected by the license renewal of St. Lucie Units 1 and 2, exceeds the corresponding

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- (a) The NRC Guidance for performing environmental justice reviews defines "minority" as American Indian or Alaskan Native, Asian or Pacific Islander, Black not of Hispanic Origin, or Hispanic (NRC 2001).
 - (b) Note that the Census Bureau plans release of income statistics from the 2000 Census during the Summer of 2002. Until then, only 1990 Census data on income are available.
 - (c) A census block group is a combination of census blocks, which are statistical subdivisions of a census tract. A census block is the smallest geographic entity for which the Census Bureau collects and tabulates decennial census information. A census tract is a small, relatively permanent statistical subdivision of counties delineated by local committees of census data users in accordance with Census Bureau guidelines for the purpose of collecting and presenting decennial census data. Census block groups are subsets of census tracts (USCB 2001).

percentage of minorities in the entire State of Florida by 20 percent, or if the corresponding percentage of minorities within the census block group is at least 50 percent. A low-income population is defined to exist if the percentage of low-income population within a census block group exceeds the corresponding percentage of low-income population in the entire State of Florida by 20 percent, or if the corresponding percentage of low-income population within a census block group is at least 50 percent.

FPL used 1990 census data for identifying minority and low-income populations within 80 km (50 mi) of the St. Lucie site. FPL also followed the convention of employing census tracts, as opposed to census block groups, and included tracts if 50 percent or greater of their area lay within the 80-km (50-mi) radius of St. Lucie (FPL 2001a). Using this convention, the 80-km (50-mi) radius includes 194 census tracts. The "more than 20 percentage points" above the comparison area criterion was used to determine whether a census tract should be counted as containing minority or low-income populations (FPL 2001a). Because the 20 percentage points criterion is a lower threshold, the 50 percent criterion was not used. Twenty-four of the census tracts qualify for the minority designation, and 7 census tracts for the low-income population.

The staff followed the convention of employing census block groups and counts of individuals in minority or low-income status. Figure 4-1 shows the distribution of minority populations (shaded areas) within the 80-km (50-mi) radius. Minority populations are present in most of the counties within the 80-km (50-mi) radius of the St. Lucie site, particularly in the agricultural areas of the counties around Lake Okeechobee.

Data from the 1990 census characterize low-income populations within the 80-km (50-mi) radius of the St. Lucie site (USCB 1991). Applying the NRC criterion of "more than 20 percent greater," the census block groups containing low-income populations were identified. Figure 4-2 shows the locations of the low-income populations within 80 km (50 mi) of the St. Lucie site. Census block groups containing low-income populations are concentrated in Gifford (Indian River County), Fort Pierce (St. Lucie County), Pahokee (Palm Beach County near Lake Okeechobee), the agricultural areas around Lake Okeechobee, and Hobe Sound (Martin County).

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

The pathways through which the environmental impacts associated with St. Lucie Units 1 and 2 license renewal can affect human populations are discussed in each associated section. The

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staff found no unusual resource dependencies or practices such as subsistence agriculture, hunting, or fishing through which minority and/or low-income populations could be disproportionately highly and adversely affected. In addition, the staff did not identify any location-dependent disproportionately high and adverse impacts affecting these minority and low-income populations. The staff concludes that offsite impacts from St. Lucie Units 1 and 2 to minority and low-income populations would be SMALL, and no special mitigation actions are warranted.



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

(a) Note: Some of the census block groups extend into Lake Okeechobee.

