

4.0 Environmental Impacts of Operation

Environmental issues associated with plant operation during the renewal term were discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996a; 1999a).^(a) The GEIS included 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 were 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 characteristics.
- (2) A single significance level (i.e., SMALL, MODERATE, OR LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).
- (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are 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 did 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 Turkey Point Plant. Section 4.1 addresses issues applicable to the Turkey Point Plant cooling canals. Section 4.2 addresses issues related to transmission lines and land use. Section 4.3 addresses the radiological impacts of normal operation. 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. Section 4.6 discusses the impacts of renewal-term operations on threatened and endangered species. Section 4.7 addresses new information that was raised during the scoping period. The results of the evaluation of environmental issues related to operation during the renewal term are summarized in

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

Section 4.8. Finally, Section 4.9 lists the references for Chapter 4. Category 1 and Category 2 issues that are not applicable to Turkey Point because they are related to plant design features or site characteristics not found at Turkey Point are listed in Appendix F.

4.1 Cooling System

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to Turkey Point Unit 3 and 4 cooling system operation during the renewal term are listed in Table 4-1. Florida Power & Light Company (FPL) stated in its Environmental Report (ER; FPL 2000a) that it is not aware of any new and significant information associated with the renewal of the Turkey Point Unit 3 and 4 operating licenses (OLs). The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2000a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of the issues, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

- c 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, 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 during the renewal term beyond those discussed in the GEIS.

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

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

Table 4-1. Category 1 Issues Applicable to the Operation of the Turkey Point Units 3 and 4 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)	
Scouring caused by discharged cooling water	4.2.1.2.3; 4.4.2.2
Eutrophication	4.2.1.2.3; 4.4.2.2
Discharge of chlorine or other biocides	4.2.1.2.4; 4.4.2.2
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4; 4.4.2.2
Discharge of other metals in wastewater	4.2.1.2.4; 4.3.2.2; 4.4.2.2
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
Gas supersaturation (gas bubble disease)	4.2.2.1.8; 4.4.3
Low dissolved oxygen in the discharge	4.2.2.1.9; 4.3.3; 4.4.3
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.2.2.1.10; 4.4.3
TERRESTRIAL RESOURCES	
Cooling pond impacts on terrestrial resources	4.4.4
HUMAN HEALTH	
Microbial organisms (occupational health)	4.3.6
Noise	4.3.7

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

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- C 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, the staff’s site visit, the scoping process, or its evaluation of other available information including the National Pollutant Discharge Elimination System (NPDES) permit for Turkey Point Units 3 and 4. 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.

- C 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, the staff’s site visit, the scoping process, or its evaluation of other available information including the NPDES permit for Turkey Point Units 3 and 4. 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.

- C 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, the staff’s site visit, the scoping process, or its evaluation of other available information including the NPDES permit for Turkey Point Units 3 and 4 and the ecological risk assessment study for the cooling canal system (ESE 2000). 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.

- C 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 condenser tubes at Turkey Point Units 3 and 4 are titanium, eliminating problems associated with copper alloys. Further, 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 available information, including the ecological risk assessment for the cooling canal system (ESE 2000). 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.

- C 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, 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.

- C 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, 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.

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- C 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, 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.

- C 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, 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 low dissolved oxygen during the renewal term beyond those discussed in the GEIS.

- C 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, 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.

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

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

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

- C Microbiological organisms (occupational health). Based on information in the GEIS, the Commission found that

“Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize worker exposures.”

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 impacts of microbiological organisms during the renewal term beyond those discussed in the GEIS.

- C 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, 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 Turkey Point Units 3 and 4 are discussed in the section that follows, and are listed in Table 4-2. Although the FPL ER identified only microbiological organisms (public health) as an applicable Category 2 issue, the staff determined that all the Category 2 issues pertaining to plants with cooling ponds are applicable to Turkey Point Units 3 and 4.

Table 4-2. Category 2 Issues Applicable to the Operation of the Turkey Point Units 3 and 4 Cooling System 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
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING POND HEAT-DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	4.2.2.1.2; 4.3.3	B	4.1.1
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
HUMAN HEALTH			
Microbiological organisms (public health)(plants using lakes or canals or cooling towers that discharge into a small river)	4.3.6	G	4.1.4

4.1.1 Entrainment of Fish and Shellfish in Early Life Stages

For plants with cooling ponds, including the Turkey Point cooling canal system, entrainment of fish and shellfish in early life stages into cooling water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment before license renewal.

The staff independently reviewed the Turkey Point ER (FPL 2000a), visited the site, and reviewed the applicant’s NPDES Permit FL0001562, issued January 7, 2000, and in force until January 6, 2005 (FPL 2000a, Appendix E). The closed-loop, recirculating Turkey Point cooling canal system neither withdraws nor discharges surface water to any surface water of the United States or the State of Florida. Therefore, the staff concludes that impacts of entrainment on early life stages are limited to the cooling canal system, and there are no impacts from entrainment of fish and shellfish in early life stages on biotic resources of Biscayne Bay, Card Sound, or other waters.

A species list or faunal survey for the fish and shellfish of the cooling canal system is not available. Suitable spawning habitat for game species that favor ocean passes or open bays (FFWCC 1999), such as the common snook and tarpon, is not present in the closed canal system. The applicant states that game fish numbers in the cooling canal system have declined to very low numbers due to lack of spawning habitat. The applicant reports that the

predominant fish in the canals are killifish and other live-bearers (FPL 2000a). Any impacts on fish and shellfish populations within the cooling canal system from entrainment of early life stages would not impact recreational or commercial fishing because the cooling canal system is closed to fishing or other resource-based uses.

Based on this review, the staff concludes that the potential impacts of the cooling-water-intake system's entrainment of fish and shellfish in early life stages are SMALL, and mitigation is not warranted.

4.1.2 Impingement of Fish and Shellfish

For plants with once-through cooling systems, including the Turkey Point cooling canal system, impacts of fish and shellfish on debris screens of cooling-water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment before license renewal.

The staff independently reviewed the Turkey Point ER (FPL 2000a), visited the site, and reviewed the applicant's NPDES Permit FL0001562, issued January 7, 2000 and in force until January 6, 2005 (FPL 2000a, Appendix E). The closed-loop, recirculating Turkey Point cooling canal system neither withdraws nor discharges surface water to the waters of the State. Therefore, the staff concludes that impacts from impingement of fish and shellfish are limited to fish and shellfish in the cooling canals and there are no impacts from impingement on fish and shellfish of Biscayne Bay, Card Sound, or other waters.

Impacts from impingement of fish and shellfish are limited to the populations of fish and shellfish residing in the cooling canal system. A species list or faunal survey for the fish and shellfish of the cooling canal system is not available. Suitable spawning habitat for game species that favor ocean passes or open bays (FFWCC 1999), such as the common snook and tarpon, is unlikely to occur in the closed canal system, although some gamefish spawning in the canals may still occur. The applicant reports that the dominant fish species in the cooling canal system are killifish and other live-bearers (FPL 2000a). The preferred habitat for these fish are shallows and aquatic vegetation, and individuals are not widely ranging. It is unlikely that populations of such species would be greatly affected by impingement in the intakes of the nuclear plants. Any impacts on fish and shellfish populations within the cooling canal system from impingement would not impact recreational or commercial fishing, because the cooling canals are closed to fishing or other resource-based uses.

The staff has reviewed the available information relative to potential impacts of the cooling water intake system on the impingement of fish and shellfish, and concludes that the potential impacts are SMALL, and mitigation is not warranted.

4.1.3 Heat Shock

For plants with cooling ponds, including the Turkey Point cooling canal system, the effects of heat shock are listed as a Category 2 issue and require plant-specific evaluation before license renewal.

The staff independently reviewed the Turkey Point ER, visited the site, and reviewed the applicant's NPDES Permit FL0001562, issued January 7, 2000 and in force until January 6, 2005 (FPL 2000a, Appendix E). The closed-loop, recirculating Turkey Point cooling canal system neither withdraws nor discharges surface water to the waters of the State. Therefore, the staff concludes that any impacts from heat shock would be limited to the cooling canal system, and there would be no impacts from heat shock on biotic resources of Biscayne Bay, Card Sound, or other waters.

A species list or faunal survey for the fish and shellfish of the cooling canal system is not available. Suitable spawning habitat for game species that favor ocean passes or open bays (FFWCC 1999), such as the common snook and tarpon, is unlikely to occur in the closed canal system. The applicant reports that the dominant fish species in the cooling canals are killifish and other live-bearers (FPL 2000a). These hardy fish are known from a wide variety of habitats, including hypersaline and thermally challenged environments. It is unlikely that populations of these species would suffer other than minor impacts from heat shock.

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

4.1.4 Microbiological Organisms (Public Health)

For plants discharging cooling water to cooling ponds, lakes, canals, or small rivers, the effects of microbiological organisms on human health are listed as a Category 2 issue and require plant-specific evaluation before license renewal.

All Turkey Point units use a closed-cycle cooling system that uses a series of shallow canals to cool the heated effluent and to recycle water for re-use. Although there is a potential for deleterious thermophilic microorganisms to be associated with the canals, the high temperature of the water as it is discharged to the canals, the salinity of the water, and high penetration of ultraviolet light provide an environment that is not conducive to the survival and reproduction of pathogenic microorganisms.

In addition, there are few if any potential pathways for significant human exposure to such organisms if they were to exist in the cooling system water. The plants do not use sprays or cooling towers that could produce respirable aerosols. Prohibitions against swimming and fishing in the cooling canals preclude direct contact and ingestion exposure routes.

FPL conducted an analysis of the potential public health impacts of microbiological organisms and submitted the results to the Florida Department of Health (FDOH) for review and comment (Hovey 1999a). FDOH concurred with the FPL conclusion and indicated "that there is minimal public health risk from the cooling canals at the Turkey Point Nuclear Plant" (Heber 1999).

