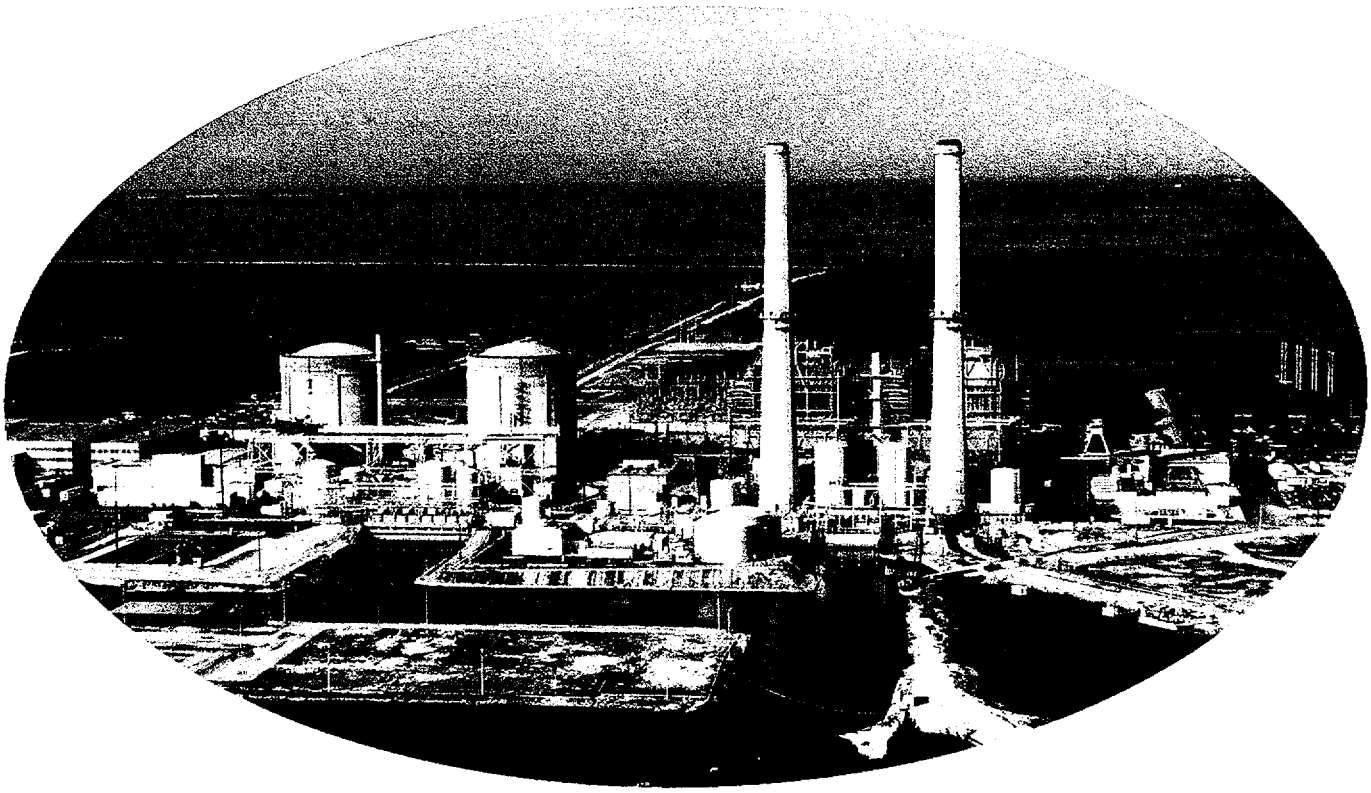
FPL

APPLICANT'S ENVIRONMENTAL REPORT OPERATING LICENSE RENEWAL STAGE



TURKEY POINT UNITS 3 & 4

Applicant's Environmental Report – Operating License Renewal Stage Turkey Point Units 3 & 4

Florida Power & Light Company
Docket Nos. 50-250 and 50-251
Revision 1

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ACRONYMS AND ABBREVIATIONS

°	degree
≤	less than or equal to
≥	greater than or equal to
~	approximately
AC	alternating current
AOV(s)	air operated valve(s)
ATWS	Anticipated Transient Without Scram
BGE	Baltimore Gas and Electric
Btu	British thermal unit
BWR	Boiling Water Reactor
C	Celsius
CCNPP	Calvert Cliffs Nuclear Power Plant
CCW	Component Cooling Water
CDF	Core Damage Frequency
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CI	Containment Isolation
CO	carbon monoxide
COE	cost of enhancement
CT	combustion turbines
DC	direct current
DEP	(Florida) Department of Environmental Protection

ACRONYMS AND ABBREVIATIONS (Continued)

DERM	(Miami-Dade County) Department of Environmental Resources Management
DOH	(Florida) Department of Health
DSM	demand-side management
ECCS	Emergency Core Cooling System
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESFAS	Engineered Safety Features Actuation System
F	Fahrenheit
FES	Final Environmental Statement
FGD	flue gas desulfurization
FPL	Florida Power & Light Company
FPSC	Florida Public Service Commission
ft^3	cubic foot
FWCC	(Florida) Fish and Wildlife Conservation Commission
FWS	U.S. Fish and Wildlife Service
gal	gallon
GEIS	Generic Environmental Impact Statement
gpm	gallons per minute
HHSI	high head safety injection
Hr	hour

ACRONYMS AND ABBREVIATIONS (Continued)

HVAC	Heating, Ventilation, and Air Conditioning
Hz	hertz
IEEE	Institute of Electrical and Electronic Engineers
IPE	Individual Plant Examination
IPEEE	Individual Plant Examination for External Events
ISLOCA	Interfacing System Loss-of-Coolant Accident
ISO	International Standards Organization
K	thousand
kV	kilovolt(s)
Kwh	Kilowatt hour
lb	pound
LOCA	loss-of-coolant accident
LOS	level of service
m	meter(s)
m^3	cubic meters
mA	milliamperes
MAB	maximum attainable benefit
MACCS2	Melcor Accident Consequences Code System
M	million
MOV(s)	motor operated valve(s)
MSIV	main steam isolation valve
MTC	moderator temperature coefficient

ACRONYMS AND ABBREVIATIONS (Continued)

MTHM	metric tonne
MW	megawatts
MWd/MTU	megawatt days per metric ton uranium
MW(e)	megawatts (electric)
MW(t)	megawatts (thermal)
NA	not applicable
NAS	National Academy of Sciences
NEPA	National Environmental Policy Act
NESC®	National Electrical Safety Code®
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
pcm	percent milli
PM_{10}	particulates having diameter of less than 10 microns
PORV	power operated relief valve
ppt	parts per thousand
PRA	probabilistic risk analysis
PSA	probabilistic safety assessment
PWR	Pressurized Water Reactor
RAI	Request for Additional Information

ACRONYMS AND ABBREVIATIONS (Continued)

RCP	reactor coolant pump
Ref.	Reference
RHR	residual heat removal
rms	root mean square
RRW	risk reduction worth
SAMA	Severe Accident Mitigation Alternatives
SAMDA	Severe Accident Mitigation Design Alternative
SBO	station blackout
SGTR	steam generator tube rupture
SHPO	State Historic Preservation Officer
SMITTR	surveillance, (on-line) monitoring, inspections, testing, trending, and recordkeeping
SO_x	sulfur oxides
SRV	safety relief valve
SSF	Safe Shutdown Facility
Std	standard
SW	service water
TSP	total suspended particulates
TVA	Tennessee Valley Authority
U.S.	United States
USC	United Staes Code
UV	ultraviolet

ACRONYMS AND ABBREVIATIONS (Continued)

V	volt(s)
Yr	year

1.0 INTRODUCTION

1.1 PURPOSE AND NEED FOR ACTION

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act and NRC implementing regulations. Florida Power & Light Company (FPL) operates Turkey Point Units 3 & 4 pursuant to NRC Operating Licenses DPR-31 and DPR-41, respectively; Units 1 and 2 are fossil-fueled and are not subject to NRC license requirements. The Unit 3 license will expire July 19, 2012, and the Unit 4 license will expire April 10, 2013. FPL has prepared this Environmental Report in connection with its Application to the NRC to renew the Turkey Point Units 3 & 4 licenses, as provided for by the following NRC regulations:

> Code of Federal Regulations, Title 10, Energy, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," Section 54.23, "Contents of Application-Environmental Information" (10 CFR 54.23); and
>
> Code of Federal Regulations,Title 10, Energy, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," Section 51.53, "Postconstruction Environmental Reports," Subsection 51.53(c), "Operating License Renewal Stage" [10 CFR 51.53(c)].

The NRC has defined the purpose and need for the proposed action, the renewal of the operating licenses for nuclear power plants such as Turkey Point Units 3 & 4, as follows:

"...The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than NRC) decision makers...." (Ref. 1.1-1, page 28472)

The renewed operating licenses would allow 20 additional years of plant operation beyond the current Turkey Point Units 3 & 4 licensed operating period of 40 years.

1.2 ENVIRONMENTAL SCOPE AND METHODOLOGY

NRC regulations for domestic licensing of nuclear power plants require environmental review of applications to renew operating licenses. The NRC regulation 10 CFR 51.53(c) requires that an applicant for license renewal submit with its application a separate document entitled *Applicant's Environmental Report - Operating License Renewal Stage*. In determining what information to include in the Turkey Point Units 3 & 4 Environmental Report, FPL has relied on NRC regulations and the following supporting documents that provide additional insight into the regulatory requirements:

NRC supplemental information in the *Federal Register* (Refs. 1.1-1, 1.2-1, 1.2-2, and 1.2-3)

Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS) (Refs. 1.2-4 and 1.2-5)

Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses (Ref. 1.2-6)

Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response (Ref. 1.2-7)

FPL has prepared Table 1.2-1 to verify conformance with regulatory requirements. Table 1.2-1 indicates where the Environmental Report responds to each requirement of 10 CFR 51.53(c). In addition, each responsive section is prefaced by a boxed quote of the regulatory language and applicable supporting document language.

TABLE 1.2-1
ENVIRONMENTAL REPORT RESPONSES TO LICENSE RENEWAL ENVIRONMENTAL REGULATORY REQUIREMENTS

Regulatory Requirement	Responsive Environmental Report Section(s)	
10 CFR 51.53(c)(1)		Entire Document
10 CFR 51.53(c)(2), Sentences 1 and 2	3.0	Proposed Action
10 CFR 51.53(c)(2), Sentence 3	7.2.2	Environmental Impacts of Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(1)	4.0	Environmental Consequences of the Proposed Action and Mitigating Actions
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(2)	6.3	Unavoidable Adverse Impacts
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(3)	7.0 8.0	Alternatives to the Proposed Action Comparison of Environmental Impacts of License Renewal with the Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(4)	6.5	Short-Term Use Versus Long-Term Productivity of the Environment
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(5)	6.4	Irreversible or Irretrievable Resource Commitments
10 CFR 51.53(c)(2) and 10 CFR 51.45(c)	4.0 6.2 7.2.2 8.0	Environmental Consequences of the Proposed Action and Mitigating Actions Mitigation Environmental Impacts of Alternatives Comparison of Environmental Impacts of License Renewal with the Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(d)	9.0	Status of Compliance
10 CFR 51.53(c)(2) and 10 CFR 51.45(e)	4.0 6.3	Environmental Consequences of the Proposed Action and Mitigating Actions Unavoidable Adverse Impacts
10 CFR 51.53(c)(3)(ii)(A)	4.1 4.6	Water Use Conflicts Groundwater Use Conflicts (Plants Using Cooling Towers Withdrawing Make-Up Water from a Small River)
10 CFR 51.53(c)(3)(ii)(B)	4.2 4.3 4.4	Entrainment of Fish and Shellfish in Early Life Stages Impingement of Fish and Shellfish Heat Shock

TABLE 1.2-1 (Cont'd)
ENVIRONMENTAL REPORT RESPONSES TO LICENSE RENEWAL ENVIRONMENTAL REGULATORY REQUIREMENTS

Regulatory Requirement	Responsive Environmental Report Section(s)	
10 CFR 51.53(c)(3)(ii)(C)	4.5	Groundwater Use Conflicts (Plants Using >100 gpm of Groundwater)
	4.7	Groundwater Use Conflicts (Plants Using Ranney Wells)
10 CFR 51.53(c)(3)(ii)(D)	4.8	Degradation of Groundwater Quality
10 CFR 51.53(c)(3)(ii)(E)	4.9	Impacts of Refurbishment on Terrestrial Resources
	4.10	Threatened or Endangered Species
10 CFR 51.53(c)(3)(ii)(F)	4.11	Air Quality During Refurbishment (Non-Attainment or Maintenance Areas)
10 CFR 51.53(c)(3)(ii)(G)	4.12	Impact on Public Health of Microbiological Organisms
10 CFR 51.53(c)(3)(ii)(H)	4.13	Electric Shock from Transmission-Line-Induced Currents
10 CFR 51.53(c)(3)(ii)(I)	4.14	Housing Impacts
	4.15	Public Utilities: Public Water Supply Availability
	4.16	Education Impacts from Refurbishment
	4.17	Offsite Land Use
10 CFR 51.53(c)(3)(ii)(J)	4.18	Transportation
10 CFR 51.53(c)(3)(ii)(K)	4.19	Historic and Archaeological Resources
10 CFR 51.53(c)(3)(ii)(L)	4.20	Severe Accident Mitigation Alternatives
10 CFR 51.53(c)(3)(iii)	4.0	Environmental Consequences of the Proposed Action and Mitigating Actions
	6.2	Mitigation
10 CFR 51.53(c)(3)(iv)	5.0	Assessment of New and Significant Information
10 CFR 51, Appendix B, Table B-1, Footnote 6	4.21	Environmental Justice

1.3 REFERENCES

Ref. 1.1-1 U.S. Nuclear Regulatory Commission. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses." *Federal Register*. Vol. 61, No. 109. (June 5, 1996): 28467-97.