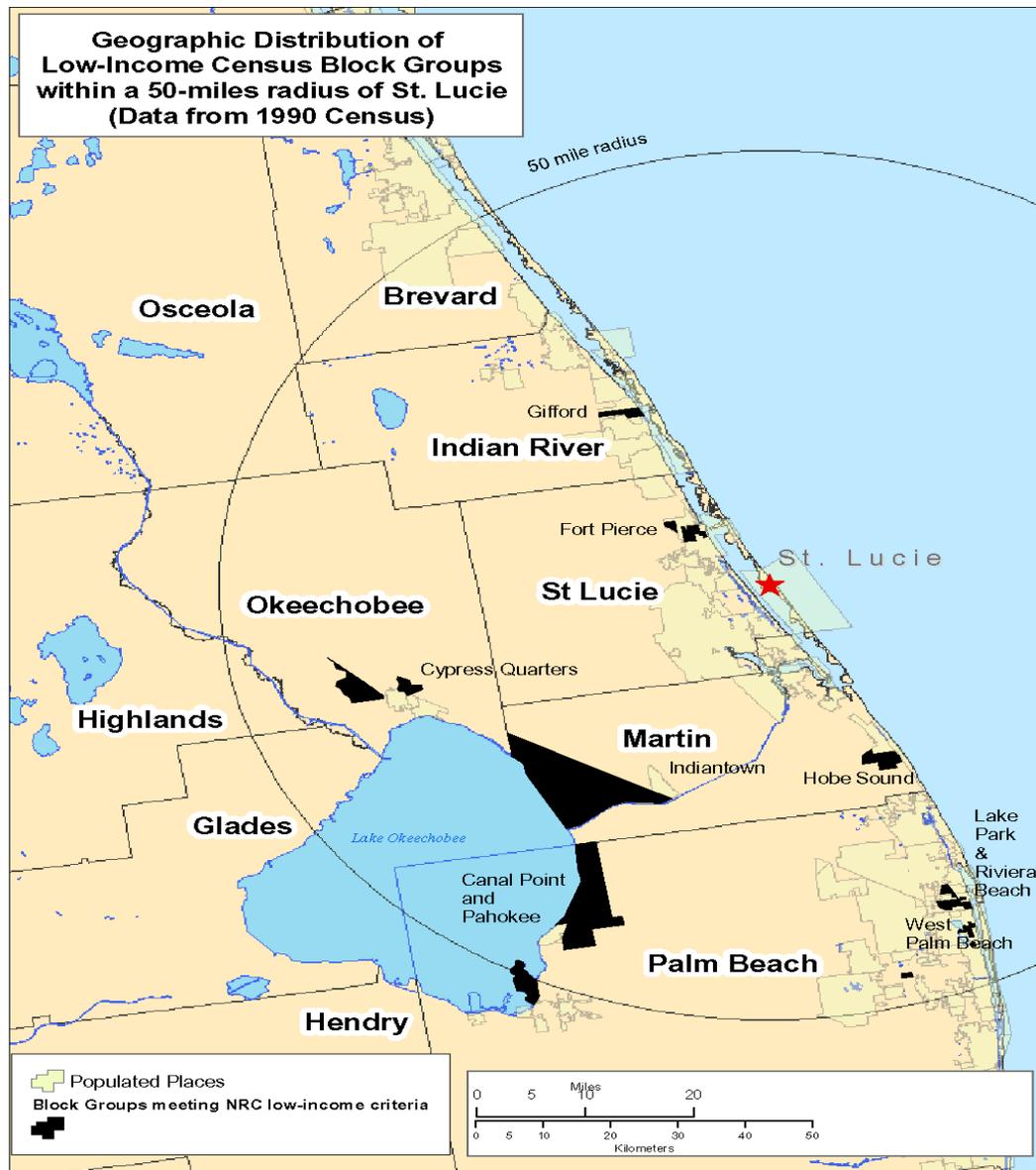


Figure 4-2. Geographic Distribution of Low-Income Populations (shown in shaded areas) Within 80 km (50 mi) of the St. Lucie Site Based on Census Block Group Data^(a)

(a) Note: Some of the census block groups extend into Lake Okeechobee.