The conditions associated with the Turkey Point cooling canal system are not favorable for survival and reproduction of pathogenic biological microorganisms, and the potential exposure pathways are limited. Analyses and evaluations conducted by FPL as published in the ER (FPL 2000a), including the results of consultation with the FDOH, indicate that the impact of deleterious microbiological organisms during continued operation of the plant during the renewal term are expected to be minimal. Consequently, the staff concludes that the potential impacts of microbiological organisms on public health are SMALL, and mitigation is not warranted.

4.2 Transmission Lines

The *Final Environmental Statement for Turkey Point Plant* (FES; AEC 1972) describes seven transmission lines that connect Turkey Point Units 3 and 4 with the transmission system. An additional transmission line was constructed in the early 1990s, and four other lines connect the Davis substation with other substations (Figure 2-5 and Table 2-1). These transmission corridors cover approximately 930 ha (2300 ac) over a total corridor length of approximately 92 km (57 mi). Tree trimming is normally only required at mid-span or when exotic species such as Australian pine invade the tower pads or corridor. Herbicides are used occasionally, primarily applied to individual trees or shrubs to prevent re-sprouting, although broadcast applications are used to control exotic grasses in some of the urban or suburban areas. FPL requires the use of State-licensed applicators for herbicides and only uses nonrestricted-use products. Regular mowing is normally also used for maintenance of corridors in suburban areas. FPL uses a computer database to prepare management prescriptions for each section of transmission line corridor 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 Turkey Point Units 3 and 4 are listed in Table 4-3. FPL stated in its ER that it is not aware of any new and significant information associated with the renewal of the Turkey Point Units 3 and 4 OLs. No significant new information has been identified by the staff

Table 4-3. Category 1 Issues Applicable to the Turkey Point 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

in its independent review. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the GEIS concluded that the impacts are SMALL, and 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 Table B-1, for each of these issues follows:

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

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

The staff has not identified any significant new information during its independent review of the FPL ER, the staff's site visit, the scoping process, consultation with the U.S. Fish and Wildlife Service (FWS) and the Florida Fish and Wildlife Conservation Commission

(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.

- C 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 FPL ER, 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.

- C 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 FPL ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of electromagnetic fields on flora and fauna during the renewal term beyond those discussed in the GEIS.

- C 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 FPL ER, 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 on flood plains and wetlands on the power line right-of-way during the renewal term beyond those discussed in the GEIS.

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- C 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 FPL ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no air quality impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

- C 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 FPL ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no onsite land-use impacts during the renewal term beyond those discussed in the GEIS.

- C 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 FPL ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts on use 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. Category 2 Issues Applicable to the Turkey Point Transmission Lines During the Renewal Term

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

4.2.1 Electromagnetic Fields—Acute Effects

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

There are four 230-kV transmission lines that connect the Turkey Point switchyard to the plant startup and main transformers and eight 230-kV transmission lines that leave the Turkey Point switchyard. These lines were constructed before the current (1997) NESC standard was adopted. Therefore FPL performed an analysis to confirm that the onsite and offsite lines conform to the current NESC clearance requirements for limiting electric shock hazard. The NESC requires that transmission lines be designed to limit the steady-state current due to electrostatic effects to 5 mA root mean square (rms).

The minimum vertical clearance to the roadbed of the lines between the plant and switchyard was calculated to be 11.6 m (38.1 ft) at a temperature of 49EC (120EF). Under these conditions, the EzEMF computer code (EzWare 1998) calculated the maximum electric field strength 1 m (3 ft) above the road to be 2.0 kV/m. Assuming a semi-tractor trailer centered under and perpendicular to the conductors, FPL determined the maximum steady-state short-circuit current to be 1.6 mA rms.

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Using a similar approach for the offsite circuits, FPL found the maximum electric field strength to be 5.4 kV/m in the corridor between the Turkey Point site and the Davis substation. With the tractor trailer and a minimum clearance of 7.6 m (25 ft), this field strength corresponds to a short-circuit current of 4.32 mA.

The maximum steady-state short-circuit currents determined by FPL both onsite and offsite are within the NESC limit of 5 mA. Therefore, the staff concludes that the impact of the potential for electric shock is SMALL, and 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, and will not be until a scientific consensus is reached on the health implications of these fields.

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

“The NIEHS concludes that ELF-EMF [extremely low frequency-electromagnetic field] exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and 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 Turkey Point Units 3 and 4 in regard to radiological impacts are listed in Table 4-5. FPL stated in its ER (FPL 2000a) that it is not aware of any new and significant information associated with

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

the renewal of the Turkey Point OLS. No significant new information has been identified by the staff in its independent review. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

- c. 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 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 impacts of radiation exposures to the public during the renewal term beyond those discussed in the GEIS.

- c. 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.”

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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 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. Refer to Section 4.7 for an evaluation of potential new and significant radiological impacts on human health.

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 2000a) that it is not aware of any new and significant information associated with the renewal of Turkey Point Units 3 and 4 OLS. No significant new information has been identified by the staff in their independent review. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS (NRC 1996a). For all of those 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 4-6. Category 1 Issues Applicable to Socioeconomics During the Renewal Term

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

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

- C 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 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 impacts on public safety, social services, and tourism and recreation during the renewal term beyond those discussed in the GEIS.

- C 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 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 impacts on education during the renewal term beyond those discussed in the GEIS.

- C 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 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 aesthetic impacts during the renewal term beyond those discussed in the GEIS.

- C 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.”

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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 aesthetic impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

Table 4-7 lists the Category 2 socioeconomic issues, which require plant-specific analysis and environmental justice, which was not addressed in the GEIS.

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

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

4.4.1 Housing Impacts During Operations

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

In 1990, the population living within 32 km (20 mi) of Turkey Points Units 3 and 4 was estimated to be approximately 391,800 (Table 2-12). This translates to around 240 persons/km² (625 persons/mi²) living on the land area present within a 32-km (20-mi) radius of the Turkey

Point site.^(a) This concentration falls into the GEIS sparseness Category 4 (i.e., having greater than or equal to 46 persons/km² [120 persons/mi²]).

In 1990, an estimated 2,613,500 people lived within 80 km (50 mi) of the Turkey Point site (Table 2-12), equating to a population density of around 260 persons/km² (665 persons/mi²) on the available land area.^(a) Applying the GEIS proximity measures (NRC 1996a), Turkey Point Units 3 and 4 are classified as Category 4 (i.e., having greater 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 Turkey Point site is located in a high-population area and Miami-Dade County is not subject to growth-control measures that would limit housing development. Based on the NRC criteria, FPL expects housing impacts to be SMALL during continued operations (FPL 2000a).

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 1996a). 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. Although FPL expects to perform these routine activities during scheduled outages, they assumed they would not add more than 60 total employees to their permanent staff during license renewal (FPL 2000a). This addition of 60 permanent workers, plus 124 indirect jobs (FPL 2000a), would result in an increased demand for a total of 184 housing units around the Turkey Point site (or 156 housing units for Miami-Dade County).^(b) The demand for the existing housing units could be met with the construction of new or use of existing, unoccupied housing. In Miami-Dade County, jobs were projected to be approximately 1.2 million in 2000 (FPL 2000a) and the population at around 2.2 million in 2000 (USCB 2001). The increase in projected housing units would not create a discernible change in housing availability, change in rental rates or housing values,

(a) These numbers differ from those presented by FPL in the ER (FPL 2000a). In their calculations, 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. It was 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) This assumes 85 percent of the new hires reside in the county (see Section 2.2.8.1).

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or spur new construction or conversion. As a result, FPL concludes that the impacts would be SMALL and mitigation measures would not be necessary (FPL 2000a).^(a)

The staff reviewed the available information relative to housing impacts and FPL's conclusions. Based on this review, the staff concludes that the impact on housing during the license renewal period would be SMALL, and 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 1996a).

Analysis of impacts on the public water supply system considered both plant demand and plant-related population growth. Section 2.2.2 describes the Turkey Point Units 3 and 4 permitted withdrawal rate and actual use of water. FPL plans no refurbishment at Turkey Points Units 3 and 4, so plant demand would not change beyond current demands (FPL 2000a).

FPL assumed an increase of 60 employees during the license renewal period, the generation of 184 new jobs, and a net overall population increase of approximately 500 as a result of those jobs,^(b) all of which would create SMALL impacts. The plant-related population increase would require an additional 0.0011 to 0.0018 m³/s (0.039 to 0.064 ft³/s) of potable water (FPL 2000a).^(c) This amount is within the residual capacity of the Alexander Orr, Jr., Water Treatment Plant (see Table 2-10) that services Miami-Dade County south of Flager Street, and includes the Turkey Point site. For Florida City and Homestead, the increase in water consumption, assuming all 500 people were located in the two towns, is well within their residual capacity as well. The staff finds that the impact of increased water use is SMALL and mitigation is not warranted.

(a) The FPL estimate of 184 housing units (156 units for Miami-Dade County) is likely to be an extreme "upperbound" estimate. Most of the potentially new jobs would most likely be filled by existing area residents, thus creating no, or little, net demand for housing.

(b) Calculated by assuming that the average number of persons per household is 2.7 (185 jobs X 2.7 = 500) (FPL 2000a).

(c) Calculated assuming that the average American uses between 50 and 80 gallons of water for personal use per day; 500 people x 80 gallons per person/day = 40,000 gallons/day (.0018 m³/s).

4.4.3 Offsite Land Use During Operations

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

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

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

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

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

FPL has identified a maximum of 60 additional employees during the license renewal term plus an additional 124 indirect jobs (total 184) in the community (FPL 2000a). Section 3.7.5 of the GEIS (NRC 1996a) 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, a population density of well over 23 persons/km² (60 persons/mi²), and at least one urban area (Miami) with a population of 100,000 or more within 80 km (50 mi). Consequently, the staff concludes that population changes resulting from license renewal are likely to result in SMALL offsite land-use impacts.

Tax revenue can affect land use because it enables local jurisdictions to be able to provide the public services (e.g., transportation and utilities) necessary to support development.