Ref. 1.2-1 U.S. Nuclear Regulatory Commission. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses; Correction." *Federal Register*. Vol. 61, No. 147. (July 30, 1996): 39555-6.

Ref. 1.2-2 U.S. Nuclear Regulatory Commission. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses." *Federal Register*. Vol. 61, No. 244. (December 18, 1996): 66537-54.

Ref. 1.2-3 U.S. Nuclear Regulatory Commission. "Changes to Requirements for Environmental Review for Renewal of Nuclear Power Plant Operating Licenses; Final Rules." *Federal Register*. Vol. 64, No. 171. (September 3, 1999): 48496-507.

Ref. 1.2-4 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437. Washington, D.C. May 1996.

Ref. 1.2-5 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants.* Section 6.3, "Transportation," and Table 9-1, "Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants." NUREG-1437, Vol. 1, Addendum 1. Washington, D.C. August 1999.

Ref. 1.2-6 U.S. Nuclear Regulatory Commission. *Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses*. NUREG-1440. Washington, D.C. May 1996.

Ref. 1.2-7 U.S. Nuclear Regulatory Commission. *Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response*. NUREG-1529. Washington, D.C. May 1996.

2.0 SITE AND ENVIRONMENTAL INTERFACES

2.1 LOCATION AND FEATURES

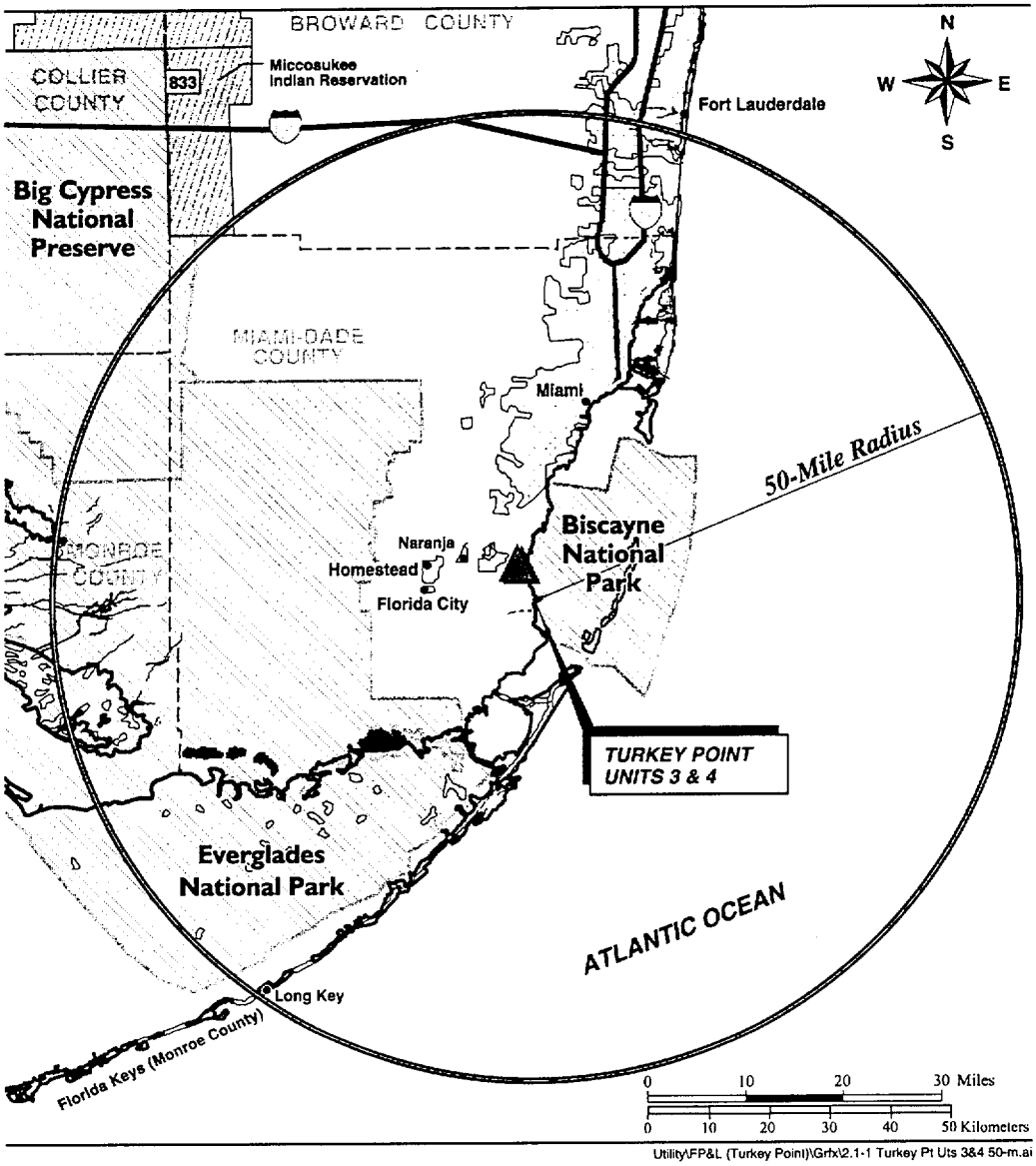
Turkey Point Units 3 & 4 are located on the shore of Biscayne Bay in Miami-Dade County, Florida, approximately 25 miles south of Miami. This location is latitude 25° 26' 04" North and longitude 80° 19' 52" West in Sections 27, 28, 29, 31, 32, 33, and 34, Township 57 South, Range 60 East (Ref. 2.1-1, Section 2.2). In decimal degrees, the location is latitude +25.435000 and longitude −80.331389. The nearest town city limits are Florida City, 8 miles west, and Homestead, 9 miles northwest. Key Largo is approximately 10 miles south of Turkey Point Units 3 & 4. Access to the site is primarily via Palm Drive from its intersection with U.S. Highway 1 in Florida City. Figures 2.1-1 and 2.1-2 show the site location and features within 50 miles and 6 miles, respectively. Figure 2.1-3 shows the Turkey Point Units 3 & 4 transmission lines.

The site is on the shore of a part of Biscayne Bay that, together with several miles of the shoreline north of the plant, is the Biscayne National Park. The Biscayne National Park headquarters are located approximately 2 miles north of Turkey Point Units 3 & 4, adjacent to the Metropolitan Miami-Dade County Homestead Bayfront Park. The Everglades National Park is approximately 15 miles west of the site. Small portions of the Miccosukee Indian Reservation and the Big Cypress National Preserve are also within 50 miles of Turkey Point Units 3 & 4. All of Miami-Dade County* is within 50 miles of Turkey Point Units 3 & 4; portions of Broward and Monroe Counties and a small portion of Collier County are also within 50 miles of the plant. Monroe County encompasses portions of Everglades National Park and Big Cypress National Preserve as well as the Florida Keys.

Mangrove Point forms the dividing line between Biscayne Bay and Card Sound. The northern half of Mangrove Point is part of Biscayne National Park, and the southern half is state-owned.

Land south and west of the site is in the Everglades Mitigation Bank. A mitigation bank is a wetland area that is created, restored, or enhanced for the purpose of

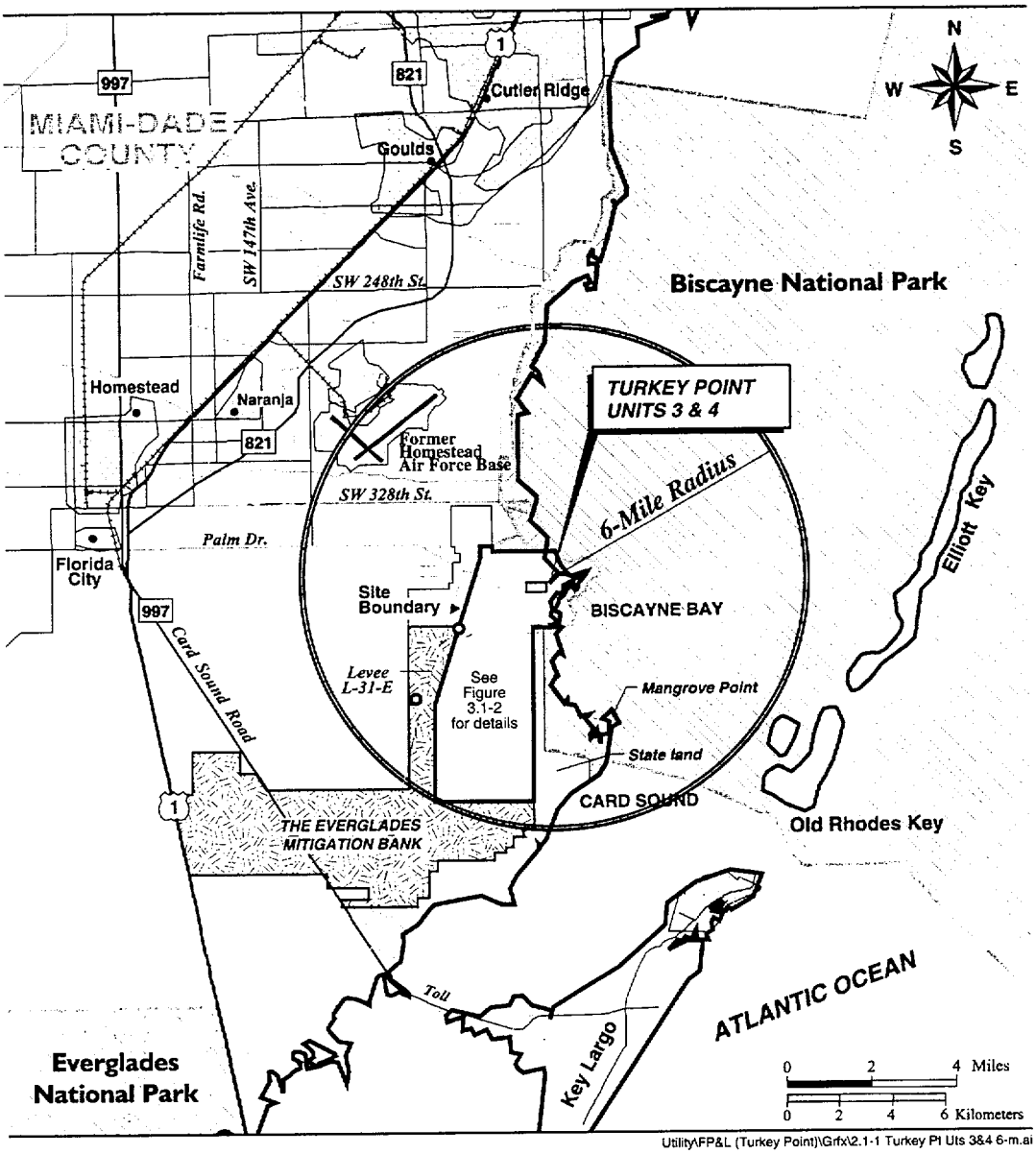
* In 1997, voters changed the name "Dade County" to "Miami-Dade County." This Environmental Report uses the latter name except when a reference predates the name change.