4.5 Groundwater Use and Quality

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to St. Lucie Units 1 and 2 groundwater use and quality are listed in Table 4-8. FPL stated in its ER that it is not aware of any new and significant information associated with the renewal of the St. Lucie 1 and 2 OLs (FPL 2001a). The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2001a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For these issues, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-8. Category 1 Issues Applicable to Groundwater Use and Quality During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
GROUNDWATER USE AND QUALITY	
Groundwater use conflicts (potable and service water; plants that use <100gpm.	4.8.1.1
Groundwater quality degradation (saltwater intrusion)	4.8.2.1

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

- Groundwater use conflicts (potable and service water; plants that use <100 gpm). Based on information in the GEIS, the Commission found that

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

As discussed in Section 2.2.2, groundwater use by St. Lucie Units 1 and 2 is less than 0.068 m³/s (100 gpm). The staff has not identified any significant new information during its independent review of the FPL ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no groundwater-use conflicts during the renewal term beyond those discussed in the GEIS.

- Groundwater quality degradation (saltwater intrusion). Based on information in the GEIS, the Commission found that

Nuclear power plants do not contribute significantly to saltwater intrusion.

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The staff has not identified any significant new information during its independent review of the FPL ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no groundwater quality degradation impacts associated with saltwater intrusion during the renewal term beyond those discussed in the GEIS.

4.6 Threatened or Endangered Species

Threatened or endangered species are listed as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue is listed in Table 4-9 and discussed in Sections 4.6.1 through 4.6.3.

Table 4-9. Category 2 Issue Applicable to Threatened or Endangered Species During the Renewal Term

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

The NRC determined that impacts to threatened or endangered species were a Category 2 issue because the status of species is reviewed on an ongoing basis, and site-specific assessment is required to determine whether any identified species could be affected by refurbishment activities or continued plant operations through the renewal period. This issue requires consultation with appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected by continued operation of the nuclear plant during the license renewal term. The presence of threatened or endangered species in the vicinity of the St. Lucie site is discussed in Sections 2.2.5 and 2.2.6.

4.6.1 Aquatic Species

Sections 2.2.5.1 and 2.2.5.2 of this supplement discuss aquatic habitats at St. Lucie Units 1 and 2. Section 2.2.5.3 presents a list of Federally threatened or endangered species and State species of special concern that may occur at St. Lucie Units 1 and 2. In this section, the environmental consequences of the plant operation to sea turtles, manatees, whales, three species of fish, and Johnson's seagrass are assessed.

4.6.1.1 Turtles

During the almost 20 years of commercial operation of St. Lucie Units 1 and 2, the only notable effect of the facility's operation on protected species has been related to sea turtles that have entered the intake canal. Soon after startup of St. Lucie Unit 1, in 1976, sea turtles were discovered in the intake canal (Ecological Associates 2000; NRC 1982b). These turtles entered the offshore velocity cap intake and were swept through the intake pipe into the canal. A program was initiated to capture the turtles from the intake canal and return them to the ocean. In 1978, a large-mesh (20-cm [8-in.]) barrier net was deployed in the canal to capture turtles before they transited the entire intake canal, entered the intake wells, and became impinged on the traveling intake screens. A biological assessment and Endangered Species Act Section 7 consultation was completed in 1982 (NRC 1982b) to address turtle entrapment in light of the pending construction and operation of St. Lucie Unit 2. At that time, the turtle entrapment history at St. Lucie Unit 1 was approximately 150 turtles per year from 1976 to 1981. Mortality rates for loggerhead (*Caretta caretta*) and green sea turtles (*Chelonia mydas*) for this period were 14.6 percent and 8.9 percent, respectively. Projecting mortality losses to include operation of St. Lucie Unit 2, the biological assessment indicated that turtle losses at St. Lucie Units 1 and 2 would represent 0.1 percent (loggerhead sea turtles) to 0.03 percent (green sea turtles) of the respective adult Caribbean populations. It was concluded that no impact to the population of either species would be expected (NRC 1982b). The assessment made several recommendations for enhancement of the ongoing capture-release and beach-nest monitoring programs.