Section 4.7.4.1 of the GEIS states that the assessment of tax-driven land-use impacts during the license renewal term should consider (1) the size of the plant's payments relative to the community's total revenues, (2) the nature of the community's existing land-use pattern, and (3) the extent to which the community already has public services in place to support and guide development. If the plant's tax payments are projected to be small relative to the community's total revenue, tax-driven land-use changes during the plant's license renewal term would be SMALL, especially where the community has pre-established patterns of development and has provided adequate public services to support and guide development. Section 4.7.2.1 of the GEIS states that if tax payments by the plant owner are less than 10 percent of the taxing

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jurisdictions revenue, the significance level would be small. If the plant's tax payments are projected to be medium to large relative to the community's total revenue, new tax-driven land-use changes would be moderate.

Miami-Dade County is the only local jurisdiction that taxes the Turkey Point Units 3 and 4 directly. FPL's tax payments to the county for Units 3 and 4 since 1995 constitute about 2 percent of the county's total property tax revenue and less than 0.5 percent of the county's total operating budget (Table 2-16). Additionally, the communities in the vicinity of the plant site have pre-established patterns of development and have provided adequate public services to support and guide development.

No adverse effects on offsite land use will occur that are related to the Everglades Restoration Project or other Federal action in the proposed project area. Consequently, the staff concludes that offsite land-use impacts are likely to be SMALL and would not require mitigation.

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 1999b for more discussion of this clarification). The issue is treated as such in this Supplemental Environmental Impact Statement (SEIS).

In the year 2000, most of the roadways within South Miami-Dade County were operating at acceptable levels of service (Miami-Dade County 2000). As discussed in Section 2.2.8.6, the area of population growth in Miami-Dade County is in the southern part. The high-growth projections for the southern part of the county indicate that the population could increase by 2015 by 47 percent to 250 percent (Section 2.2.8.6). Such growth could put tremendous pressure on the local transportation systems in the south end of the county, particularly the Florida Turnpike and U.S. Highway 1. Planned improvements in the southern part of the county include constructing the remaining portions of the South Miami-Dade Busway between SW 112th Avenue and SW 344th Street in Homestead between 2001 and 2005 (Miami-Dade County 2000). Additional road improvements are planned in the south part of the county through the year 2020.

However, none of this expected growth is due directly to increases in employment at the Turkey Point site. The permanent employment associated with Turkey Points Units 3 and 4 is currently 960 employees (FPL and contractors [FPL 2000a]). During periods of refueling, once or twice a year, up to an additional 800 to 900 workers are hired on a temporary basis. The "upper bound" potential increase in permanent staff during the license renewal term is 60 additional workers, or approximately 6 percent of the current permanent and contract work force of 960.

The level of access to the Turkey Point 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 (NHPA) requires that Federal agencies take into account the effects of their undertakings on historic properties. NRC representatives met with a representative of the Florida State Historic Preservation Officer (SHPO) on December 5, 2000 to explain the Turkey Point relicensing project and to obtain from the State relevant information about the area and recommended contacts for additional site-specific information. The historic preservation review process mandated by Section 106 of the NHPA is outlined in regulations issued by the Advisory Council on Historic Preservation at 36 CFR Part 800. Renewal of an OL is an undertaking that could potentially affect historic properties. Therefore, according to the NHPA, the NRC is to make a reasonable effort to identify historic properties in the areas of potential effects. If no historic properties are present or affected, the NRC is required to notify the 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 this instance, there are no known historic or archeological resources at the Turkey Point site, and the Turkey Point Units 3 and 4 license renewal application for continued operations does not include proposals for future land-disturbing activities or structural modifications beyond routine maintenance at the plant. Consultation between the license renewal applicant and the Florida SHPO for this license renewal application was initiated in September 1999. In a letter dated October 22, 1999, the Florida SHPO stated that it was their opinion that the proposed relicensing would "...have no effect on any site listed, or eligible for listing in the National Register" (Matthews 1999).

Continued operation of Turkey Point Units 3 and 4 would have a beneficial effect on any potential unknown or undiscovered historic or archeological resources located in undisturbed areas for the duration of the license renewal period by protecting the natural landscape and vegetation and by providing restricted access to the plant.

Additional care should be taken during normal operational or maintenance conditions to ensure that potential historic properties are not inadvertently impacted. These activities may include

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not only operation of the plant itself, but also land management-related actions such as recreation, wildlife habitat enhancement, or maintaining/upgrading plant access roads throughout the plant site. The environmental impacts of activities undertaken by FPL are managed through the Environmental Protection Plan (Appendix B to each units' operating license) and the licensee's program to implement the requirements of 10 CFR 50.59, "Changes, tests, and experiments." Based on the staff's cultural resources analysis and consultation, the finding that FPL did not identify any major refurbishment activities related to the renewal of the Turkey Point Unit 3 and 4 OLS, and that operation will continue within the bounds of plant operations as evaluated in the FES (AEC 1972), it is the staff's conclusion that the potential impacts on historic and archaeological resources are expected to be SMALL, and mitigation is not 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 Letter 906, *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues* (NRC 1999b).

The staff examined the geographic distribution of minority and low-income populations recorded during the 1990 Census (USCB 1991) within 80 km (50 mi) of Turkey Point Units 3 and 4, encompassing all of Miami-Dade County and parts of Broward and Monroe counties. The analysis was also supplemented by field inquiries to the planning department and social service agencies in Miami-Dade County.^(b)

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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 1999b).
- (b) Miami-Dade County was the focus of this inquiry because all except a small portion of the northwest part of the county lies within the 80-km (50-mi) radius of the Turkey Point site. The staff concluded that any findings of environmental justice issues in the county would warrant further field inquiries in Broward and Monroe counties. For reasons stated later in this section, further investigation was not warranted.

For the purpose of the staff's review, a minority population is defined to exist if the percentage of each minority and aggregated minority category within the census block groups potentially affected by the license renewal of Turkey Point Units 3 and 4 exceeds the corresponding 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^(a) 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. For census block groups within Miami-Dade, Broward, and Monroe counties, the percentage of minority and low-income populations is compared to the percentage of minority and low-income populations in Florida.

FPL followed the convention of including the census tracts. They included the census tracts where at least 50 percent of their area lay within 80-km (50-mi) of Turkey Point Units 3 and 4 (FPL 2000a). Using this convention, the 80-km radius includes 362 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 a minority or low-income population (FPL 2000a). Because the 20 percentage points is a lower threshold, the 50 percent criteria was not needed.

The staff followed the convention of employing census block groups.^(b) Figure 4-1 shows the distribution of minority populations (shaded areas) within the 80-km (50-mi) radius. Within the

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

(b) There are other small differences between the NRC and FPL method of identifying minority and low-income populations. NRC uses "families" below poverty while FPL uses "households" below poverty. A "household" consists of all the persons who occupy a housing unit (house or apartment), whether or not they are related to each other. A family is a group of two or more persons, related by birth, marriage, or adoption, who live together. All such related persons are considered members of one family (HHS 2001). NRC uses "Blacks" while FPL uses "non-Hispanic Blacks." Non-Hispanic Blacks are a subcategory of the Black category. Non-Hispanic Blacks are added to Hispanic Blacks to come up with the total Black population (NRC number). FPL included a census tract within the 80-km (50-mi) radius only if more than 50 percent of the geographic area of the tract falls within the 80-km (50-mi) radius. NRC includes the census block groups if any portion of the group falls within the 80-km (50-mi) radius. These small differences do not impact the overall findings of this section.

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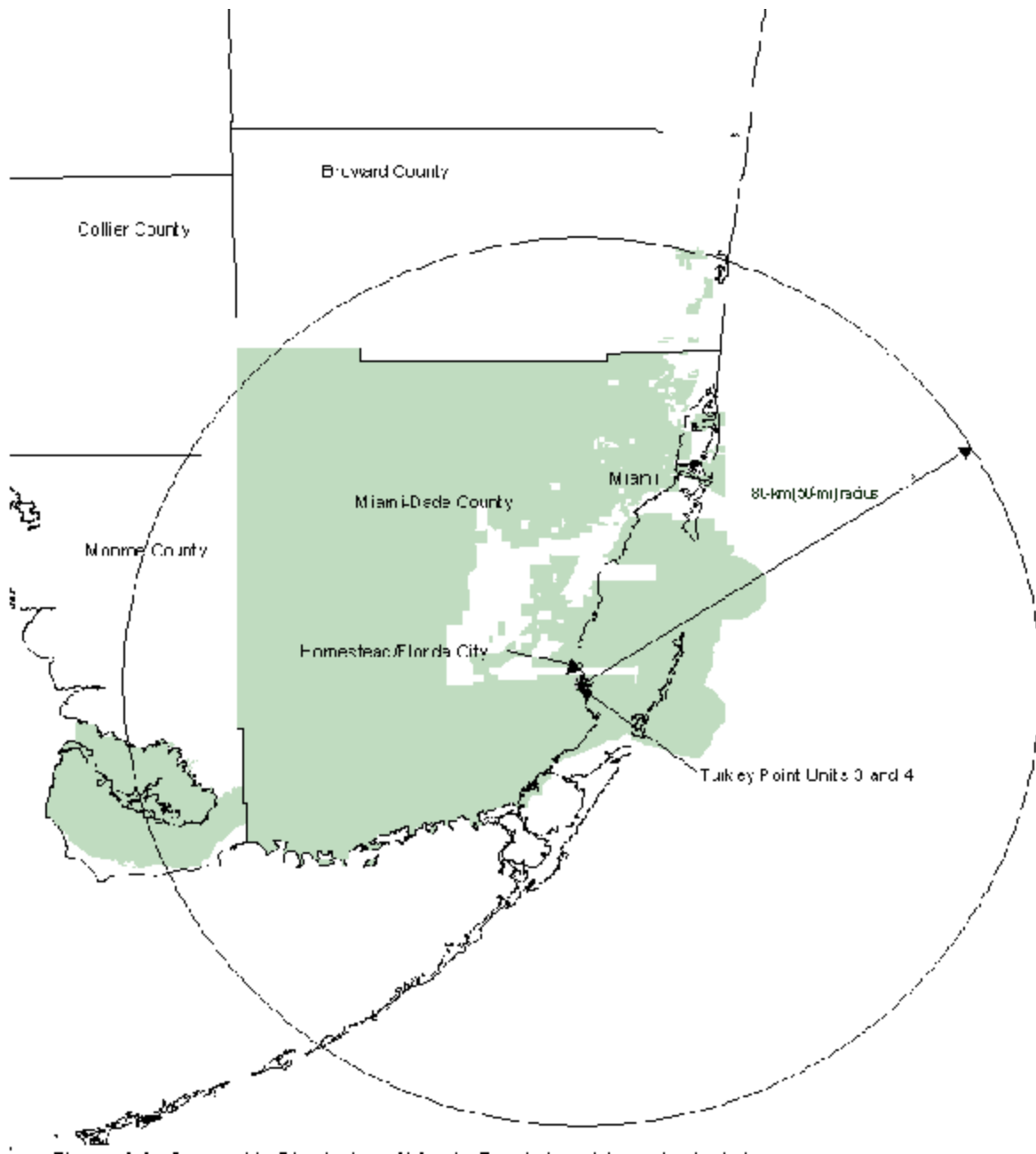