LEGEND

- County Lines
- Metropolitan Area
- National Parks
- Roads

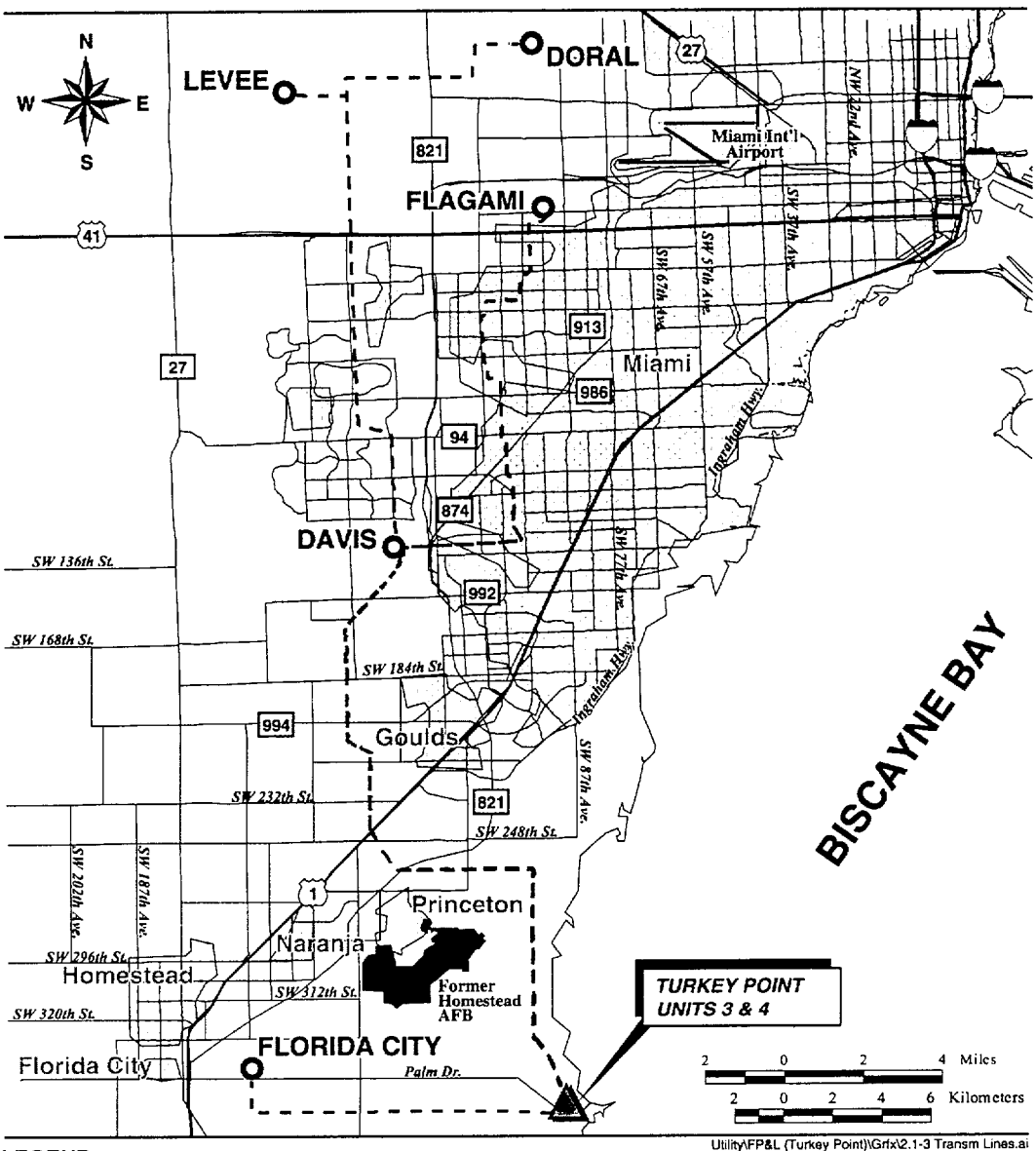
FIGURE 2.1-1
Turkey Point Units 3 & 4, 50-Mile Region
LICENSE RENEWAL APPLICATION
TURKEY POINT UNITS 3 & 4



LEGEND

- Groundwater Monitoring Wells (approx. location)
- Metropolitan Area
- National Parks
- Railroads
- Rivers/Streams

FIGURE 2.1-2
Turkey Point Units 3 & 4, 6-Mile Vicinity
LICENSE RENEWAL APPLICATION
TURKEY POINT UNITS 3 & 4



LEGEND

- Substations
- Metropolitan Areas
- Transmission Lines

FIGURE 2.1-3
Turkey Point Transmission Lines
LICENSE RENEWAL APPLICATION
TURKEY POINT UNITS 3 & 4

providing compensatory mitigation of wetland losses elsewhere. The U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the Natural Resources Conservation Service, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service guide use of the mitigation bank program to satisfy mitigation requirements of the Clean Water Act Section 404 permit program, the wetland conservation provisions of the Food Security Act, the National Environmental Policy Act, and several other statutory provisions (Ref. 2.1-2). The Florida Department of Environmental Protection, the South Florida Water Management District, and Miami-Dade County guide the mitigation bank program within Florida pursuant to the Florida Mitigation Banking Rule and other state authorities (Ref. 2.1-3).

Under the joint federal- and state-operated mitigation bank program, lands can be publicly or privately owned. Florida Power & Light Company (FPL) owns the Everglades Mitigation Bank land, approximately 13,000 acres of relatively undisturbed freshwater and estuarine wetlands. The primary goal of the mitigation bank is to restore mitigation bank lands as closely as reasonably attainable to historic conditions in concert with federal and state goals for the region, including Everglades restoration. The mitigation bank allows public and private entities to purchase mitigation credits to offset adverse impacts to wetlands from proposed actions elsewhere in the region.

Turkey Point Units 3 & 4 are co-located with a 2-unit fossil plant, Turkey Point Units 1 & 2. Section 3.1 describes key features of Turkey Point Units 3 & 4, and Section 3.5 describes key features of Turkey Point Units 1 & 2. In addition to the nuclear and fossil units, one site feature is a 6,700-acre (2-mile by 5-mile) system of cooling canals that all 4 units use.

2.2 AQUATIC AND RIPARIAN ECOLOGICAL COMMUNITIES

The ground elevation at the site is typically less than 1 foot above mean sea level. The direction of surface drainage is to the east and south, toward Biscayne Bay and Card Sound. The area contains no lakes or perennial streams. Surface water runoff in the region is not naturally limited to confined watercourses such as rivers or streams; it also flows over the surface as a broad, shallow sheet called "sheet flow." Canal, levee, and road construction during this century has diverted much of this flow, drying land areas for agricultural and other uses (Ref. 2.1-1, Section 2.7). South Florida is criss-crossed by an extensive flood control system. Levee L 31-E, which has a crest elevation of 7 feet above mean sea level, runs roughly north-south at the inland boundary of the FPL canal system.

As shown in Figure 2.1-2, lower Biscayne Bay is directly east of the Turkey Point site, separated from the Atlantic Ocean by Elliott Key. The water is shallow, about 13 feet at the deepest point; the average depth at mean low water is 5 feet. The principal tidal movement is north to south. Salinity in this part of Biscayne Bay varies from about 24 parts per thousand (ppt) to 44 ppt, depending on rainfall and surface drainage. Water temperature varies from 15°C to 33°C (59°F to 91°F).

Card Sound is located immediately south of Biscayne Bay and is approximately 24 miles square. Principal circulation is north to south with very little exchange to the open ocean except during periods of intense onshore winds. Mean depth is 10 feet and temperatures range from 15°C to 34°C (59°F to 93°F). Salinity depends upon surface runoff.

As described in the 1972 Turkey Point Units 3 & 4 Final Environmental Statement for operations (Ref. 2.2-1, Section II.F.2), the marine environment comprises three zones from the shore to the center of Biscayne Bay and Card Sound–red mangroves, shallows, and open water. Mangroves contribute nutrients to the aquatic system and serve as a fishery and invertebrate nursery. The studies done for the Final Environmental Statement collected more than 50 species of fish in the mangroves; 36 percent were gray snapper (*Lutjanus griseus*), 18 percent were mullet (*Mugil spp.*), and 6 percent were yellowfin mojarra (*Gerres cinereus*). Five species of invertebrates were collected. The most common (90 percent) was the blue crab (*Callinectes sapidus*).

Seagrass beds extend from shore into Biscayne Bay and Card Sound for distances from hundreds to thousands of feet. The principal grass is turtle grass (*Thalassia testudinum*). The turtle grass beds are the most important plant community in

Biscayne Bay. They serve as primary producers and a source of detritus; they provide shelter and substrate for such organisms as sponges, algae, mollusks, crabs, and small fish. The third type of habitat in the near shore waters is the central area, characterized by little vegetation except algae and some scattered patches of turtle grass. Most of the organisms collected in the central area of Card Sound are associated with sponge beds, including the spiny lobster (*Panulirus argus*). Other animals from Card Sound include fishes, mollusks, crustaceans, sponges, and echinoderms (Ref. 2.2-1, Section II.F.2).

The cooling canals at Turkey Point are a closed system and are not considered waters of the U.S. or the State. FPL activities in the canal system include aquatic weed removal, maintenance of the berms and canals, and crocodile monitoring. FPL facilities are adjacent to the system, and personnel travel on the canals in airboats. The canals are hypersaline (approximately 40 to 50 ppt), with high water temperatures [35°C to 38°C (95°F to 100°F)] and high ultraviolet light penetration because of the shallowness of most of the canals (approximately 3 feet) and the latitude of south Florida. The hypersalinity, temperature, and depth (less than 3 feet) limit the aquatic community. The predominant grass is widgeongrass (*Ruppia maritima*). Forage fish, particularly the killifish and livebearer families, have adapted well to the canal system. Other fish, such as snappers, jacks, and barracuda, are not able to reproduce within the canal system and their numbers have been reduced through natural attrition. This reduction in predator species and the favorable habitat account for the continued abundance of the forage fish (Ref. 2.2-2, page III.A.2-6). The crocodiles clearly breed in the canals, but how much foraging they do in the canal system is not known. Wading birds feed in the canals.

2.3 GROUNDWATER

The climate in the area of Turkey Point Units 3 & 4 consists essentially of two seasons; warm, wet summers from May to October and mild, dry winters the remainder of the year (Ref. 2.2-1, Section II.E.2). Groundwater in much of southern Florida (from Lake Okeechobee south) is near surface level and, during the wet season, merges with surface water. Natural groundwater and surface water flow is generally south to the Gulf of Mexico, Florida Bay, Biscayne Bay and smaller sounds, and the Atlantic Ocean.

The Biscayne Aquifer occurs at or close to the ground surface and extends to a depth of approximately 70 feet below ground surface. It is composed of highly permeable limestone overlain by approximately 5 feet of organic soils. Below the aquifer are 500 to 700 feet of less permeable limestone, marl, and sandstone. Groundwater in the vicinity of the site is saline and moves slowly to the east, to Biscayne Bay (Ref. 2.1-1, Section 2.10).

The natural ground surface elevation in the area of Turkey Point Units 3 & 4 is less than 1 foot above mean sea level and the normal tide range of Biscayne Bay is about 2 feet. Natural (undeveloped) areas are inundated during high tide and can remain under 1 to 3 inches of water at low tide. Tidal flooding is a much more significant surface hydrological feature of the area than is rainfall runoff. The relationship between surface recharge during rainy seasons and saline recharge from the ocean during dry seasons results in a great variance in groundwater chemistry from season to season. However, the movements are relative and there is a general freshwater wedge near the surface that oscillates about 5 miles towards and away from the coastline during a yearly cycle. Relatively high salinity (higher than 28 ppt) exists in groundwater below 40 feet at all times at the plant site (Ref. 2.2-1, Section II.E.3).

During the wet season and early part of the dry season, a natural seaward gradient exists at Turkey Point Units 3 & 4, and groundwater flow is southeasterly towards Biscayne Bay and Card Sound. Because most of the recharge comes from local rainfall, however, the natural gradient can disappear during the dry season and flow can be limited to tidal influences. During extremely dry periods, groundwater levels may be depressed below sea level, resulting in a reverse flow direction. As a result of these fluctuations in flow and the proximity to the saline waters of Biscayne Bay and Card Sound, groundwater in the vicinity of Turkey Point Units 3 & 4 is not used as a water source due to its salinity (Ref. 2.1-1, Section 2.10). Florida classifies these as a Class G-III waters (Ref. 2.3-1, page 1). Florida uses

"Class G-III" to identify groundwater that has no reasonable potential as a future source of drinking water due to high total dissolved solids content (Ref. 2.3-2).

The Turkey Point Units 3 & 4 site was traversed by two water management canals that were re-routed around the south end of the cooling canals system (Section 3.1.2) at the time of Turkey Point Units 3 & 4 construction. Water management canals are part of the drainage system that the South Florida Water Management District maintains and that intercepts much of the sheet flow in the plant area.

2.4 CRITICAL AND IMPORTANT TERRESTRIAL HABITATS

Turkey Point was built on mangrove-covered tidal flats adjacent to Biscayne Bay. The land is low and swampy. Mangrove swamps extend inland 3 to 4 miles. Most undeveloped portions of the site remain under 1 to 3 inches of water, even during low tide. The terrain is flat and rises gently from sea level at the shore to about 10 feet above mean sea level 8 to 10 miles west of the site in Homestead. Across Biscayne Bay, about 5 to 8 miles to the east, is a series of offshore barrier islands running northeast, between the Bay and the Atlantic Ocean (Ref. 2.1-1, Section 2.7.3).