During 1995, in response to an increase in the number of sea turtles that had entered the intake canal, particularly green sea turtles, the NRC reinitiated the Endangered Species Act Section 7 consultation process with the National Marine Fisheries Service (NMFS). During this process, construction of a new, smaller mesh barrier east of the large mesh barrier was identified as appropriate, and construction of this small-mesh (13-cm [5-in.]) barrier net was completed in January 1996. The size of the mesh was selected to be smaller than any of the green sea turtles that had entered the intake canal during the first half of 1995. The new net was located halfway between the old 20-cm (8-in.) mesh barrier net and the intake headwall, thus confining sea turtles that entered the intake canal to a smaller area and facilitating their safe capture and release. The new net is anchored along the bottom of the canal and held up by an aerial wire strung between towers on the sides of the canal. The net is inspected and maintained regularly.

As a result of the 1995 consultation, the NMFS issued a biological opinion (NMFS 1997). In the biological opinion, the NMFS concluded that the continued operation of St. Lucie Units 1 and 2 is not likely to jeopardize the existence of the sea turtle species. To increase protective measures for the turtles, NMFS included an incidental take statement in the biological opinion. This statement specified the permissible annual mortality level of sea turtles entering the intake

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canal. The requirements of the incidental take statement were incorporated as part of the St. Lucie Units 1 and 2 OLS. If the annual mortality level criteria were exceeded, a new Section 7 consultation would be required.

In November 1999, the NRC formally requested that the Section 7 process be initiated after St. Lucie Units 1 and 2 exceeded the NMFS's anticipated incidental take of green turtles per year established in the incidental take statement of the 1997 biological opinion. In March 2000, FPL submitted a report to NMFS analyzing the physical and ecological facts influencing sea turtle entrainment levels during the period 1976 through 1998 (Ecological Associates 2000). In May 2001, the NMFS issued its biological opinion and revised the incidental take statement. The biological opinion reiterates the previous conclusions and states:

It is NMFS' biological opinion that the continued use of St. Lucie Nuclear Power Plant's circulating seawater cooling system is not likely to jeopardize the continued existence of the endangered green, leatherback, hawksbill, and Kemp's ridley sea turtles or the threatened loggerhead sea turtle (NMFS 2001).

The NMFS specified that the annual incidental capture could be up to 1000 turtles with that number being in any combination of the 5 species found in the area. The permissible annual mortality of entrapped green and loggerhead sea turtles that is causally related to plant operation for the next 10 years is greater than or equal to 1 percent of the total combined number of green and loggerhead sea turtles captured, rounded up to the next whole turtle. The permissible mortality for the other three species of sea turtles found in the area are two Kemp's ridley turtles (*Lepidochelys kempi*) per year and one hawksbill (*Eretmochelys imbricata*) or leatherback turtle (*Dermochelys coriacea*) every 2 years for the next 10 years. Some of the terms and conditions of the previous opinion were also revised. Specifically, there are additional requirements for the intake canal capture-and-release program. Citing the loss rate on flipper tags and the scarring that can result, the NMFS now requires all turtles captured in the intake canal to be tagged with a passive integrated transponder tag. Those turtles not exhibiting flipper scarring and damage also will be flipper-tagged so data can continue to be collected on loss rates. Additionally, FPL biologists must notify staff from the Florida Sea Turtle Stranding and Salvage Network of any sick or injured turtles within 30 minutes of discovery so the turtles can receive proper attention. The NMFS again stipulated that if the incidental take statement requirements are "greater than" rather than "greater than or equal to," then a new Section 7 consultation is required (NMFS 2002a).^(a)

In addition to the take restrictions, FPL has a program in place at St. Lucie Units 1 and 2 to mitigate the effects on sea turtles that enter the intake canal. This program includes recovery

(a) This clarification was an error, which was corrected in subsequent correspondence (see last paragraph of 4.6.1.1 and NMFS [2002b]).