Figure 4-1. Geographic Distribution of Minority Populations (shown in shaded areas) Within 80 km (50 mi) of Turkey Point Site Based on Census Block Group Data^(a)

(a) Note: Some of the census block groups extend into open water.

vicinity of the Turkey Point site, there is a large Hispanic minority population and a smaller Black minority population. In Figure 4-1, there is a large shaded area that covers most of the Florida Everglades in Miami-Dade County. This area, generally lying to the west of the Florida Turnpike, the cities of Homestead, Florida City, and Miami and extending to the boundaries of Broward County on the north and Collier and Monroe counties on the west, is one large census block group. Although the minority population characteristics are similar to other census block groups that are much smaller geographically, this large census block group has a very low population density. It could mistakenly give the impression that there is a large minority population when there is not because of the presence of the Everglades.

Most of the low-income population census block groups (Figure 4-2) in Miami-Dade County are concentrated in central Miami and just outside and to the south of the Miami metropolitan city limits. In Broward County, most of the census block groups are in Fort Lauderdale and along the Miami-Dade/Broward county line.

With the locations of minority and low-income populations identified, the staff proceeded to evaluate whether any of the environmental impacts of the proposed action could affect these populations in a disproportionately high and adverse manner. Based on staff guidance (NRC 1999b), air, land, and water resources within about 80 km (50 mi) of the Turkey Point 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 Turkey Point Units 3 and 4 license renewal can affect human populations are discussed in each associated section. The staff evaluated whether minority and low-income populations could be disproportionately affected by these impacts. The staff found no unusual resource dependencies or practices, such as subsistence agriculture, hunting, or fishing, through which the populations could be disproportionately high and adversely affected. In addition, the staff did not identify any location-dependent disproportionately high and adverse impacts affecting these minority and low-income populations. The staff concludes that offsite impacts from Turkey Point Units 3 and 4 to minority and low-income populations would be SMALL, and no special mitigation actions are warranted.

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 Turkey Point Units 3 and 4 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 Turkey Point Units 3 and 4 OLs (FPL 2000a). The staff has not identified any significant new information during its independent review of the FPL ER (FPL 2000a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to this issue beyond those discussed in the GEIS. For this

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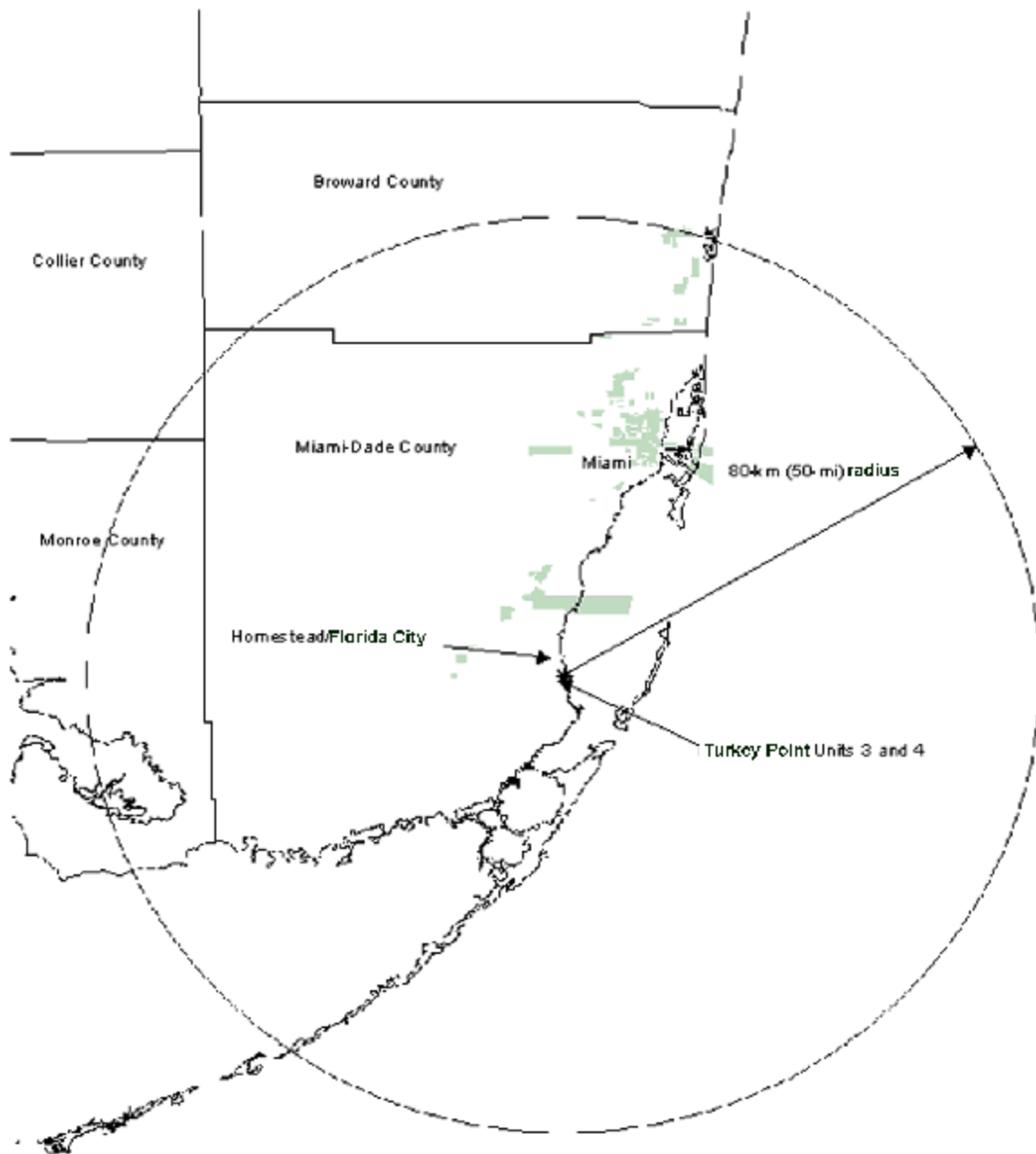


Figure 4-2. Geographic Distribution of Low-Income Populations (shown in shaded areas) Within 80 km (50 mi) of the Turkey Point Site Based on Census Block Group Data^(a)

(a) Note: Some of the census block groups extend into open water.

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 <100 gpm).	4.8.1.1
Groundwater quality degradation (saltwater intrusion)	4.8.2.1
Groundwater quality degradation (cooling ponds in salt marshes)	4.8.3

issue, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

- c. 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, Turkey Point Units 3 and 4 groundwater use 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.

- c. 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.”

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

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degradation impacts associated with saltwater intrusion during the renewal term beyond those discussed in the GEIS.

- c. Groundwater quality degradation (cooling ponds in salt marshes). Based on information in the GEIS, the Commission found that

“Sites with closed-cycle cooling ponds may degrade ground-water quality. Because water in salt marshes is brackish, this is not a concern for plants located in salt marshes.”

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 cooling ponds in salt marshes during the renewal term beyond those discussed in the GEIS.

There are no Category 2 issues related to groundwater use and quality for Turkey Point Units 3 and 4.

4.6 Threatened or Endangered Species

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

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

Assessment of potential impacts was initiated by FPL on September 7, 1999 with letters to FWS and National Marine Fisheries Service (NMFS) (Hovey 1999b; 1999c). Assessment of potential impacts on State species of concern was also initiated by FPL on September 7, 1999 with a letter to FFWCC (Hovey 1999d). The three letters requested information on any deficiencies, concerns, or data needed related to the consultation process. In response to FPL’s letter, the FWS identified the requirement for consultation by the Federal action agency, identified recent studies by FPL on the American crocodile, described the importance of FPL’s conservation activities on American crocodile recovery in south Florida, and provided a table of Federally listed and candidate species and designated critical habitats in south Florida by county (Slack 2000). The NMFS responded to FPL’s letter with a conclusion that the proposed action is not

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

likely to affect species protected by the Endangered Species Act (ESA) under its purview (Hogarth 1999). The FFWCC responded to FPL's letter with a conclusion that the continued operation of Turkey Points Units 3 and 4 will not likely impact State-listed species (Lau 1999).

The staff began consultation with the FWS regarding threatened and endangered species and submitted a biological assessment on August 28, 2001 (Carpenter, 2001) concerning endangered and threatened species that could be affected by continued operation and maintenance of the Turkey Point Plant and associated transmission lines (see Appendix E). FWS concurred with the conclusion in the biological assessment that continued operation of the Turkey Point Plant is not expected to impact fish and wildlife resources (Ferrell, 2001). Therefore, it is the staff's conclusion that the impact on endangered, threatened, or candidate species of an additional 20 years of operation and maintenance of the Turkey Point Plant and associated transmission lines would be SMALL, and further mitigation is not warranted.