Turkey Point includes portions of the critical habitats designated by the U.S. Fish and Wildlife Service for two endangered species: the Florida manatee and the American crocodile (50 CFR 17). Critical habitat for the Florida manatee includes Biscayne Bay and Card Sound offshore from Turkey Point, and adjoining and connected waterways such as the Turkey Point barge turning basin, the old discharge channel, and the South Florida Water Management District canals. Critical habitat for the American crocodile includes all of the Turkey Point site and offshore waters.

The first six miles of transmission lines immediately north of Turkey Point Units 3 & 4 (Figure 2.1-3) pass through mangrove swamp habitat. This area is near the western boundary of Biscayne National Park. Habitat along the transmission line from Turkey Point Units 3 & 4 to the Florida City substation is a vast (formerly marshy) wetland that has been seriously degraded by invasive exotic species such as Brazilian pepper (*Schinus terebinthifoluis),* Australian pine (*Casuarina litorea*), and melaleuca (*Melaleuca quinquinervia*). Other habitats traversed by the transmission lines include developed and agricultural areas typical of urban and suburban south Florida. These areas include shopping centers and businesses, residential areas, golf courses, vacant lots, plant nurseries, citrus groves, orchards, and row crops.

There are two other designated critical habitats in Miami-Dade County. The Everglades National Park and smaller areas northwest of Florida City, FL, constitue designated critical habitat for the Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*), and the area north of the Park and toward Lake Okeechobee is designated critical habitat for the Everglades kite (*Rostrhamus sociabilis).* The Turkey Point site is not within either habitat and the Turkey Point transmission lines do not cross either.

2.5 THREATENED OR ENDANGERED SPECIES

Animal and plant species that are state or federally listed as endangered, threatened, or of special concern, or are candidate species, and that occur or could occur (based on habitat and known geographic range) in the vicinity of Turkey Point Units 3 & 4 or along associated transmission lines (discussed in Section 3.1.4) are listed in Table 2.5-1.

Endangered American crocodiles (*Crocodylus acutus*) occur in the Turkey Point Units 3 & 4 cooling canal system. FPL manages the cooling canal system to enhance the habitat for crocodiles. FPL prepared and follows a crocodile management plan that details methods and timing of canal maintenance, construction, and security that will be least likely to disturb nests, adults, and hatchlings. In addition, FPL actively creates nesting sanctuaries by clearing exotic vegetation that chokes the berms where the crocodiles prefer to nest, providing shade by planting native species, and digging small ponds at the sanctuaries. In accordance with a state special purpose permit (Table 9.1-1) hatchlings are captured, weighed, measured, and permanently marked by clipping scutes and embedding microchips with unique identification numbers. Crocodiles also occur in the mangrove swamp immediately north of Turkey Point Units 3 & 4, through which the transmission line passes.

Endangered Florida manatees (*Trichechus manatee*) and threatened loggerhead turtles (*Caretta caretta*) occur in Card Sound and Biscayne Bay. Other sea turtle species listed in Table 2.5-1 are less common than loggerhead turtles in the vicinity of Turkey Point Units 3 & 4. Manatees also occur in the Turkey Point barge turning basin, the old discharge channel, and state canals. Other than birds, federally listed animal species shown in Table 2.5-1 occur or could occasionally occur in the wetlands comprised by the Everglades Mitigation Bank, but are not expected to occur in the cooling canal system or within the transmission line corridors due to the lack of suitable habitat. Most of the federal- and state-listed bird species shown in Table 2.5-1, while occurring primarily in the Everglades Mitigation Bank, would also be expected to utilize some portions of the transmission line corridors and the cooling canal system. The Everglades kite would not use the cooling canal system since it is restricted to freshwater wetlands.

Twenty-two plant species (Table 2.5-1) found within the Everglades Mitigation Bank site are listed as state endangered (17), or threatened (5). Of these, one is federally endangered (reclined clustervine; *Jacquemontia reclinata*) and one is federally threatened (Garber's spurge; *Chamaesyce garberi).* Some of the plant species shown in Table 2.5-1 could potentially occur in the mangrove swamp through which the transmission line passes immediately north of Turkey Point

Units 3 & 4. Listed plant species are not expected to exist along other portions of the transmission corridors due to the developed character of the habitats.

FPL has not included on Table 2.5-1 two plant species that the U.S. Fish and Wildlife Service lists (Ref. 2.5-7) as occurring within Miami-Dade County, the Crenulate lead-plant (*Amorpha crenulata)* and the Deltoid spurge (*Chamaesyce deltoidea deltoidea*). FPL understands that these species occur on rocky pinelands (Ref. 2.5-4, pages 343 and 398), habitat that does not occur on the Turkey Point site or transmission line corridors. The U.S. Fish and Wildlife Service also lists the Schaus swallowtail butterfly (*Papilio aristodemus ponceanus*) as occurring within Miami-Dade County. The Service website indicates, however, that the butterfly occurs in tropical hardwood hammocks on the upper Florida Keys from Elliott Key to northern Key Largo and on Upper Matecumbe Key (Ref. 2.5-6). Elliott Key is located within Miami-Dade County, approximately 8 miles from Turkey Point Units 3 & 4 (Figure 2.1-2). However, due to the lack of known presence on the mainland and the lack of tropical hardwood hammock habitat on the Turkey Point site and transmission line corridors, FPL concludes that this species is not pertinent to Turkey Point Units 3 & 4 license renewal.

TABLE 2.5-1
ENDANGERED, THREATENED, OR SPECIAL CONCERN ANIMAL AND PLANT SPECIES THAT MAY OCCUR AT TURKEY POINT UNITS 3 & 4 OR ALONG ASSOCIATED TRANSMISSION LINES

Scientific Name	Common Name	Federal Status[a]	State Status[a]
Birds			
Ajaia ajaja	Roseate spoonbill	–	SSC
Ammodramus maritimus mirabilis	Cape Sable seaside sparrow	E	E
Aramus guarauna	Limpkin	–	SSC
Charadrius melodus	Piping plover	T	T
Columba leucocephala	White-crowned pigeon	–	T
Egretta caerulea	Little blue heron	–	SSC
Egretta rufescens	Reddish egret	–	SSC
Egretta thula	Snowy egret	–	SSC
Egretta tricolor	Louisiana heron	–	SSC
Eudocimus albus	White ibis	–	SSC
Falco peregrinus	Peregrine falcon	–	E
Falco sparverius paulus	Southeastern American kestrel	–	T
Haematopus palliatus	American oystercatcher	–	SSC
Haliaeetus leucocephalus	Bald eagle	T	T
Mycteria americana	Wood stork	E	E
Pelacanus occidentalis	Brown pelican	–	SSC
Rostrhamus sociabilis	Everglades kite	E	E
Rynchops niger	Black skimmer	–	SSC
Speotyto cunicularia	Florida burrowing owl	–	SSC
Sterna dougallii	Roseate tern	T	T
Sterna antillarum	Least tern	–	T
Reptiles			
Alligator mississippiensis	American alligator	T (SA)	SSC
Caretta caretta	Loggerhead sea turtle	T	T
Chelonia mydas mydas	Green sea turtle	E	E
Crocodylus acutus	American crocodile	E	E
Dermochelys coriacea	Leatherback sea turtle	E	E
Drymarchon corias couperi	Eastern indigo snake	T	T

TABLE 2.5-1 (Cont'd)
ENDANGERED, THREATENED, OR SPECIAL CONCERN ANIMAL AND PLANT SPECIES THAT MAY OCCUR AT TURKEY POINT UNITS 3 & 4 OR ALONG ASSOCIATED TRANSMISSION LINES

Scientific Name	Common Name	Federal Status[a]	State Status[a]
Eretmochelys imbricata imbricata	Hawksbill sea turtle	E	E
Eumeces egregius egregius	Florida Keys mole skink	–	SSC
Mammals			
Felis concolor coryi	Florida panther	E	E
Felis concolor	Puma (mountain lion)	T(SA)	–
Mustela vison evergladensis	Everglades mink	–	T
Trichechus manatus	Florida manatee	E	E
Fish			
Centropomus undecimalis	Common snook	–	SSC
Rivulus marmoratus	Rivulus	–	SSC
Plants			
Acrostichum aureum	Golden leather fern	–	E
Argythamnia blodgettii	Blodgett's silverbrush	C	E
Brickellia mosieri	Mosier's false boneset (Florida brickell-bush)	C	E
Chamaecrista lineata keyensis	Big Pine partridge pea	C	–
Chamaesyce deltoidea pinetorum	Pineland sandmat	C	–
Chamaesyce garberi	Garber's spurge	T	E
Coccothrinax aregentata	Silver palm	–	E
Dalea carthagenensis floridana	Florida prairie-clover	C	–
Digitaria pauciflora	Florida pineland crabgrass	C	E
Encyclia boothiana	Dollar orchid	–	E
Eugenia confusa	Redberry ironwood	–	E
Eulophia alta	Wild coco	–	T
Galactia smalli	Small's milkpea	E	E
Galeandra beyrichii	Helmet orchid	–	E
Jacquemontia curtissii	Pinelands clustervine	–	E
Jacquemontia reclinata	Reclined clustervine	E	E
Lantana depressa	Pineland lantana	–	E
Linum arenicola	Sand flax	C	E

TABLE 2.5-1 (Cont'd)
ENDANGERED, THREATENED, OR SPECIAL CONCERN ANIMAL AND PLANT SPECIES THAT MAY OCCUR AT TURKEY POINT UNITS 3 & 4 OR ALONG ASSOCIATED TRANSMISSION LINES

Scientific Name	Common Name	Federal Status[a]	State Status[a]
Linum carteri carteri	Carter's small-flowered flax	C	E
Linum carteri var. *smalli*	South Florida flax	–	E
Lupinus aridorum	Scrub lupine	E	E
Nephrolepsis biserrata	Giant sword fern	–	T
Polygala smallii	Tiny polygala	E	E
Suriana maritima	Bay cedar	–	E
Swietenia mahogani	West Indian mahogany	–	E
Thelypteris augescens	Abrupt-tipped maiden fern	–	T
Tillandsia balbisiana	Inflated wild pine	–	T
Tillandsia fasciculata	Common wild pine	–	E
Tillandsia flexuosa	Banded wild pine	–	E
Tillandsia utriculata	Giant wild pine	–	E
Tillandsia valenzuelana	Soft-leaved wild pine	–	T
Tournefortia gnaphalodes	Sea lavender	–	E
Vanilla barbellata	Worm vine orchid	–	E

Sources: Refs. 2.1-3; 2.2-2; 2.5-1; 2.5-2; 2.5-3; 2.5-4; 2.5-5; 2.5-6; and 2.5-7

Note: a. C = candidate (proposed)
E = endangered
SA = similarity of appearance (e.g., to the crocodile)
SSC = Species of Special Concern
T = threatened

2.6 REGIONAL DEMOGRAPHY

The *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) presents a population characterization method that is based on two factors, "sparseness" and "proximity" (Ref. 2.6-1, Section C.1.4). "Sparseness" measures population density and city size within 20 miles of a site and categorizes the demographic information as follows:

	Category	
Most sparse	1.	Less than 40 persons per square mile and no community with 25,000 or more persons within 20 miles
	2.	40 to 60 persons per square mile and no community with 25,000 or more persons within 20 miles
	3.	60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 miles
Least sparse	4.	Greater than or equal to 120 persons per square mile within 20 miles

Source: Ref. 2.6-1, page C-159.

"Proximity" measures population density and city size within 50 miles, and categorizes the demographic information as follows:

	Category	
Not in close proximity	1.	No city with 100,000 or more persons and less than 50 persons per square mile within 50 miles
	2.	No city with 100,000 or more persons and between 50 and 190 persons per square mile within 50 miles
	3.	One or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 miles
In close proximity	4.	Greater than 190 persons per square mile within 50 miles

Source: Ref. 2.6-1, page C-159.

The GEIS then uses the following matrix to rank the population category as low, medium, or high:

Sparseness \ Proximity	1	2	3	4
1	1.1	1.2	1.3	1.4
2	2.1	2.2	2.3	2.4
3	3.1	3.2	3.3	3.4
4	4.1	4.2	4.3	4.4

Low Medium High

Source: Ref. 2.6-1, page C-6.

FPL used 1990 census data from the U.S. Census Bureau website (Ref. 2.6-2) and geographic information system software (ArcView®) to determine demographic characteristics in the vicinity of Turkey Point Units 3 & 4. The Census Bureau provides updated annual projections, in addition to decennial data, for selected portions of its demographic information. However, Section 2.12 uses 1990 minority and low-income population demographic information because updated projections are not available for the census-tract-level analysis in Section 4.21, *Environmental Justice*. FPL chose to also use 1990 data in Section 2.6, *Regional Demography*, so that the data sets are consistent throughout the Turkey Point Units 3 & 4 Environmental Report.