of turtles from the intake canal and release to the ocean, beach-nest monitoring, beach-stranding monitoring, and compliance with facility lighting restrictions to protect turtles. The canal-monitoring program is based on the protection afforded by barrier nets in the canal. This system of barriers restricts turtles to the eastern end of the canal, where capture efficiency is greatest and residency time is reduced. The canal and barrier nets are normally monitored 7 days a week, 8 to 12 hours per day, by onsite biologists. In addition to entanglement nets, which are used only in daylight hours and under continual surveillance, turtles are removed by dip nets and hand captured by divers. These captures reduce residence time for turtles in the canal. FPL constantly evaluates its netting program to minimize trauma to turtles and to maximize capture efficiency. Captured turtles are identified, measured, weighed, tagged, and examined for health condition (Ecological Associates 2000). Healthy turtles are released to the ocean the day of capture. Sick or injured turtles are sent to rehabilitation facilities determined by the FFWCC. Dead turtles are processed similarly and, if in fresh condition, necropsied. Additional mitigation carried out by FPL includes performance of sea turtle nesting surveys, participation in the Sea Turtle Stranding and Salvage Network, and sponsorship of educational public sea turtle walks. FPL has also created a vegetative light screen and uses shielded security lighting to prevent direct lighting of the beach. This is done to avoid disorientation of turtle hatchlings and discouragement of females from nesting near the St. Lucie site. FPL also participates in a 24-hour, on-call (beach) stranding monitoring program (FPL 1995).

The increase in the number of sea turtles entering the intake canal at St. Lucie Units 1 and 2 over the operating history of the plant is likely due to an increase in turtle abundance in the area (NMFS 1997). NMFS acknowledged that protective measures have been refined and enhanced over the years. Improvements to the canal capture program have included improvements to the barrier net and capture techniques, and leaving the entanglement nets in the water for longer time intervals. The turtle barrier net installed in 1996 greatly restricts the movement of turtles within the intake canal and facilitates their capture and removal. Since 1996, mortality rates have been less than 1 percent for loggerhead and green sea turtles (NMFS 1997).

At the initiation of the process to prepare this SEIS, NRC staff contacted the NMFS to informally consult on the status of protected species in the vicinity of St. Lucie Units 1 and 2. In a letter dated June 3, 2002 (NRC 2002c), the NRC staff informed NMFS that the licensee had requested a renewal of the OL for St. Lucie Units 1 and 2. Based on the existence of the May 4, 2001, biological opinion, the NRC staff believed that no additional consultation is necessary at this time related to the license renewal effort. NMFS responded in a letter dated July 30, 2002, (NMFS 2002b) stating that "consultation should be reinitiated if take is greater than or equal to that of the May 4, 2001, Opinion." The letter also states that with respect to the St. Lucie license renewal application, "...NOAA Fisheries does not believe additional consultation is required at this time." By letter dated August 23, 2002 (NRC 2002d), the NRC staff requested reinitiation of consultation with NMFS regarding the incidental capture of green

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and loggerhead turtles at St. Lucie Units 1 and 2. On February 10, 2003 (NRC 2003) the NRC staff summarized the circumstances surrounding the 6 mortalities in 2001 and described modifications and improvements in the intake canal made by the licensee to prevent a reoccurrence of the high 2001 mortality rate. The NRC staff concluded that the elevated mortality rate during 2001 was an unusual occurrence primarily resulting from severe weather and a block net system that could not cope with the unusually high debris loading present in the water column. Modifications to the canal and block net system made by the licensee in the Fall of 2002 should minimize or prevent future episodes of higher than expected mortality. As discussed above, the NRC has a long history of Section 7 consultations with NMFS at the St. Lucie plant and expects the consultation interactions to continue throughout the operating life of the facility.

4.6.1.2 Mammals

Six species of protected mammals (five species of whales and the Florida manatee) occur in vicinity of the St. Lucie site. There have been five occasions when manatees have entered in the intake canal. During 1991, FPL coordinated capture efforts with the FWS and FDEP (predecessor to the FFWCC). After capture, the animals underwent evaluation and rehabilitation and were released to the wild. Except for the first manatee, the animals were removed from the canal within a day of each first sighting. Two of these animals were taken to rehabilitation facilities before their release. One was treated for deep boat propeller wounds it incurred before entering the canal, and one appeared to be a small calf separated from its mother. None of the manatees appeared to have been harmed or to have died as a result of entering the intake canal. FPL procedures require coordination with the FFWCC on the capture and evaluation of entrapped manatees. FPL assists the FFWCC, as needed, in transporting ill or injured animals to approved rehabilitation facilities and in releasing animals that have entered the intake canal back to the wild (Ecological Associates 2001).