4.6.1 Aquatic Species

As described in Section 2.2.5, the distributions of Johnson's seagrass, the small-toothed sawfish, the five species of sea turtles, and the West Indian manatee do not include the Turkey Point cooling canal system or other areas impacted by operation of the nuclear plants. Aquatic threatened or endangered (or candidate) species that potentially could be impacted by operation of the cooling canals or maintenance of the transmission lines include the mangrove rivulus, the American alligator, and the American crocodile. Activities associated with exotic vegetation control within transmission line corridors could potentially affect the mangrove rivulus and the American alligator. The method of control used in mangrove areas is infrequent and involves selective physical removal of exotic trees. This activity could affect individuals of mangrove rivulus, but because the distribution of this fish is widespread but scattered, the population size of the species should not be threatened by these activities. Vegetation control along transmission corridors could disturb or temporarily displace adult and juvenile individuals of the American alligator in freshwater habitats, but is unlikely to permanently affect the local population.

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Actions of continued operations that could affect the American crocodile population inhabiting the Turkey Point cooling canals include the following:

- | C continue to deny public access to the closed cooling canal system (beneficial effect)
- | C continue research and monitoring activities (small adverse effect outweighed by beneficial management practices)
- | C continue vegetation control, including exotic control (beneficial effect)
- | C continue maintenance of perched freshwater ponds on the berms (beneficial effect)
- | C continue hypersalinity of the ponds due to evaporation, offset by maintenance of freshwater ponds in the canal system (no effect).

A review of American crocodile status and risk assessment relative to Turkey Point cooling canal operations (both fossil and nuclear) (ESE 2000) concluded that the crocodile population in the Turkey Point cooling canals is growing and reproducing successfully, and that the presence of freshwater ponds provides nursery areas for juveniles. The study also concluded that chemicals of potential concern (COPCs) are equal to or less than concentrations from reference sites, and that mercury, polychlorinated biphenyls, and other COPCs have no observed or anticipated effect.

Continued closure of the cooling canal system to public access would continue to have a beneficial impact on the Turkey Point crocodile population by protecting nests, juveniles, and adults from disturbance. Disturbance of the crocodiles is limited to research and monitoring activities and canal maintenance activities. FPL has obtained state permits for research and carcass salvage. FPL actively maintains favorable habitats for crocodiles within the cooling canal system. Exotic vegetation is removed, nesting areas are monitored and protected, and freshwater ponds are created for juvenile rearing. Based on these considerations, the staff has determined that the continued operation of the Turkey Point Plant and the continued maintenance of the transmission lines will not adversely affect listed aquatic species.

4.6.2 Terrestrial Species

Federally listed terrestrial animal species that are known to occur at the Turkey Point site or along the transmission corridors include the eastern indigo snake, wood stork, and bald eagle. The indigo snake occurs infrequently in the area, and FPL maintains a permit from the FFWCC that allows handling and nonharmful capture of eastern indigo snakes to protect them from construction and maintenance activities. Wood storks winter in the vicinity of the Turkey Point

site, and are regular visitors to the cooling canal system. However, the nearest known nesting colony is at Corkscrew Swamp approximately 175 km (110 mi) northwest of the Turkey Point site. Bald eagles nest in the Arsenicker Keys southwest of the Turkey Point site and are occasional visitors to the canal system. There have been no reports of collisions or electrocutions of wood storks, bald eagles, or any other migratory birds along the electrical transmission lines associated with the Turkey Point site, and maintenance crews are trained to avoid listed species, such as the eastern indigo snake, and to report unusual occurrences such as bird collisions or electrocutions. Based on these considerations, the staff has determined that the continued operation of the Turkey Point Units 3 and 4 and the continued maintenance of the transmission lines is not likely to adversely affect the bald eagle, wood stork, or eastern indigo snake.

Six additional Federally listed threatened or endangered terrestrial animal species occur in Miami-Dade County: the piping plover, roseate tern, Cape Sable seaside sparrow, everglades snail kite, Florida panther, and Schaus swallowtail butterfly. These species either are not known to range within the vicinity of the Turkey Point site and associated powerlines, or only would be rare, incidental visitors. Therefore the staff determined that license renewal will have no effect on these six species.

There are 13 plant species of Federal concern (6 endangered or threatened and 7 candidate) that potentially occur within the transmission corridors, primarily in the vicinity of remnant pine rockland habitats. The only plant species listed in Table 2-3 that is not potentially affected by the Turkey Point site transmission corridors is the beach jacquemontia, because there are no known populations near the Turkey Point Site or associated transmission corridors. FPL commissioned a field survey of the transmission corridors during the spring of 2001 to determine if any of these species are present within the transmission corridors. None of the listed or candidate species were observed within the corridors. Furthermore, it is believed that the maintenance practices used within or near potential habitat areas (primarily mowing and weedy tree removal) are not likely to have an adverse effect on the listed species if they did inhabit the corridors, because these actions function to maintain an open canopy required by most of these species.

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

During the scoping period, comments indicated concern about the health effects from exposure to radiation from Turkey Point Units 3 and 4, the noise and aesthetic impacts of these Turkey Point units on National Park visitors, and the plants' ability to withstand the effects of severe weather. These issues are discussed in the following sections.

4.7.1 Evaluation of Potential New and Significant Radiological Impacts on Human Health

During the scoping and public comment period for the Turkey Point Units 3 and 4 draft SEIS, there were a number of comments about the studies related to strontium-90 radiation levels in deciduous (baby) teeth and use of these studies as “in-body” measurements of radioactive materials. The commenters alleged that the source of this material was the Turkey Point plant and implied that this is new and significant information, and therefore, should be considered in the environmental impact evaluation for Turkey Point Units 3 and 4, specifically with respect to public health. In the draft SEIS, this section addressed the comments obtained during the public scoping period. The section has been extensively revised in response to comments on the draft SEIS to (1) summarize the comments related to strontium-90 in deciduous teeth, and (2) discuss why the staff determined that strontium-90 in deciduous teeth and use of “in-body” measurements as a means to evaluate public health impacts from releases from nuclear power plants is not new and significant information.

The staff has evaluated whether any of the comments related to strontium-90 in the environment could be new and significant with respect to the conclusions in the GEIS. In 2000, a report titled *Strontium-90 in Deciduous Teeth as a Factor in Early Childhood Cancer* was published (Gould et al. 2000), alleging that there was an increase in cancer incidence due to strontium-90 released from nuclear power facilities. Elevated levels of strontium-90 in deciduous teeth was claimed in the report as the evidence for the increase in childhood cancer. Although the Gould report was not available at the time that the GEIS was written, the staff has determined that the report does not represent new information with regard to the Category 1 issues as evaluated in the GEIS, nor does it identify a significant departure from what was specifically documented in the GEIS with regard to public dose. This section refutes the claims by the Radiation and Public Health Project (RPHP) staff, who were the authors of the Gould report and provided comments on the draft SEIS. The staff has determined that the strontium-90 found in deciduous teeth in the vicinity of Turkey Point Units 3 and 4 is not due to releases from the plant, and that the operation of the Turkey Point Plant is not responsible for increased incidence of cancer in the area.

4.7.1.1 Summary of Comments

Following publication of the draft SEIS, there were additional comments, both written and at the public meeting, related to the subject of the work by Gould et al. and the RPHP comments (Mangano et al. 2001). The comments focused on five primary issues related to the discussion of the Gould study. The first issue was use of in-body measurement of radionuclides to determine public health effects. The second issue was use of strontium-90 to perform “in-body” measurement to evaluate the potential health risks from release of radioactive materials from

Turkey Point Units 3 and 4. The third major issue described was increased cancer incidence in southern Florida, near Turkey Point Units 3 and 4. The fourth issue was the assertion that the BEIR V Report of the National Academy of Sciences' committee on the Biological Effects of Ionizing Radiation (BEIR) concluded there is no safe exposure to radiation (National Resource Council 1990). Finally, a fifth major issue is the implication of a cause-and-effect relationship between reactor operation, catastrophic events, and perceived increase in cancer rates. Other comments on this subject not specifically related to RPHP are discussed in Appendix A, Part 2.

The discussion that follows explains the basis for the staff's conclusion that neither the public scoping comments nor the comments on the draft SEIS provide new and significant information related to the Category 1 radiological human health issues. The discussion (1) explains the source and amount of strontium-90 in the environment; (2) describes the NRC's basis for developing regulations related to protecting public health based on consensus standards by national and international organizations; (3) addresses the radiological monitoring programs at nuclear power reactors and specifically the program at Turkey Point Units 3 and 4; (4) explains why "in-body" measurement of radioactive materials is not used to determine public health impacts; (5) refutes the statements regarding cancer incidence discussed in the Gould report and public comments using a study performed by the Florida Department of Health; and (6) disputes the implication that radioactive effluents from nuclear reactors are the cause of perceived increases in cancer incidence near Turkey Point. Finally, the rationale for assigning radiological issues as Category 1 in the GEIS and the staff's evaluation of these issues for Turkey Point Units 3 and 4 are briefly discussed.

4.7.1.2 Strontium-90 in the Environment

There are three sources of strontium-90 in the environment: fallout from nuclear weapons testing, releases from the Chernobyl accident in the Ukraine, and releases from nuclear power reactors. By far the largest source of strontium-90 is from weapons testing fallout.

Both strontium-89 and strontium-90 were released to the atmosphere by above-ground explosions of nuclear weapons (United Nations Scientific Committee on the Effects of Atomic Radiation [UNSCEAR 2001]). Although the United States performed its last atmospheric test of a nuclear weapon in 1963, other countries continued to perform atmospheric testing of nuclear weapons until 1980 (UNSCEAR 2001). Strontium-89 has a half-life of 50.5 days, while the half-life of strontium-90 is 28.8 years. Consequently, virtually no strontium-89 currently remains in the soil from nuclear weapons testing (Eisenbud 1987). In contrast, strontium-90 remains in soils of the Northern Hemisphere at more than 50% of its peak levels in the 1960s (UNSCEAR 2000). Approximately 622 PBq (16.8 million Ci) of strontium-90 were produced and globally dispersed in atmospheric nuclear weapons testing.