According to the Census Bureau information, there are an estimated 468,065 people living within 20 miles of Turkey Point Units 3 & 4. Applying the GEIS sparseness measures, this means that Turkey Point Units 3 & 4 has a population density of 372 persons per square mile within 20 miles and falls into the least sparse category (Category 4, having greater than or equal to 120 persons per square mile within 20 miles).

There are an estimated 2,572,526 people living within 50 miles of Turkey Point Units 3 & 4. This equates to a population density of 328 persons per square mile within 50 miles. Applying the GEIS proximity measures, Turkey Point Units 3 & 4 are classified as being "in close proximity" (Category 4, having greater than or equal to 190 persons per square mile within 50 miles). According to the GEIS sparseness and proximity matrix (Ref. 2.6-1, page C-6), the Turkey Point Units 3 & 4 sparseness Category 4 and proximity Category 4 result in the conclusion that Turkey Point Units 3 & 4 are located in a high population area.

All or parts of 4 counties are located within 50 miles of Turkey Point Units 3 & 4; Broward, Collier, Miami-Dade, and Monroe (collectively known as South Florida). Figure 2.1-1 shows the location of these counties. The portion of Collier County within 50 miles of Turkey Point Units 3 & 4 is part of the Big Cypress National Preserve and has a population of zero. All but a small corner of Miami-Dade County is within 50 miles of Turkey Point Units 3 & 4, as are portions of Broward and Monroe Counties. The portion of Monroe County that is within 50 miles of Turkey Point Units 3 & 4 includes the Everglades National Park and the Keys to approximately Long Key. Table 2.6-1 presents total population statistics and projections for the three counties of interest.

TABLE 2.6-1
POPULATION AND ANNUAL GROWTH RATES IN BROWARD, MIAMI-DADE, AND MONROE COUNTIES FROM 1980 TO 2020

	Broward County		Miami-Dade County		Monroe County	
Year	Population	Growth Rate[a] (Percent)	Population	Growth Rate[a] (Percent)	Population	Growth Rate[a] (Percent)
1980	1,018,300	5.1	1,625,500	2.5	63,200	1.9
1990	1,255,500	2.1	1,937,200	1.8	78,000	2.1
2000	1,493,000	1.7	2,141,700	1.0	87,700	1.2
2010	1,707,800	1.4	2,362,100	1.0	96,800	1.0
2020	1,926,600	1.2	2,587,400	0.9	106,000	0.9

Source: Modified from Ref. 2.6-3.

Note: a. Annual growth rate over previous decade.

Since the early 1950s, the urbanization of South Florida has occurred rapidly. In 1950, there were four cities within the region with populations of 25,000 or more. As the region entered the final decade of the 1900s, 25 of the 57 municipalities had populations greater than 25,000 and 10 had more than 50,000 residents (Ref. 2.6-3).

The dramatic growth in city size over the years has occurred despite a declining overall regional growth rate. Essentially rural areas in the western extremes of Broward and Miami-Dade Counties have given way to sprawling suburban residential development. South Florida has a distinctly urban population. Miami-Dade County was 94 percent urban in 1950, and Broward County was 77 percent urban. By 1980, both counties were 99 percent urban. Only in Monroe County did a significant portion of the population still live outside of urban areas in 1990 (27 percent), consistent with the special characteristics of that county's geography.

The region is likely to continue to urbanize. Current preferences for low-density residential areas will likely give way to a higher density urban-like lifestyle. There will be less developable land available, resulting in a greater need to protect natural habitats. Agriculture will continue to be pressured as land is developed or set aside for environmental protection (Ref. 2.6-3).

2.7 ECONOMIC BASE

Historically, South Florida's economy has been strongly influenced by tourism and migration into the area. Over time, the regional economy has become more service-oriented, with an increasing share of employment in the service-producing industries and a decreasing share of employment in goods-producing industries. In recent years, it also has seen a significant increase in international trade as integration with the global economy has accelerated.

Miami-Dade County's unemployment rates have been the highest in the region, and higher than the state average since 1988. In 1998, Miami-Dade County had a 6.1 percent unemployment rate, Broward County a 4.1 percent unemployment rate, and Monroe County a 2.8 percent unemployment rate. Florida's unemployment rate was 3.8 percent during the same year (Ref. 2.6-3).

2.8 HOUSING

The Miami-Dade County Comprehensive Development Master Plan includes a housing element (Ref. 2.8-1, page III-1). The plan presents policies and programs aimed at attaining the following housing goals:

> Goal 1 – Ensure the provision of affordable housing products that will meet the spatial and economic necessities of all current and future Miami-Dade County residents, regardless of household type or income.
>
> Goal 2 – Identify and provide more affordable housing opportunities from within the existing housing stock and ensure its efficient use through rehabilitation, infill development, and adaptive conversion of non-residential structures to housing use throughout Miami-Dade County.
>
> Goal 3 – All variations of affordable housing products in Miami-Dade County should be provided through the most economically feasible alternatives.

As the wording of the goals suggests, the Plan encourages housing development, particularly for housing that is affordable at lower income levels. The Plan seeks to guide housing development and maintain fair housing ordinances and does not include growth control measures that would limit housing development.

2.9 TAXES

FPL pays annual property taxes to Miami-Dade County for Turkey Point Units 3 & 4. Property and other taxes fund Miami-Dade County operations, the Miami-Dade County schools, the South Florida Water Management District, and the Florida Inland Waterways Navigation System. For the years 1995 to 1998, Turkey Point Units 3 & 4 property taxes comprised about 2 percent of Miami-Dade County's total property tax revenue (Table 2.9-1). Property taxes from all sources constitute about 24 percent of Miami-Dade County's total operating budget.

FPL projects that the Turkey Point Units 3 & 4 annual property taxes will remain approximately the same through the license renewal period.

TABLE 2.9-1
TURKEY POINT UNITS 3 & 4 CONTRIBUTION TO COUNTY PROPERTY TAX REVENUES AND OPERATING BUDGET

Year	Total Miami-Dade County Property Tax Revenues	Property Tax Paid to Miami-Dade County for Turkey Point Units 3 & 4	Percent of Total Property Taxes	Operating Budget for Miami-Dade County
1995	$611,518,000	$12,931,312	2.1	$2,553,886,000
1996	$608,922,000	$9,950,694	1.6	$2,663,645,000
1997	$627,268,000	$8,979,384	1.4	$2,685,422,000
1998	$653,096,000	$10,139,868	1.6	$2,767,395,000

2.10 LAND USE PLANNING

This section focuses on Miami-Dade County because approximately 85 percent of the permanent Turkey Point Units 3 & 4 workforce lives in Miami-Dade County (see Section 3.4 for workforce description). The following discussion is based on the Miami-Dade County Comprehensive Development Master Plan (Ref. 2.8-1).

The Miami-Dade County government has responsibilities that include land use, transportation, housing, education, capital improvements, and others for incorporated and unincorporated areas of the county. Miami-Dade County contains 30 municipalities. The Florida Statutes require that counties and municipalities maintain comprehensive planning and land development regulations. Several fundamental growth management components of these plans set minimum standards for zoning, services, and regulations, including allowable land uses and public services and facilities, policies for development of urban centers, population estimates and distributions, and the construction and operation of public facilities.

The most recent land-use comprehensive plan developed by the county considers development through the year 2015. Key components of the land-use plan (Ref. 2.8-1, pages I-2 through I-19) are:

- urban growth shall be concentrated around centers of activity, emphasizing well-developed communities rather than urban sprawl (Objective 1)

- development and redevelopment shall ensure the protection of natural resources, and historic and archaeologically significant sites (Objectives 3 and 6)

- land uses that are inconsistent with the goals of the comprehensive plan shall be reduced by 2005 (Objective 4)

- development will be energy efficient through metropolitan land use patterns, site planning, landscaping, building design, and the development of multimodal transportation systems (Objective 9)

The plan has designated the location of Turkey Point Units 3 & 4 as coastal wetland and hammocks, an environmental protection area (Ref. 2.8-1, Figure 5, page I-54). The plan states that,"...necessary electrical generation and transmission facilities are ... permitted in this area. The approval of any new use,

and the replacement or expansion of any existing use will be conditioned upon its demonstrated consistency with the adopted goals, objectives, and policies of this plan, and conformity with all prevailing environmental regulations" (Ref. 2.8-1, page I-57).

2.11 SOCIAL SERVICES AND PUBLIC FACILITIES

2.11.1 PUBLIC WATER SUPPLY

Potable water services in Miami-Dade County are provided by the cities of Florida City, Hialeah, Homestead, North Miami, North Miami Beach, and the Miami-Dade Water and Sewer Department, which supplies Turkey Point Units 3 & 4. The Miami-Dade system's Alexander Orr, Jr., Water Treatment Plant services the south and central Miami-Dade area except for the Florida City and Homestead areas. This plant has a permitted capacity of 248 million gallons per day, although its treatment capacity is limited to 217 million gallons per day until additional supply wells are completed. South Florida Water Management District allocations for the plant include an average flow of 203.1 million gallons per day and a peak flow of 241.7 million gallons per day. For the 12 months ending December 1998, actual daily demand averaged 171.6 million gallons per day with a peak demand of 187.5 million gallons per day. Plant staff do not consider the plant to be near its capacity.

The Florida City municipal water treatment plant has a permitted capacity of 2.7 million gallons per day. South Florida Water Management District allocations for the plant include a maximum permitted raw water withdrawal of 3.6 million gallons per day. In 1997, average plant production was 2.6 million gallons per day, with a peak demand of 3.0 million gallons per day. The plant was rated as having no additional treatment capacity available.

The Homestead municipal water treatment plant has a permitted capacity of 9.9 million gallons per day. South Florida Water Management District allocations for the plant include a maximum permitted raw water withdrawal of 8.6 million gallons per day. In 1997, average plant production was 8.2 million gallons per day, with a peak demand of 9.1 million gallons per day. The plant was rated as having 8.1 percent treatment capacity available.

All of Miami-Dade County's drinking water comes from the Biscayne Aquifer, so the Comprehensive Development Master Plan (Ref. 2.8-1, Water and Sewer Supplement, beginning on page V-2) sets strict criteria for maintaining the integrity

of the aquifer. In addition, the Master Plan describes how the county will meet future water demands, including:

- The regional treatment system will operate at an average daily capacity that is 2 percent greater than the average daily per capita system demand for the preceding five years

- The county will continue its practice of installing oversized water and sewer mains and associated facilities in anticipation of future needs

- The county will develop and implement a water conservation program, and will expand traditional sources of raw water

2.11.2 TRANSPORTATION

The U.S. Transportation Research Board has developed a commonly used indicator, called "level of service," for measuring how well a roadway handles traffic volume. Level of service is a qualitative measure of how efficiently traffic is serviced and how much delay might be encountered by the average vehicle during peak hours. Table 2.11-1 presents the level of service definitions used by local and state agencies, as well as by the NRC in the GEIS (Ref. 2.6-1, Section 3.7.4.2).

Road access to the Turkey Point plant is via East Palm Drive (SW 344 Street), which is a two-lane road for approximately one half of its length from the plant to Florida City, (Figure 2.1-2). Palm Drive intersects U.S. Highway 1 in Florida City, approximately 9 miles from the plant. Both Palm Drive and U.S. Highway 1 are four-lane roads in the area of intersection and carry a level-of-service classification of "B."

TABLE 2.11-1
LEVEL-OF-SERVICE DEFINITIONS

Level of service	Conditions
A	Free flow of the traffic stream; users are unaffected by the presence of others.
B	Stable flow in which the freedom to select speed is unaffected but the freedom to maneuver is slightly diminished.
C	Stable flow that marks the beginning of the range of flow in which the operation of individual users is significantly affected by interactions with the traffic stream.
D	High-density, stable flow in which speed and freedom to maneuver are severely restricted; small increases in traffic will generally cause operational problems.
E	Operating conditions at or near capacity level causing low but uniform speeds and extremely difficult maneuvering that is accomplished by forcing another vehicle to give way; small increases in flow or minor perturbations will cause breakdowns.
F	Defines forced or breakdown flow that occurs wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. This situation causes the formation of queues characterized by stop-and-go waves and extreme instability.

Source: Ref. 2.6-1, Section 3.7.4.2.

2.12 MINORITY AND LOW-INCOME POPULATIONS

2.12.1 MINORITY POPULATIONS

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 (Ref. 2.12-1, Attachment 4). The guidance indicates that a minority population exists if:

> Exceeds 50 Percent - the minority population of the environmental impact site exceeds 50 percent or
>
> More than 20 Percent Greater - the minority population percentage of the impact site is significantly greater (typically at least 20 percent) than the minority population percentage in the geographic area chosen for comparative analysis

The NRC performed environmental justice analyses for Calvert Cliffs Nuclear Power Plant and Oconee Nuclear Station license renewal (Section 4.4.6 of Refs. 2.12-2 and 2.12-3, respectively). In doing so, the NRC used a 50-mile radius as the environmental impact site and the state as the geographic area for comparative analysis. FPL has adopted this approach for the Turkey Point Units 3 & 4 environmental justice analysis (Section 4.21).