In addition to potential impacts from the water intake system, the attraction to or contact with the warm waters discharged from the plant need to be considered. The discharge canal transports the heated cooling water to two discharge pipes. The pipes transport water beneath the beach and dune system back to the Atlantic Ocean. The pipes extend about 460 m (1500 ft) and 1040 m (3400 ft) offshore and terminate in a Y-port and a multiport diffuser. The discharge of heated water through the Y-port and multiport diffusers ensures distribution over a wide area and rapid and efficient mixing with ambient waters (FPL 1996; Foster Wheeler 2000). Modeling studies presented by the U.S. Atomic Energy Commission (AEC) and NRC in the operating stage FESs indicate that the areas of the thermal plumes to the 1.1°C (2°F) isotherm from the St. Lucie Units 1 and 2 diffusers under typical conditions would be about 73 ha (180 ac) and 71 ha (175 ac), respectively (AEC 1973; NRC 1982a). Considering that some of the manatee captures have occurred during summer months, there seems to be no compelling

evidence to infer that manatees congregate at, or are attracted to, the warm water discharges from St. Lucie Units 1 and 2.

The manatee inhabits the Indian River Lagoon and Atlantic coastal waters off Hutchinson Island, although preferred habitats are in the Indian River Lagoon and other inland waterways. The entire inland section of water known as the Indian River is designated as critical habitat for the manatee (50 CFR 17.108). Manatees are mostly found where food sources are abundant. They do occasionally travel up and down the coast near shore. Water is not withdrawn or discharged to the Indian River for normal operations at St. Lucie Units 1 and 2, and there is little attached vegetation in the nearshore environment adjacent to the plant. Manatees are present in the area known as Big Mud Creek within the plant boundaries. This area has been closed to public access due to NRC security concerns, and any boats that are operated within Big Mud Creek are required to travel at idle speed and produce no wake.

Five manatees have entered the offshore intake structures and were entrapped in the intake canal since 1990 (personal communication Tom Abbatiello, March 20, 2003). FPL, FWS, and the FDEP worked together to capture and remove the manatees. Two of the animals were taken to marine mammal care and rehabilitation facilities before release; none of the manatees sustained injuries because of entrainment or residency in the intake canal. One animal apparently sustained a prop injury and the other was a calf separated from its mother. There have been no mortalities to manatees resulting from entrainment at St. Lucie Units 1 and 2.

There are procedures in place for FPL to coordinate capture and evaluation of entrapped manatees with FWS. FPL assists FWS in transporting ill or injured animals to approved rehabilitation facilities and releasing entrapped animals back into the wild.

While manatees also inhabit the freshwater environs near St. Lucie Units 1 and 2, this habitat is not a designated manatee protection area and is not where the offshore intakes are located. In designating manatee protection areas throughout peninsular Florida, FWS considered the needs of the species on an ecosystem level in order to address life requirements of the manatee and to progress toward recovery of the species. Indian River was considered by FWS as a potential manatee protection area. The FWS has stated that the Indian River may warrant further consideration, particularly if manatees do not make satisfactory progress toward recovery. However, the Indian River was not included in FWS' most recent designation of manatee protection areas (FWS 2002b).

Five species of whales are known to occur in the vicinity of the St. Lucie site. Because of their size and habits, adult whales are unlikely to be entrained with cooling water. Additionally, whales do not appear to be attracted to the thermal discharges. The only incident involving a whale at the St. Lucie plant occurred in March 1982, when a right whale became entangled in

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gill nets used to monitor offshore fish populations. The whale was untangled and released, unharmed.