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Numerous measurements of the global disposition on strontium-90 and the occurrence of these and other fallout radionuclides in foodstuffs and the human body were made at the time the atmospheric tests were taking place. The worldwide average effective dose from ingesting strontium-90 (1945 to date) is 97 μSv (9.7 mrem). The worldwide average effective dose from inhaling strontium-90 (1945 to 1985) is 9.2 μSv (0.92 mrem). No statistically significant excess of biological effects due to strontium-90 exposures at levels characteristic of worldwide fallout has been demonstrated (NCRP 1991).

The other two sources of strontium-90 in the environment are from the Chernobyl accident in April 1986 when approximately 8 PBq (216,000 Ci) of strontium-90 were released into the atmosphere, and strontium-90 released from nuclear power reactor operations. The total annual release of strontium-90 into the atmosphere from all U.S. nuclear power plants is typically 37 MBq (1/1,000th of a Ci). The amount of strontium-90 released into the environment from a nuclear facility is so low that the only chance of detecting strontium-90 is sampling the nuclear power plant effluents themselves. In addition to strontium-90, power reactors also release very small quantities of strontium-89.

Because of the extremely small amount of strontium-90 released from nuclear power plant effluents, it is unlikely that strontium-90 found in deciduous teeth would be from nuclear power plants. Without determining that there is strontium-89 in the teeth, it is impossible to tell where the strontium-90 is from. If there is no strontium-89 in the teeth, then it is unlikely that the strontium-90 is from a recent release from a nuclear reactor. The fact that the RPHP has failed to measure the strontium-89 to strontium-90 ratio in any deciduous teeth collected limits conclusions regarding the source of the internal contamination.

4.7.1.3 Regulatory Basis and Discussion of Risk

The evaluation of health effects from exposure to radiation, both natural and man-made, is an ongoing activity involving public, private, and international institutions. International and national organizations such as the International Commission on Radiological Protection (ICRP) and National Council on Radiation Protection and Measurements (NCRP) provide consensus standards developed from recent and ongoing research. NRC's regulatory limits for effluent releases and subsequent dose to the public are based on the radiation protection recommendations of these organizations. NRC provides oversight of all licensed commercial nuclear reactors to ensure that regulatory limits for radiological effluent releases and the resulting dose to the public from these releases are within the established limits. The regulations related to radiological effluents and dose to the public can be found in 10 CFR Part 20 and 10 CFR Part 50, Appendix I.

The National Academy of Sciences' Committee on the BEIR published its fifth report (BEIR V) just over a decade ago (National Research Council 1990). That report contains mathematical models that predict risk of radiation-induced cancers in human populations over and above the incidence of cancer that occurs in the absence of radiation exposure. The BEIR V committee chose a linear, nonthreshold (LNT) dose-response model for solid cancers and a linear-quadratic (LQ) model for leukemia.

The BEIR V report does not address what is safe or not safe; it merely evaluates excess cancer risk in terms of probabilities. ICRP Publication 60 (1991), however, does define safe in the sense of "acceptable risk," and this and similar definitions have been reaffirmed by the NCRP (NCRP 1993) and the U.S. Environmental Protection Agency (EPA 1987). These implicit definitions of "safe" are embodied in all U.S. radiation protection regulations, including those of the NRC.

There is no human activity without some risk, however slight, so "safe" does not mean "with no risk," but rather "safe" means "with an acceptably tiny risk." What risk is acceptable from society's standpoint is determined by the political process in the United States as spelled out recently, for example, by the U.S. Presidential/Congressional Commission on Risk Assessment and Risk Management^(a) (Omenn et al. 1997).

4.7.1.4 Effluent Monitoring at Turkey Point

Regulatory Guide 1.21 recommends that "a quarterly analysis for strontium-89 and strontium-90 should be made on a composite of all filters from each sampling location collected during the quarter." The sensitivity is such that the analysis for radioactive material in particulate form should be sufficient to permit measurement of a small fraction of the activity, which would result in annual exposures of 0.15 mSv (15 mrem) to any organ of an individual, or 0.05 mSv (5 mrem) to the whole body, in an unrestricted area. Nuclear power plants, including Turkey Point Units 3 and 4, routinely release small amounts of radioactive material in their effluents. To demonstrate that the plant is within the regulatory limits, the plants monitor the radiological materials released to the environment and take frequent radiological samples around the plant site as well as analyze their effluent discharge. Both strontium-89 and strontium-90 can be found in power plant effluents in very small quantities. Each nuclear power plant in the United States is required to submit an annual report on effluent releases to the NRC. The report contains information about the types and quantities of radionuclides that are released to the environment, as well as the dose impact on the environment.

(a) Telephone 202.233.9537, fax 202.233.9540, internet <http://www.riskworld.com>.

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Gaseous and liquid effluent releases are monitored at Turkey Point Units 3 and 4 to demonstrate that they are within regulatory limits. The licensee also has a Radiological Environmental Monitoring Program (REMP) that provides the procedures for monitoring releases to the environment. The results of this monitoring are provided to NRC in annual reports titled *Annual Radioactive Effluent Release Report* and *Annual Radiological Environmental Operating Report* (FPL 2000b and FPL 2000c). The effluent release program and the REMP were both reviewed for the preparation of the input to this SEIS. The releases of radionuclides to the environment, including strontium-90, are monitored as prescribed by FPL's *Offsite Dose Calculation Manual* (FPL 1999), and have been maintained well below regulatory limits. During 2000, Turkey Point Units 3 and 4 did not release detectable levels of strontium-90 in the gaseous effluents. Liquid effluents containing radioactive materials, including strontium-90 and strontium-89, were released into the closed system cooling canals. The only time radioactive strontium was released in detectable levels in the liquid effluents was during the second quarter and the releases were 0.12 MBq (3.2 E-06 Ci) of strontium-90 and 0.37 MBq (10 E-06 Ci) of strontium-89 (FPL 2000c). To put this value in perspective, for the second quarter of 2000, the total amount of radioactive effluents released from Turkey Point Units 3 and 4 were about 150 times **below** NRC regulatory limits (0.00663 percent of applicable limits). The quantity of gaseous and liquid materials released to the environment in 2000 are comparable to the quantities released in the past 5 years and the expected quantities released in years to come, including the license renewal period.

4.7.1.5 Use of "In-Body" Radionuclide Measurements to Assess Public Risk from Radiological Effluents from Turkey Point Units 3 and 4

Comments on the Turkey Point draft SEIS have stated or implied that the NRC should measure radioactive substances in persons living near nuclear power plants. Such measurements would be misleading and unwarranted for a variety of reasons:

- c Radioactive substances may come from a variety of sources. In the case of strontium-90, the primary source has always been fallout from atmospheric weapons tests (UNSCEAR 2001). The comments on the SEIS that imply that strontium-90 measured in people near nuclear plants must have come from nuclear plants has no basis.
- c Interpreting measurements of radioactive materials in people is difficult unless one knows what each individual was exposed to, when the exposures occurred, and by what routes they occurred (ingestion, inhalation, etc.). In particular for strontium-90, dietary contributions from foodstuffs produced out of the region must be considered. Finally, migration must be accounted for, because people may have lived and acquired radionuclides elsewhere than near a nuclear power plant.

C Substances in the human body are dynamic, not static. This includes radioactive and nonradioactive substances. The dynamic processes include intake of material; uptake to systemic circulation from the gastrointestinal tract, respiratory tract, or skin; translocation throughout the body system; retention over time; and elimination via excretion and radioactive decay. Thus, even in deciduous teeth, the time course of exposure leading to intake and all other dynamic processes must be considered to interpret measurements.

4.7.1.6 Increased Cancer Incidence in the Area of Turkey Point

Due to the concern from the issues regarding the increased cancer rates raised by RPHP, the Florida Department of Health chose to also look at the cancer rates using the same data used by RPHP. Staff from the Florida Bureau of Environmental Epidemiology interviewed the RPHP staff to determine the source of data and then performed their own calculations. They were unable to identify any unusually high rates of cancers, nor any systematic trend for some county rates to be higher than State or national levels. These rates fluctuate from year to year, and, in some situations, fluctuate widely due to a small number of cases in small populations (FDOH 2001). The documentation of the Bureau of Epidemiology calculations and interpretations is attached as part of the transcript in Appendix A, Part 2, of this SEIS.

4.7.1.7 Ability for Strontium-90 to Cause Cancer

One comment states that strontium-90 is “one of the most toxic radioactive chemical(s) produced by reactors.” Strontium-90 is produced in roughly 5.8% of nuclear fissions in a reactor’s fuel elements, and undergoes radioactive decay with a half-life of almost 29 years. Strontium-90, and its radioactive decay product yttrium-90, are not harmful unless they are near or inside the body. They are easily shielded if outside the body, resulting in no radiation exposure.

If ingested, strontium-90 tends to mimic calcium when it is in the body and therefore becomes concentrated in calcified tissues such as bones and teeth. If ingested in quantities that produce very large radiological dose rates (about thousand times higher than dose rates we all receive from natural background [Raabe 1994]), strontium-90 is known to increase the risk of bone cancer and leukemia in animals, and is presumed to do so in people. Below these dose rates, there is no evidence of any excess cancer. Compared to other radionuclides, both natural and human-made, strontium-90 is not the most toxic. For example, naturally occurring thorium 230 is 700 times more radiotoxic when inhaled.

4.7.1.8 Cause-and-Effect Relationship Between Radiological Releases from Turkey Point and Increased Incidence in Cancers in the Area

Comments on the Turkey Point draft SEIS have stated or implied that claimed statistical associations between cancer rates and reactor operations are cause-and-effect relationships. Many excellent scientific minds have addressed the question of when one can decide that an association is causal, that is, when two things that appear to be associated over time can lead one to deduce that one causes the other.

A simple counterexample helps illustrate this point. A college professor gives the following example of a causal inference: "In the winter, I wear galoshes. In the winter, I get colds. Therefore, galoshes cause colds." There's no argument that a strong statistical association exists between wearing galoshes and the health effect of colds. There is, however, an argument about whether galoshes *cause* colds. So, how does one go about addressing whether this association is really causation?