The NRC guidance calls for use of the most recent U.S. Census Bureau decennial census data. FPL used 1990 census data from the U.S. Census Bureau website (Ref. 2.6-2) in determining the percentage of the total population within the State of Florida for each minority category and in identifying minority and low-income populations within 50 miles of Turkey Point Units 3 & 4. The U.S. Census Bureau provides updated annual population projections for selected portions of its demographic information, however, the updated projections are not available for census-tract levels of analysis. FPL used ArcView® software to combine U.S. Census Bureau tract data with Environmental Systems Research Institute tract-boundary spatial data to produce tract-by-tract data and maps. FPL included census tracts if 50 percent of their area lay within 50 miles of Turkey Point Units 3 & 4. The 50-mile radius (geographic area) includes 362 census tracts.

FPL divided U.S. Census Bureau population numbers for each minority by the total population for the State of Florida to obtain the percentage of the total represented

by each minority. Table 2.12-1 shows the result of this calculation and the threshold for determining whether a minority population exists. Because the state percentages are low, the "more than 20 percent greater" criterion is more encompassing than the "exceeds 50 percent" criterion. For example, if 40 percent of a Florida tract was Black, it would not contain a minority population under the "exceeds 50 percent" criterion. However, because 13 percent of the Florida population is Black, the tract would contain a minority population under the "more than 20 percent greater" criterion because 40 percent does exceed 33 percent (13 percent plus 20 percent).

For each of the 362 census tracts within 50 miles of Turkey Point Units 3 & 4, FPL calculated the percentage of the population in each minority category and compared the result to the corresponding threshold percentage to determine whether minority populations exist. Three counties, Broward, Miami-Dade, and Monroe, make up the 50-mile radius surrounding Turkey Point Units 3 & 4. Table 2.12-1 indicates how many census tracts within each county exceed the threshold for determining the presence of a minority population.

Based on the "more than 20 percent greater" criterion, Broward County has Black minority populations in 16 tracts and a Hispanic minority population in 1 tract. Miami-Dade County has an Asian minority population in 1 tract, Black minority populations in 72 tracts, and Hispanic minority populations in 146 tracts. Monroe County tracts do not meet either criterion for minority populations. Overall, the vicinity of Turkey Point Units 3 & 4 contains a large Hispanic minority population and a somewhat smaller Black minority population. Figures 2.12-1 and 2.12-2 show the locations of these populations. As shown, Hispanic minority populations occur throughout most of Miami-Dade County, including the tract immediately north of the Turkey Point Units 3 & 4 site. Black minority populations tend to be concentrated north of central Miami.

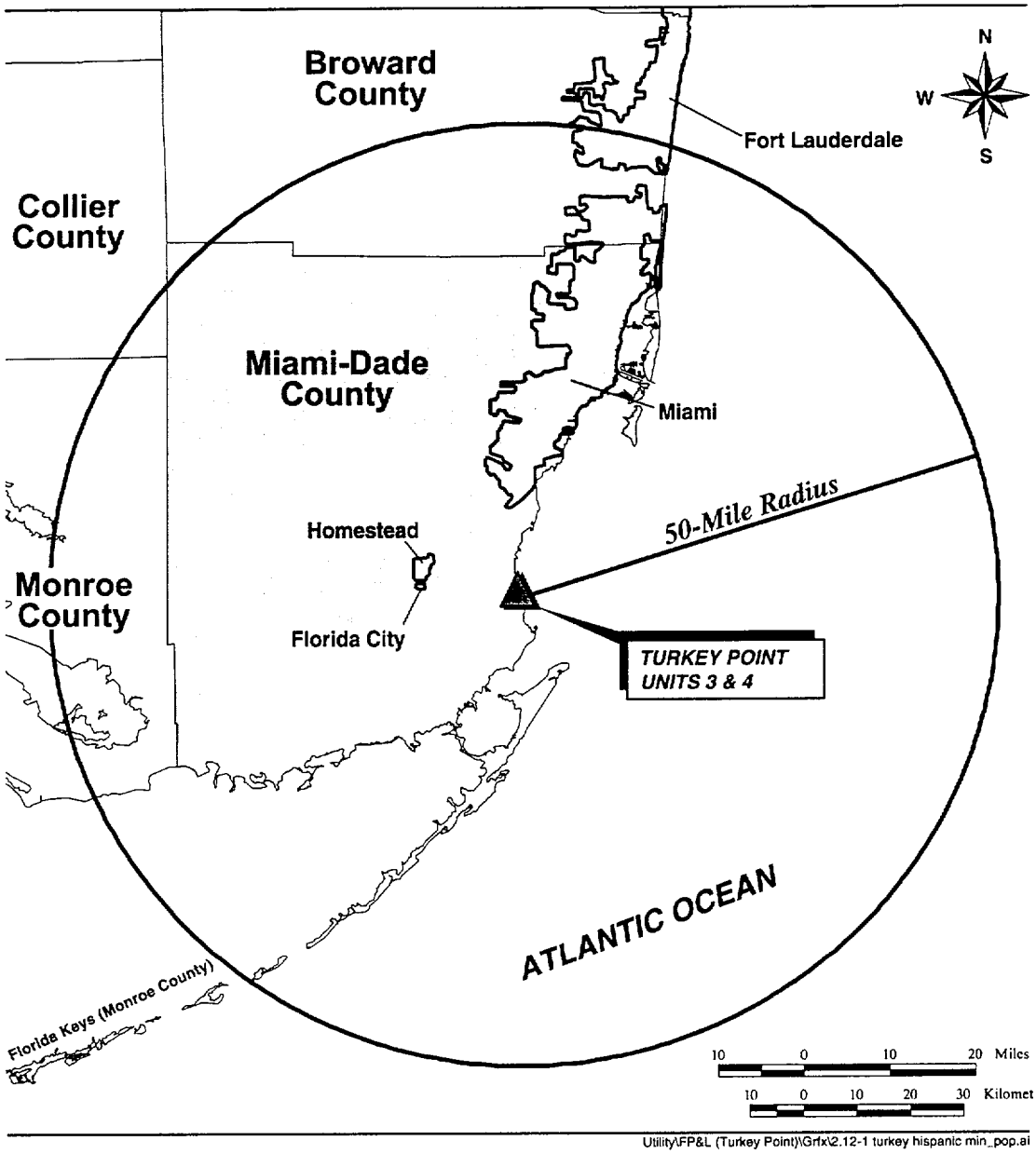
2.12.2 LOW-INCOME POPULATIONS

NRC guidance defines "low-income" using U.S. Census Bureau statistical poverty thresholds (Ref. 2.12-1, Attachment 4). The guidance indicates that a low-income population is present if the percentage of households below the poverty level in an environmental impact site is significantly greater (typically at least 20 percent) than the low-income population percentage in the geographical area chosen for comparative analysis. U.S. Census Bureau data (Ref. 2.6-2) characterize 12 percent of Florida households as low-income. Applying the NRC criterion (at least 20 percent greater than state), seven Broward County census tracts,

TABLE 2.12-1
MINORITY AND LOW-INCOME POPULATION CENSUS TRACTS

Category[a]	State Average (percent)[b]	Threshold for Minority Population (percent)[c]	Number of County Census Tracts Exceeding Threshold		
			Broward	Miami-Dade	Monroe
American Indian or Alaskan Native	<1	20	0	0	0
Asian or Pacific Islander	1	21	0	1	0
Black (Non-Hispanic origin)	13	33	16	72	0
Hispanic	12	32	1	146	0
Low Income	12	32	7	50	0

Notes: a. As defined by Ref. 2.12-1, Attachment 4.
b. Source: U.S. Census Bureau website (Ref. 2.6-2).
c. At least 20 percent greater than state average (Ref. 2.12-1, Attachment 4).



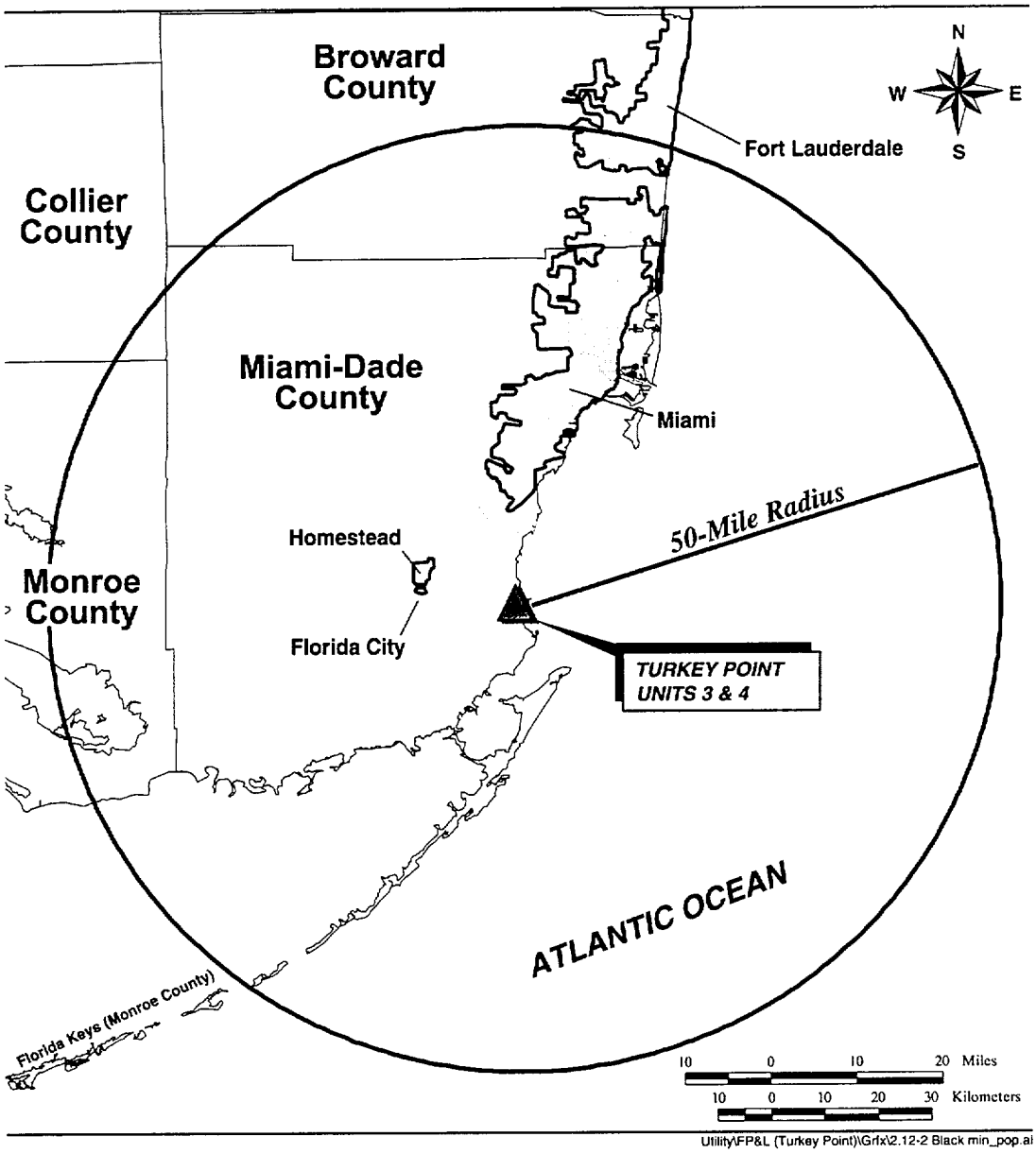
LEGEND

1990 Hispanic Minority Population

Cities

Tracts are designated as Hispanic minority populations if the percentage of Hispanic population is at least 20 percent greater than the Hispanic percentage of 12 percent for the State of Florida.

FIGURE 2.12-1
Hispanic Minority Population within 50 Miles of Turkey Point Units 3 & 4
LICENSE RENEWAL APPLICATION
TURKEY POINT UNITS 3 & 4



LEGEND

1990 Black Minority Population

Cities

Tracts are designated as Black minority population if the percentage of Black population is at least 20 percent greater than the Black percentage of 13 percent for the Sate of Florida.