4.6.1.3 Johnson's Seagrass

Johnson's seagrass is found in the Indian River Lagoon, most often near inlets. Major threats to Johnson's seagrass include loss of habitat through dredge and fill activities and degradation of water clarity. Due to turbulence and sediment instability, it is unlikely that Johnson's seagrass could inhabit the nearshore waters off Hutchinson Island. Water depths and anoxic bottom conditions probably preclude its presence in the dredged channel of Big Mud Creek. Consequently, the species is not likely to suffer thermal or other impacts associated with operators of St. Lucie Units 1 and 2 (Ecological Associates 2001).

4.6.1.4 Fish

There are no Federally protected fish species in the vicinity of St. Lucie Units 1 and 2; however, there are three State-protected species. The Atlantic sturgeon (*Acipenser oxyrinchus*) occurs in the Atlantic Ocean near the plant, but they have not been collected in any of the impingement samples at the plant (FPL 2001a). Rivulus (*Rivulus marmoratus*) occurs along the margins of the wetlands onsite. Because plant operations are not expected to involve the loss of wetlands, there should be no impacts to rivulus populations (St. Lucie County 2002). The common snook (*Centropomus undecimalis*) is a highly prized recreational species common to the Indian River Lagoon and nearshore ocean water adjacent to the plant. FPL coordinates the removal and assessment of snook with the appropriate wildlife agencies and assists in their return to the ocean. This program reduces the extent of impacts to snook entrained at St. Lucie Units 1 and 2.

4.6.2 Terrestrial Species

There are a number of Federally listed threatened or endangered terrestrial species in St. Lucie County (Table 2.3), but none has been observed to regularly inhabit the immediate vicinity of St. Lucie Units 1 and 2. However, eastern indigo snakes (*Drymarchon corias couperi*) are assumed to be present at or near the site because they have been observed on Hutchinson Island and gopher tortoise burrows are present within the boundaries of the St. Lucie site. Eastern indigo snakes often use abandoned gopher tortoise burrows as dens and are often found in areas with plentiful gopher tortoise burrows. FPL has a program to train personnel involved with site and transmission line right-of-way maintenance to recognize and avoid indigo snakes in the field. Southeastern beach mice (*Peromyscus polionotus neveiventris*) could be present near the plant site, but they have not been found during any recent surveys on Hutchinson Island and may have been extirpated from the island. Other species such as the wood stork (*Mycteria americana*) and the bald eagle (*Haliaeetus leucocephalus*) are occasional

visitors to the plant vicinity. There have been no reported collisions or electrocutions of wood storks, bald eagles, or any other birds at the St. Lucie site or along the transmission lines.

Several Federally listed threatened or endangered species may be present in the vicinity of the St. Lucie transmission line right-of-way. The Florida scrub jay (*Aphelocoma coerulescens*) inhabits the transmission line right-of-way on the eastern edge of the Savannas State Preserve. The Audubon's crested caracara (*Polyborus plancus audubonii*), Everglades snail kite (*Rostrhamus sociabilis*), and American alligator (*Alligator mississippiensis*) occasionally may be present in the transmission line right-of-way. Plant species potentially occurring near the transmission line right-of-way include the fragrant prickly apple (*Harrisia [Cereus] eriophorus*) and the four-petal paw paw (*Asimina tetramera*). The transmission line right-of-way maintenance practices employed by FPL are likely to have little or no detrimental impact on the species potentially present in or near the transmission line rights-of-way, and in some cases the maintenance practices may be beneficial. For instance, thinning of the larger trees on the east side of the Savannas State Reserve may help to maintain the open shrubby habitat preferred by the Florida scrub jay.

Interactions with FWS were initiated by FPL in April 2001 (FPL 2001c), and an informal consultation with FWS was initiated in February 2002 by the NRC with a request for information concerning which species are potentially present in the vicinity of St. Lucie Units 1 and 2 (NRC 2002a). The FWS responded to NRC with a list of species potentially present in the vicinity of the site in March 2002 (FWS 2002a). NRC staff met with representatives from FWS in December 2001 and April 2002 to discuss potential impacts to threatened or endangered species from continued operation of St. Lucie Units 1 and 2. Correspondence related to this informal consultation is provided in Appendix E.