Here are some of the major factors to consider before inferring that a statistical association is a causal one (Hill 1965):

- (1) Strength: Is a large effect observed, e.g., 32-fold lung cancer increase in heavy smokers?
- (2) Consistency: Is the effect consistently observed across studies?
- (3) Specificity: Does the effect occur in specific persons, for particular sites and types of disease?
- (4) Temporality: Does exposure precede disease? Is there a suitable latent period between exposure and clinical symptoms?
- (5) Biological Gradient: Is there a dose-response curve in which increasing dose leads to increasing response?
- (6) Biological Plausibility: Is there a plausible biological mechanism for the observed association?
- (7) Coherence: Does the cause-and-effect inference seriously conflict with generally known facts of the natural history and biology of the disease?
- (8) Experiment: Does intervention reduce or prevent the association?

(9) Analogy: Do other, similar agents produce the effects?

Statistical association alone does not prove causation. The RPHP work fails to meet many of these criteria, even if the strontium-90 measurements were the result of the nuclear power plant operations. In particular, they fail to meet criteria 1, 2, 3, 4, and 6.

Epidemiology is the study of patterns of health and disease in human populations. In 1995, an international group of experts assembled to help determine how to use epidemiology studies for risk assessments. Their work has been published (Federal Focus Inc. 1996) and a non-copyrighted summary can be found on the internet at <http://www.pnl.gov/berc/epub/risk/index.html>.

A disease cluster is a group of cases of a disease that appears around the same time in a limited geographic or occupational area. A very readable, non-technical analysis of “the cancer-cluster myth” has been published in a popular magazine (Gawande 1999). Gawande explains why infectious disease clusters can and should spur immediate investigations and perhaps intervention by public health officials, and yet why non-infectious disease clusters rarely, if ever, are verified (see, for example, Neutra 1990 and Reynolds et al. 1996). For cancer, which has a significant latency between exposure and appearance of clinical symptoms, apparent clusters are very misleading because of migration and confounding sources of exposure.

4.7.1.9 Additional Discussion on Cancer

Information regarding the relationships between environmental exposure to radiation and cancer as stated in the Gould report were not substantiated. One form of cancer the Gould report linked to strontium-90 exposure is “the extremely rare form of childhood cancer known as rhabdomyosarcoma” (Gould et al. 2000). Rhabdomyosarcoma is not rare; indeed, it is the most common soft tissue sarcoma in children (American Cancer Society [ACS] 2001a), and is the fifth most common form of pediatric cancer (St. Jude Children’s Research Hospital 2001). Furthermore, no association has been documented between the incidence of rhabdomyosarcoma and any environmental condition, including toxic substances, air or water pollution, or radiation exposure (ACS 2001a).

While the Gould report is correct with regard to the general increase in cancer incidence in the United States (Gould et al. 2000), this increase does not appear to be due to environmental causes other than cigarette smoking. The National Cancer Institute (NCI 2001) states that

“It is true that a person’s chance of developing cancer within his or her lifetime is almost twice as great today as it was half a century ago, which means that doctors are seeing more cases of cancer than they did in the past. However, this increase is caused largely by the

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facts that people are living longer and cancer is more prevalent in older people. When corrected for the increasing average age of the population, cancer rates in the United States have actually been stable or even falling slightly in the past several years. Much of the rise prior to that was due to cigarette smoking, a well established and avoidable cause of cancer.”

The ACS (ACS 2001b) acknowledges that a dramatic increase in prostate cancer was noted between 1989 and 1992, but notes that this increase was apparent rather than real. They suggest that it was due to earlier diagnosis in men without any symptoms by increased use of prostate-specific antigen (PSA) blood test screening. They note that prostate cancer incidence rates have declined significantly since 1992 (ACS 2001b).

| With regard to cancer clusters, especially breast cancer deaths, that are identified by the Gould report (Gould et al. 2000), detailed studies of this phenomenon have yet to substantiate relationships with environmental exposures, especially from nuclear power plants. Scientists from the NCI conducted and are conducting studies of breast cancer death clusters in the northeastern United States, the Washington D.C. area, and San Francisco. Primary factors driving the observed differences appear to be regional differences in the ages of mothers at first birth and mammography screening (Sturgeon et al. 1995).

At the request of Congress, the NCI conducted a study of cancer mortality rates around 52 nuclear power plants, including the Turkey Point Plant, nine DOE facilities, and one former commercial fuel reprocessing facility. The study covered the period from 1950 to 1984, and evaluated the change in mortality rates before and during facility operations. The study (Jablon, Hrubec, and Boice 1991) concluded the following:

| “From the evidence available, this study has found no suggestion that nuclear facilities may be linked causally with excess deaths from leukemia or from other cancers in populations living nearby.”

Additionally, the ACS (ACS 2001c) has concluded that, although reports about cancer case clusters in such communities have raised public concern, studies show that clusters do not occur more often near nuclear plants than they do by chance elsewhere in the population. Likewise, there is no new evidence that links strontium-90 with increases in breast cancer, prostate cancer, or childhood cancer rates. The ACS recognizes that public concern about environmental cancer risks often focuses on risks for which no carcinogenicity has been proven or on situations where known carcinogen exposures are at such low levels that risks are negligible. “Ionizing radiation emissions from nuclear facilities are closely controlled and involve negligible levels of exposure for communities near such plants “ (ACS 2001c).

4.7.1.10 Conclusion

In the GEIS, radiation exposure to the public during the license renewal term was considered a Category 1 issue (see Chapter 1 and Section 4.3 for a discussion of Category 1 issues and radiological impacts from normal operations). The GEIS determined that the risk to the public from continued operation of a nuclear plant would not increase during the license renewal term. Doses to members of the public from Turkey Point Units 3 and 4 emissions were specifically evaluated in Section 4.6 of the GEIS, using data from monitored emissions and ambient monitoring, and were found to be well within regulatory limits.

The staff extensively reviewed the Gould report, comments received during scoping, information provided by the RPHP, comments from concerned citizens at the public meetings held in July 2001 at Homestead, Florida, and written comments submitted by interested citizens, the industry, and other governmental agencies. The staff has concluded that the claims of elevated levels of childhood cancer in the vicinity of the plant caused by the release of strontium-90 during routine operations are unfounded and without scientific merit. According to an independent study by the State of Florida, there are no elevated levels of childhood cancer in the vicinity of the plant. Furthermore, environmental monitoring by the State of Florida as well as in-plant monitoring of effluent streams has established that there are no significant releases of strontium-90 from the plant. No causal relationship has been established between the levels of strontium-90 being reported by the RPHP in deciduous teeth and childhood cancer. Furthermore, there is almost unanimous consensus among the scientific community on the adequacy of current radiation protection standards.

The staff concludes that the information provided from the Gould report and subsequent scoping comments, and comments on the draft SEIS do not provide any information that can be considered new and significant with respect to the findings of the GEIS on the health effects to the public from radiological effluent releases due to the Turkey Point Units 3 and 4.

4.7.2 Evaluation of Turkey Point Noise and Aesthetic Impacts on National Park Visitors

The National Park Service submitted scoping comments calling attention to the environmental sensitivity of Biscayne National Park and the impacts of the Turkey Point site on the park and visitors to the park (Canzanelli 2000). Two impacts mentioned in the National Park Service's comments were noise and aesthetic impacts on visitors to the park. Noise impacts and aesthetic impacts during the license renewal term are classified as Category 1 issues with SMALL impacts in 10 CFR 51 Subpart A, Appendix B, Table B-1.

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Biscayne National Park is immediately north and east of the Turkey Point site. The park was created by Congress in 1980. Previously, the lands and waters in the park were part of Biscayne National Monument, which was created by Congress in 1968. Biscayne National Park was established by Congress to "preserve and protect for the education, inspiration, recreation, and enjoyment of present and future generations a rare combination of terrestrial, marine, and amphibious life in a tropical setting of great natural beauty" (16 USC 410gg). Congress has stated in the National Park Service Organic Act that the fundamental purpose of national parks is to "conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." (16 USC 1).

Biscayne National Park existed prior to the development of the GEIS and the proximity of Turkey Point to the park does not constitute information that is new relative to the GEIS. The Turkey Point site consists of four units, two of which are unrelated to the proposed action. By comparison, Turkey Point Units 1 and 2, the fossil-fired units, have a greater aesthetic impact on Biscayne National Park than Units 3 and 4, the nuclear units that are the subject of this renewal. Additionally, the visual effect of a nuclear power plant on visitors to a park was considered in the GEIS. The case study in the GEIS, which analyzed aesthetic impacts of nuclear facilities at a sampling of sites, included an analysis of the aesthetic impacts from facilities located in close proximity to parks and other recreational areas. The NRC has carefully reviewed the National Park Service comments and evaluated this information in the following discussion.

Noise from operations at the nuclear Units 3 and 4, as well as fossil-fired Units 1 and 2, is detectable at some times by visitors in Biscayne National Park. Noise transmission is facilitated by the location of the Turkey Point units on Biscayne Bay. The noise is most noticeable under calm wind conditions or when the wind is blowing lightly in a direction from the Turkey Point site to the park. Section 4.3.7 of the GEIS points out that the principal sources of noise at a nuclear power plant are cooling towers (which are not present at the Turkey Point Plant), transformers, and loudspeakers. Other occasional sources of noise may include auxiliary equipment such as pumps and safety valves. The noise levels from Turkey Point Units 3 and 4 are not greater than from other nuclear power plants, and are less than those with cooling towers. In spite of the proximity of the Turkey Point Units 3 and 4 to Biscayne National Park, noise impacts are classified as SMALL for purposes of this SEIS. Noise from the Turkey Point Plant is often not detectable within the park because the noise is subsumed in overall ambient noise, which is predominantly wind noise. When the noise from the Turkey Point units is detectable within the park, it generally constitutes a low hum that is deemed sufficiently minor that it will neither destabilize nor noticeably alter the experience of a visitor to Biscayne National Park. The conclusions from the GEIS, therefore, apply.