FIGURE 2.12-2
Black Minority Population within 50 Miles of Turkey Point Units 3 & 4
LICENSE RENEWAL APPLICATION
TURKEY POINT UNITS 3 & 4

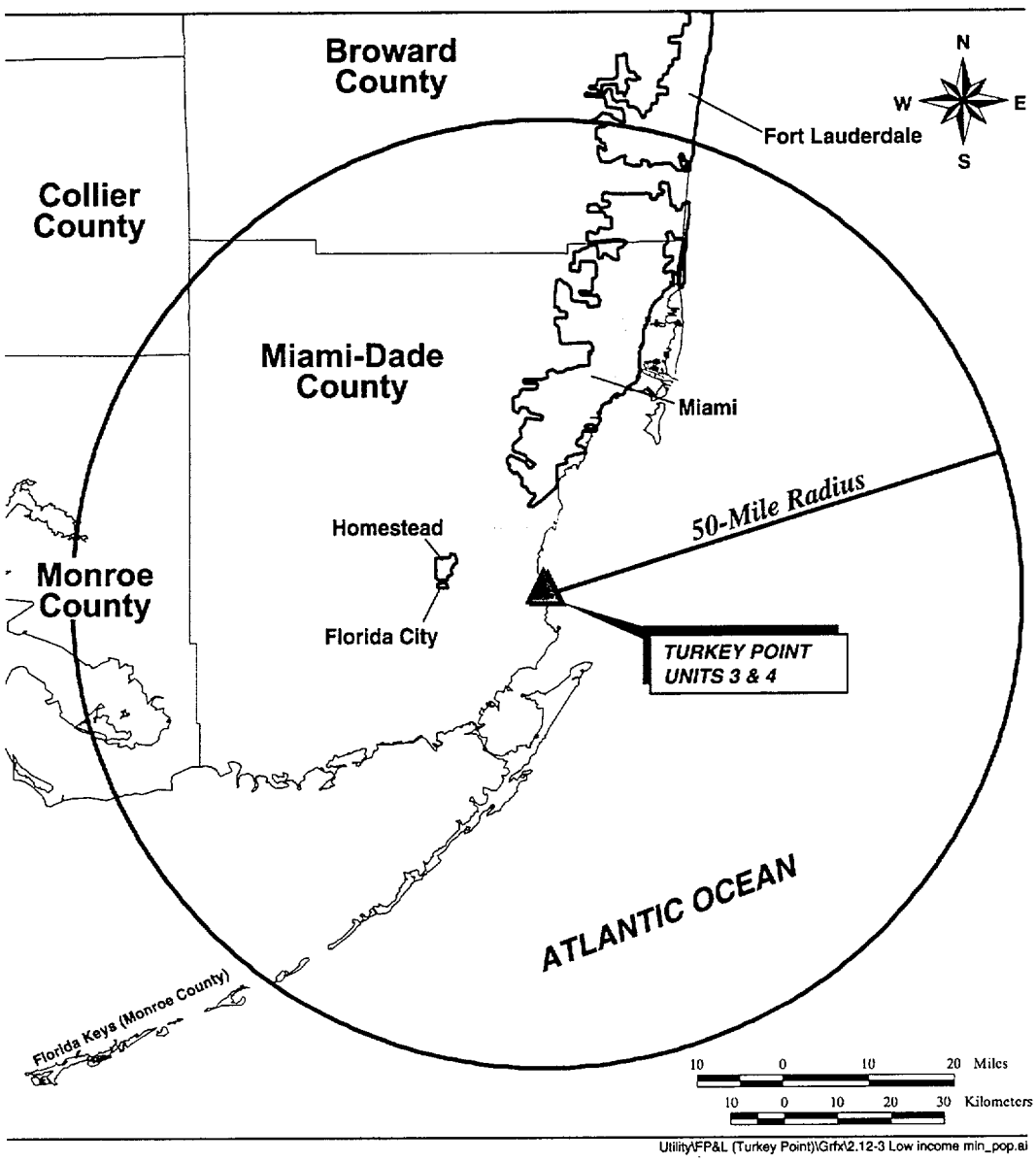
50 Miami-Dade County census tracts, and no Monroe County census tracts have low-income populations (Table 2.12-1). Figure 2.12-3 shows the locations of the low-income population census tracts.

2.12.3 MIGRANT FARM WORKERS

Migrant farm workers are those whose employment requires travel that prevents the employee from returning to his or her permanent place of residence the same day (Ref. 2.12-4). Migrant farm workers can be members of minority or low-income populations, but their travel could prevent them from being available for census data gathering. In addition, migrant farm workers can spend a significant amount of time in an area without being a resident. These factors could result in migrant farm worker numbers being under-represented in minority and low-income population analyses based on U.S. Census Bureau data.

Citrus groves, orchards, and row crops are important land-use categories in the vicinity of Turkey Point Units 3 & 4 (Section 2.4) and migrant farm workers are frequently present at these locations. However, FPL is unaware of any reliable estimate of the number of migrant farm workers that might be present. In 1997, there were 8,695 hired farm workers in Miami-Dade County and 1,122 in Broward County (Ref. 2.12-5). Monroe County did not have any hired farm workers. Using the 12.5 percent national average of hired farm workers who meet the definition of migrant workers (Ref. 2.12-4), there may be as many as 1,227 migrant workers present at any time within 50 miles of Turkey Point.

As a result of the large number of farms in the vicinity, 779 in Miami-Dade County and 156 in Broward County (Ref. 2.12-4), and the large geographic area they cover, FPL assumes that migrant farm workers are located throughout the region's agricultural areas and not clustered in a single location. Due to their small number compared to the overall population, FPL does not expect the migrant farm worker population to change the population characteristics of any particular census tract.



LEGEND

1990 Low Income Household Population

Cities

Tracts are designated as containing low-income households if the percentage of households under the poverty level is greater than 20 percent above the State of Florida average of 12 percent.

FIGURE 2.12-3
Low-Income Households within 50 Miles of Turkey Point Units 3 & 4
LICENSE RENEWAL APPLICATION
TURKEY POINT UNITS 3 & 4

2.13 METEOROLOGY AND AIR QUALITY

Turkey Point Units 3 & 4 are located within the Southeast Florida Intrastate Air Quality Control Region. The Region is designated as in attainment r unclassified for all criteria air pollutants, although Miami-Dade and Broward Counties are maintenance areas for ozone. Vehicle emissions are considered the major contributor to the area's status as a maintenance area for ozone (Ref. 2.13-1, Section 3.8.3.1).

2.14 HISTORIC AND ARCHAEOLOGICAL RESOURCES

The construction of Turkey Point Units 3 & 4, in the 1970s, did not "threaten any known archaeological or historic sites of significance" (Ref. 2.2-1, Section II.D). An archaeological resource survey for the Everglades Mitigation Bank, the southwestern part of the Turkey Point site (Figure 2.1-2), found no historic or prehistoric cultural materials within the 13,500-acre mitigation bank site.

The Miami-Dade Comprehensive Development Master Plan identifies historic districts and archaeological zones that merit local designation and as possible candidates for submission to the National Register of Historic Places. The Plan also identifies the general location of probable archaeological sites recommended for investigation to determine eligibility for inclusion on the State Master File. The features closest to Turkey Point Units 3 & 4 are the Snapper Creek Future Archaeological Site, located on Biscayne Bay approximately 16 miles north, and two probable archaeological sites located 20 miles northwest (Ref. 2.8-1, Figure 7, page I-66). The Turkey Point transmission lines do not cross any of the districts or zones, and no archaeological sites appear to be located on any of the Turkey Point transmission line corridors. The Plan does not identify the precise locations of such sites, perhaps to minimize the potential for vandalism or other damage.

2.15 REFERENCES

Ref. 2.1-1 Florida Power & Light Company. *Updated Final Safety Analysis Report*, Rev. 16. October 1999.

Ref. 2.1-2 Department of Defense, et al. "Federal Guidance for the Establishment, Use and Operation of Mitigation Banks." *Federal Register*. Vol. 60, No. 228 (November 28, 1995): 58605-14.

Ref. 2.1-3 Florida Power & Light Company. *FPL South Dade Mitigation Bank*. October 1995. [Note to Reader: Name of the mitigation bank has been changed from "South-Dade" to "Everglades."]

Ref. 2.2-1 U.S. Atomic Energy Commission. *Final Environmental Statement Related to Operation of Turkey Point Plant; Florida Power & Light Company. Dockets No. 50-250 and 50-251.* Directorate of Licensing, Washington D.C. July 1972.

Ref. 2.2-2 Uhrig (FPL) letter to O'Reilly (NRC), *Turkey Point Units 3 & 4; Docket Nos. 50-250 & 50-251; Non-Radiological Environmental Monitoring Report 1982*, March 31, 1983.

Ref. 2.3-1 Florida Department of Environmental Protection. *Permit Number UO 13-277655, Florida Power & Light Company Turkey Point Nuclear Power Plant Wastewater Treatment Facility Class V, Group 3 Injection (Gravity Disposal) Well IW-1*. November 20, 1995.

Ref. 2.3-2 Florida Administrative Code. Section 62-520.430, *"Standards for Class G-III Ground Water."*

Ref. 2.5-1 Connell Metcalf & Eddy. *Report on Rare and Endangered Species at Florida Power & Light Company South Dade Site*. Undated Report (circa 1977).

Ref. 2.5-2 Florida Game and Fresh Water Fish Commission. *Florida's Endangered Species, Threatened Species and Species of Special Concern, Florida Fish and Wildlife Conservation Commission.* August 1, 1997. www.state.fl.us/gfc/pubs/endanger.html. Accessed September 3, 1999.

Ref. 2.5-3 U.S. Fish and Wildlife Service. "Endangered and Threatened Wildlife and Plants; Review of Plant and Animal Taxa That Are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Recycled Petitions; Annual Description of Progress on Listing Actions; Proposed Rule." *Federal Register.* Vol. 64, No. 205 (October 25, 1999): 57533-47.

Ref. 2.5-4 Wunderlin, R. P. *Guide to the Vascular Plants of Florida.* University Press of Florida, Gainesville, Fla. 1998.

Ref. 2.5-5 U.S. Air Force and Federal Aviation Administration. *Draft Supplemental Environmental Impact Statement; Disposal of the Former Homestead Air Force Base, Florida.* Table 3.11-3. December 1999.

Ref. 2.5-6 U.S. Fish and Wildlife Service. *Schaus swallowtail butterfly, Species Account, Endangered Species Listing Program.* http://endangered.fws.gov/i/i/sai02.html. Accessed July 13, 2000.

Ref. 2.5-7 Slack, J. J. (U.S. Fish and Wildlife Service) Letter to R. J. Hovey (Florida Power & Light Company). July 5, 2000.

Ref. 2.6-1 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants.* NUREG-1437. May 1996.

Ref. 2.6-2 U.S. Census Bureau. *Tables for Persons, Households, Race, Hispanic Origins, and Poverty Status in 1989 by Household Type.* Linked to *All Census Tracts for Broward, Dade, and Monroe Counties, Florida.* Linked to "1990 Decennial Census." http://venus.census.gov/cdrom/lookup. Accessed September 10, 1999.

Ref. 2.6-3 South Florida Regional Planning Council. *South Florida Resident Population Estimates and Projections (1920 – 2020).* 1998. www.sfrpc.com/region/sfcpprt1.htm. Accessed September 10, 1999.

Ref. 2.8-1 Miami-Dade County. *Adopted Components; County Comprehensive Development Master Plan; Metro-Dade County, Florida.* Miami-Dade County Department of Planning and Zoning, Miami, Fla. 1997.

Ref. 2.12-1 U.S. Nuclear Regulatory Commission. "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues." NRR Office Letter No. 906, Rev. 2. September 21, 1999.

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Ref. 2.12-3 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Oconee Nuclear Station*. NUREG-1437, Supplement 2, Draft. Washington, D.C. May 1999.

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Ref. 2-12-5 U.S. Department of Agriculture. *Census of Agriculture – County Data*. Washington, D.C. 1997.

Ref. 2.13-1 U.S. Department of Defense. *Draft Supplemental Environmental Impact Statement; Disposal of Portions of the Former Homestead Air Force Base, Florida.* 1999.

3.0 PROPOSED ACTION

NRC

"...The report must contain a description of the proposed action, including the applicant's plans to modify the facility or its administrative procedures...This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment..." 10 CFR 51.53(c)(2)

Florida Power & Light Company (FPL) proposes that the U.S. Nuclear Regulatory Commission (NRC) renew the Turkey Point Units 3 & 4 operating licenses for an additional 20 years. Renewal would give FPL and the State of Florida the option of relying on Turkey Point Units 3 & 4 to meet Florida's future needs for electric generation. Section 3.1 discusses the plant in general. Sections 3.2 through 3.4 address potential changes that could be required to support renewed operating licenses.

3.1 GENERAL PLANT INFORMATION

General information about Turkey Point Units 3 & 4 is available in several documents. In 1972, the U.S. Atomic Energy Commission, a predecessor agency to the NRC, prepared a Final Environmental Statement (FES) for Turkey Point Units 3 & 4 operation (Ref. 3.1-1). The NRC *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) describes many Turkey Point features (Ref. 3.1-2) and, in accordance with NRC requirements, FPL maintains an Updated Final Safety Analysis Report for the units (Ref. 3.1-3). FPL has referred to each of these documents for additional details.