The staff evaluated the potential impacts of continued operation of St. Lucie Units 1 and 2 for an additional 20-year license term to Federally listed threatened or endangered species and sent this evaluation to the FWS in July 2002 (NRC 2002b). This biological assessment is included in Appendix E of this SEIS. In its evaluation, the staff concluded that the proposed license renewal was not likely to adversely affect the eastern indigo snake, bald eagle, wood stork, southeastern beach mouse, Florida scrub jay, four-petal paw paw, and fragrant prickly apple. License renewal was determined to have no effect on Audubon's crested caracara, Everglades snail kite, Lakela's mint (*Dicerandra immaculate*), tiny milkwort (*Polygala smallii*), American alligator, or any other Federally listed threatened or endangered terrestrial species. FWS concurred with these conclusions in October 2002 (FWS 2002c). Copies of correspondence related to this consultation are provided in Appendix E.

State of Florida-listed threatened, endangered, or other species of concern (Table 2-3) were not specifically considered within the NRC's June 2002 evaluation. The staff has determined that the generic conclusions regarding transmission line maintenance impacts on wildlife and

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wetlands, bird collisions with power lines, the effects of electromagnetic fields, and plant and cooling system operation effects on wildlife and native vegetation are applicable to the State-listed species, and therefore the potential impacts are SMALL, and additional mitigation measures are not warranted.

4.6.3 Conclusion

The staff has reviewed the available information including that provided by the applicant, the FWS, the FFWCC, the scoping process, and other public information sources. Using this information, the staff evaluated the potential impacts to threatened or endangered species that could be affected by continued operation and maintenance of St. Lucie Units 1 and 2 and associated transmission lines. It is the conclusion of the staff that the potential impacts to Federally listed threatened or endangered species of an additional 20-year license term for operation of St. Lucie Units 1 and 2 are SMALL.

During the course of its evaluation, the staff considered mitigation measures for continued operation of St. Lucie Units 1 and 2 along with cumulative impacts of past, current, and future activities at the site. Based on this evaluation, the staff expects that mitigation measures currently in place concerning sea turtle protection and recovery are appropriate and no additional mitigation measures are warranted. Additionally, the staff expects that FPL will continue to maintain the transmission line right-of-way on the eastern edge of the Savannas State Preserve as it has since constructing the transmission line, and that these maintenance procedures will continue to provide or enhance habitat for the Florida scrub jay and other threatened or endangered species potentially present in that area. This will provide adequate mitigation for potential impacts to terrestrial threatened or endangered species, and no additional mitigation measures are warranted.

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

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

4.8 Summary of Impacts of Operations During the Renewal Term

Neither FPL nor the staff is aware of information that is both new and significant related to any of the applicable Category 1 issues associated with the operation of St. Lucie Units 1 and 2 during the renewal term. Consequently, the staff concludes that the environmental impacts associated with these issues are bounded by the impacts described in the GEIS. For each of these issues, the GEIS concluded that the impacts would be SMALL and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

Plant-specific environmental evaluations were conducted for 11 Category 2 issues applicable to the operation of St. Lucie Units 1 and 2 during the renewal term and for environmental justice and chronic effects of electromagnetic fields. For all 10 Category 2 issues and environmental justice, the staff concluded that the potential environmental impact of renewal term operations of St. Lucie Units 1 and 2 would be of SMALL significance in the context of the standards set forth in the GEIS and that additional mitigation would not be warranted. For threatened or endangered species, the staff's conclusion is that the impact resulting from license renewal would be SMALL and further mitigation is not warranted. In addition, the staff determined that a consensus has not been reached by appropriate Federal health agencies regarding chronic adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is possible.

4.9 References

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

36 CFR 800. Code of Federal Regulations, Title 36, *Parks, Forests, and Public Property*, Part 800, "Protection of Historic Properties."

50 CFR 17. Code of Federal Regulation, Title 50, *Wildlife and Fisheries*, Part 17, "Endangered and Threatened Wildlife and Plants."

59 FR 7629. Executive Order 12898. "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations." *Federal Register*. Vol. 59, No. 32. February 11, 1994.

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