The containment buildings and other structures associated with Turkey Point Units 3 and 4 are visible during the daylight hours from the Biscayne National Park visitor center complex and from waters and lands within the park boundary. Units 3 and 4 (as well as Units 1 and 2) are also visible from the park at night because of outside lighting used at the Turkey Point site. The National Park Service states in its scoping comments that the Turkey Point Plant can be seen at night as far east as the park's barrier islands, which are 11 km (7 mi) offshore. There is no visible steam plume from Unit 3 and 4 operations because cooling towers are not used. For the purpose of this SEIS, the aesthetic impact of Units 3 and 4 must be evaluated as an increment to the impact of Units 1 and 2. Units 1 and 2 and their associated structures use most of the lighting at the Turkey Point site. They also have the largest (oil storage tanks) and tallest (exhaust stacks) structures at the site. The staff concludes that operation of Units 3 and 4 will not materially alter the visual impact presented by power generation facilities at the Turkey Point site. Therefore, the aesthetic impact of Units 3 and 4 is classified as SMALL for purposes of this SEIS because the incremental impact of Units 3 and 4 is minor relative to Units 1 and 2.

The National Park Service recommended consideration of various mitigation measures to potentially reduce the noise and aesthetic impacts from Turkey Point Units 3 and 4 on visitors to Biscayne National Park. Such mitigation measures could include reduced use of outside loudspeakers, reduced night lighting at the plant and/or placement of light shielding, landscaping to reduce the visibility of onsite structures, and repainting of structures in natural tones that mirror the surrounding landscape and consequently are less obtrusive to the natural setting. However, because the impacts from operation of Units 3 and 4 are minor relative to the impacts from operation of Units 1 and 2, it has been determined that additional plant-specific mitigation measures solely for Units 3 and 4 are not likely to be sufficiently beneficial to warrant implementation. Moreover, it is not within NRC's regulatory authority to require implementation of these mitigation measures. Nevertheless, NRC has brought them to the attention of FPL and encouraged FPL to meet with National Park Service personnel to achieve consensus on measures that can reasonably be undertaken to mitigate the noise and aesthetic impacts of all Turkey Point units on visitors to Biscayne National Park.

For the reasons stated above, the information provided by the National Park Service in their scoping comments does not represent significant new information that would call into question the Commission's conclusion in the GEIS.

4.7.3 Evaluation of Potential New and Significant Plant Design Information

A number of comments received during the scoping period concerned the design of Turkey Point Units 3 and 4, and the plant's ability to withstand the effects of severe weather, including hurricanes more severe than Hurricane Andrew that occurred in 1992.

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In order to receive NRC approval to operate a nuclear power plant, an applicant must submit a Safety Analysis Report (SAR) as part of its application. The SAR presents the design criteria and design information for the proposed reactor as well as a comprehensive description of the proposed site. The SAR also discusses various hypothetical accident situations called design-basis accidents (DBAs) and the safety features that are provided to prevent and mitigate accidents. The NRC staff reviews the application to determine whether the plant design meets the Commission's regulations and requirements. The staff also conducts an analysis of the plant's interactions with the site, focusing on those site characteristics that could affect the safe operation of the facility; these characteristics include seismology, meteorology, geology, and hydrology.

| The impact of hurricane force winds and storm surges on the Turkey Point Plant were analyzed as part of the original plant application and presented in the licensee's SAR. During the licensing review of the facility, the staff prepares a Safety Evaluation Report (SER) that documents the result of the safety review. The licensee's SAR and the staff's SER represents part of a plant's licensing basis, which must be met at all times during the operating life of the plant. Part of the licensing review of the facility is an evaluation of the facility to successfully protect against DBAs. The results of this analysis are documented in the facility SAR and SER, and are also discussed briefly in Section 5.1 of this SEIS. The earlier resolution of these issues make them a part of the current licensing basis of the plant; the current licensing basis of the plant is to be maintained by the licensee under its current license and, therefore, under the provisions of 10 CFR 54.30, is not subject to review under license renewal.

| Severe accidents initiated by external phenomena such as tornadoes, floods, earthquakes, fires, and sabotage have not traditionally been discussed in quantitative terms in FESs and were not specifically considered for Turkey Point plant in the GEIS (NRC 1996a). However, the GEIS did evaluate existing impact assessments performed by NRC and by the industry at 44 nuclear plants in the United States and concluded that the risk from sabotage and beyond design basis earthquakes at existing nuclear power plants is small, and that the risks from other external events, including severe natural phenomena (e.g., weather events) are adequately addressed by a generic consideration of internally initiated severe accidents. Weather events more severe than the plant's design basis have been addressed by the licensee in its individual plant examinations of internal and external events (IPE and IPEEE, respectively). These plant-specific risk studies provide baseline estimates of risk from internal and external events. In evaluating severe accident mitigation alternatives (SAMAs), a license renewal applicant uses risk profiles to identify potential means of further reducing risk through design alternatives that enhance the ability to prevent or mitigate core damage. Section 5.2 of this SEIS contains the staff's evaluation of SAMAs.

The impact of severe weather phenomena on the Turkey Point site is of concern to the safe operation of the facility and, if new information is identified that questions the adequacy of the design or operation of the facility, the licensee and the NRC staff have a responsibility to evaluate that information. During the licensing review of the facility, the staff evaluated the impact of severe weather on Turkey Point Units 3 and 4 and concluded that the design was adequate. Information regarding hurricanes and other natural phenomena and the environmental impacts that would result from their impact on Turkey Point Units 3 and 4, in the absence of some nexus to aging of systems, structures, and components within the scope of 10 CFR Part 54, is not considered new or significant information in the context of the GEIS.

4.7.4 Evaluation of Turkey Point Cooling Canal Impacts on Vegetation and Other Biota of Biscayne National Park

The National Park Service submitted scoping comments that asserted that the Turkey Point cooling canals have altered the natural environment by maintaining a hypersaline area that impedes the natural groundwater flow from the upland side of the canals to Biscayne Bay. They suggested that this has changed the biological community in the area east of the cooling canals to favor salt-tolerant species.

Since the mid-nineteenth century, water management activities in southern Florida have disrupted the natural groundwater flow in the Turkey Point area. As the U.S. Environmental Protection Agency (EPA) stated in their review of the environmental statement for the construction of the Turkey Point Plant (AEC 1972, Appendix E-10), "it is essential to note that the flow of surface water over the marsh area and through the mangrove fringe has not existed for over 30 years because of drainage canals and roads that serve as diversion dikes." Among these diversions is the L-31E canal and levee, which were built parallel to the shoreline of the bay in the 1960s and lie less than 0.4 km (1/4 mi) to the west of the Turkey Point cooling canal system (South Florida Water Management District 2001a). This canal blocks surface water and groundwater flow from inland areas to the bay, including the area of the Turkey Point cooling canal system (South Florida Water Management District 2001a).

Historical vegetation maps and photographs suggest that salt-tolerant vegetation existed in the area before the construction of the cooling canals (AEC 1972). The extent of the affected area may be increasing. A recent study of this area just south of the cooling canals (Ross et al. 1999) identifies several factors that may limit biological productivity in the region near the coast. These factors include wide seasonal fluctuation in salinity and moisture content resulting from natural variations in tides and storms, absence of freshwater input from upstream sources as a result of water management activities, phosphorus availability, and sporadic occurrence of natural disturbances such as periodic fires and freezes. The study also notes that rising sea level may be a factor.

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The potential impacts of the Turkey Point cooling canals on Biscayne Bay and Card Sound were considered in detail in the FES related to operation of the Turkey Point Plant (AEC 1972). There is no indication of any impacts of the operation of the cooling ponds on Biscayne Bay or Card Sound exceeding the impacts considered in the FES, which were considered to be small.

The National Park Service suggests that the NRC should investigate ways to mitigate the postulated impacts of the cooling canals on groundwater flow to Biscayne Bay. It is likely that the impacts postulated by the National Park Service are not the result of Turkey Point cooling canals, but rather are due to water management implemented by the South Florida Water Management District that predate construction of the Turkey Point cooling canals (AEC 1972; South Florida Water Management District 2001a). There is a significant effort underway to restore southern Florida areas adversely impacted by earlier water management activities (South Florida Water Management District 2001b). These efforts include coordinated planning among diverse governmental agencies including the U.S. Army Corps of Engineers and the South Florida Water Management District. FPL has demonstrated a commitment to environment restoration in the area by establishing the South Dade Mitigation Bank in the area adjacent to the Turkey Point site. Agencies providing guidance in the mitigation bank program include the U.S. Army Corps of Engineers, the EPA, the Natural Resources Conservation Service, the FWS, the NMFS, the Florida Department of Environmental Protection, the South Florida Water Management District, and Miami-Dade County. FPL and others may wish to extend restoration efforts to the area of National Park Service concern. However, it would be inappropriate for the NRC to attempt to guide restoration efforts to that end.

For the reasons stated above, the information provided by the National Park Service in their scoping comments does not represent information that would call into question the Commission's conclusion that impacts on terrestrial resources from continued operations of cooling ponds are SMALL and that additional plant-specific mitigation measures are unlikely to be sufficiently beneficial to warrant implementation.

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 Turkey Point operation during the renewal term. Consequently, the staff concludes that the environmental impacts associated with these issues are bounded by the impacts described in the GEIS. For each of these issues, the GEIS concluded that the impacts would be SMALL and that "plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation." NRC has identified certain mitiga-

tion measures that can reduce the aesthetic and noise impacts associated with Units 3 and 4 (Section 4.7.2) and brought these to FPL's attention.

Plant-specific environmental evaluations were conducted for 11 Category 2 issues applicable to Turkey Point operation during the renewal term and for environmental justice and chronic effects of electromagnetic fields. For all 11 issues and environmental justice, the staff concluded that the potential environmental impact of renewal term operations of Turkey Point would be of SMALL significance in the context of the standards set forth in the GEIS and that mitigation would not be warranted. For threatened and endangered species, the staff's conclusion is that the impact resulting from license renewal would be SMALL and further investigation 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 evaluation of this issue is required.

4.9 References

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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, "Advisory Council on Historic Preservation."

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