3.1.1 REACTOR AND CONTAINMENT SYSTEMS

Turkey Point Units 3 & 4 are shown in Figure 3.1-1. Each unit is a pressurized light-water reactor with three steam generators, which produce steam that turns turbines to generate electricity. Each unit is capable of an output of 2,300 MW(t), with a corresponding gross electrical output of approximately 795 MW(e). Onsite electrical power usage amounts to slightly more than 100 MW(e), leaving each unit with a reliable net summer rating of 693 MW(e). The FES describes a lower power rate but, in 1996, the NRC prepared an environmental assessment for an increase,

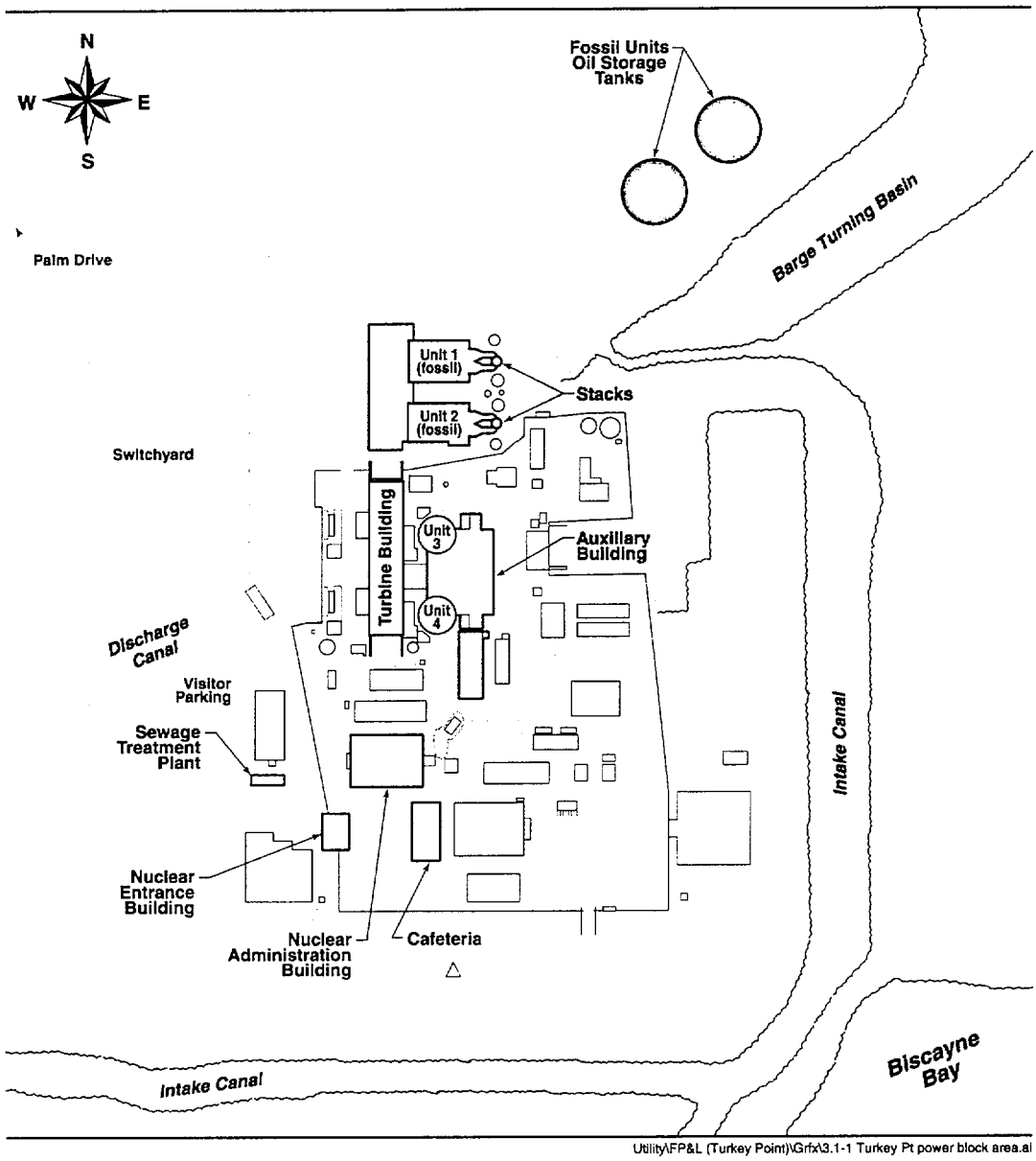


FIGURE 3.1-1
Turkey Point Power Block Area
LICENSE RENEWAL APPLICATION
TURKEY POINT UNITS 3 & 4

called an "uprate," in the units' power levels (Ref. 3.1-4). The GEIS evaluated, and FPL based this Environmental Report, on the uprated values.

Each reactor containment structure is 210 feet tall and 124 feet in diameter. Each is a dry containment structure designed to withstand environmental effects and the internal pressure and temperature accompanying a postulated loss-of-coolant accident or steam line break. Together with its engineered safety features, each containment structure is designed to adequately retain fission products that escape from the reactor coolant system. Turkey Point Units 3 & 4 are licensed for fuel that is slightly enriched uranium dioxide, up to 4.5 percent by weight uranium-235 (FPL currently uses a maximum of 4.45 percent enrichment). FPL operates the reactors at an equilibrium core average fuel discharge burnup rate of approximately 45,000 megawatt-days per metric ton uranium.

3.1.2 COOLING AND AUXILIARY WATER SYSTEMS

Introduction

Turkey Point Units 3 & 4 have three main cooling water systems, as do other pressurized water reactors. The primary system is a closed loop that removes heat from the reactor and passes through a steam generator, where it transfers heat through non-contact cooling to the secondary system before returning to the reactor. The primary system maintains its water under pressure so that the water does not flash to steam. Secondary-system water does flash to steam in the steam generator, and the steam turns the turbine to generate electricity. After exiting the turbine, secondary system water passes through a condenser, where it cools and condenses into liquid before returning to the steam generator to complete the secondary loop.

Circulating water (tertiary system) cools secondary-system water in the condenser by non-contact cooling. Water for the circulating water systems is withdrawn from and discharged to a closed system of cooling canals that is described later in this section. Traveling screens and strainers remove debris from the cooling water intake flow and plastic foam (Amertap) balls minimize biological growth and other fouling inside the condenser tubes. FPL uses no biocontrol chemicals in the circulating water system or in any other systems that discharge to offsite surface waters. All plant outfalls discharge into the cooling canal system.

In the late 1970s, FPL found evidence of deterioration of Turkey Point Units 3 & 4 steam generator components. In order to avoid unacceptable leaks of radioactive

primary system water into the secondary system side, FPL made repairs to all six steam generators. The repairs consisted of replacing the lower assembly of each steam generator, including the tube bundles (Ref. 3.1-5).

Support systems maintain a high water quality in primary and secondary systems by using chemical controls and by removing water and adding demineralized water as makeup.

Municipal Water Supply

Turkey Point Units 3 & 4 use approximately 690 gallons of water per minute from the Miami-Dade public water supply system. The Newton treatment plant, which is part of Miami-Dade's Rex system, supplies Turkey Point. Plant uses include process (primarily demineralizer water makeup), potable, and fire protection water. Turkey Point Units 3 & 4 discharge treated waste-process waters into the cooling canal system (described below) and sanitary wastewater to septic tanks and an injection well after treatment (Section 3.1.3).

Cooling Canal System

Turkey Point Units 3 & 4 use a system of canals to cool heated effluent and to recirculate water for reuse. The NRC defines "cooling pond" as a man-made impoundment that does not impede the flow of a navigable system, and categorizes the Turkey Point system of cooling canals as a cooling pond (Ref. 3.1-2, Section 4.4.1.1, page 4-51). There are no cooling towers associated with the Turkey Point recirculating heat dissipation system.

FPL constructed Turkey Point Units 3 & 4 at the site of an existing fossil-fuel fired plant that used a once-through heat dissipation system discharging to Biscayne Bay. FPL originally proposed Turkey Point Units 3 & 4 to be a once-through plant discharging to Card Sound. Remnants remain of the fossil plant discharge canal and the discharge canal that FPL constructed but never used for Turkey Point Units 3 & 4. FPL has diked both and does not use them. Instead, FPL constructed a zero-discharge system of recirculating canals, described below, for use by all four Turkey Point units (i.e., two fossil and two nuclear). FPL also diked the original fossil plant intake canal, keeping the Biscayne Bay side open only for barge access to deliver fuel oil for the fossil plant.

FPL constructed the Turkey Point cooling canals, in agreement with the U.S. Environmental Protection Agency and the State of Florida, as a mitigative action to

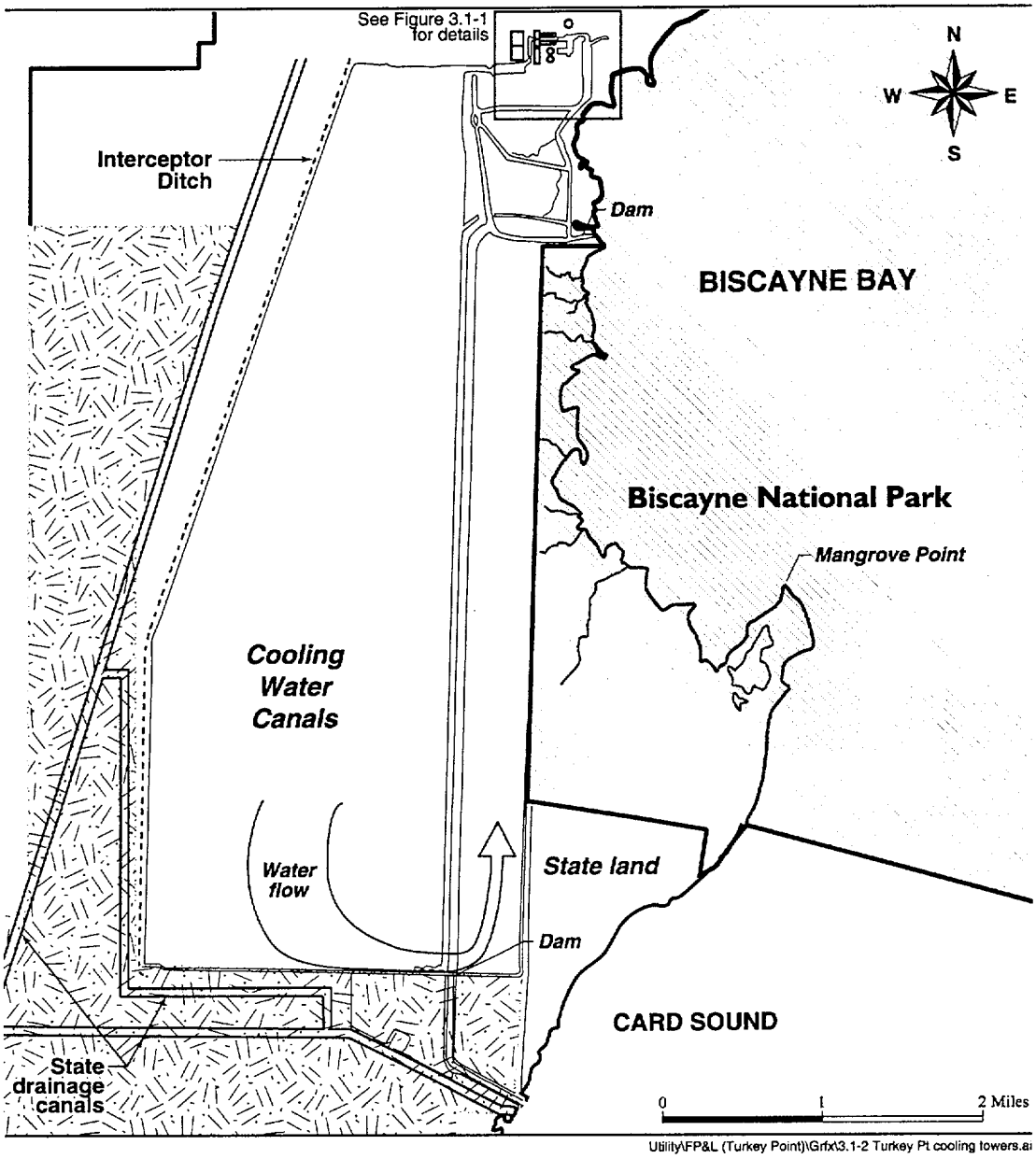
protect the Biscayne Bay and Card Sound aquatic environment. The State of Florida oversees FPL operation of the canals in accordance with a U.S. District Court Final Judgment (Ref. 3.1-1, Appendix C).

The site includes 168 miles of cooling canals that occupy an area approximately 2 miles wide by 5 miles long (6,700 acres) (Figure 3.1-2). The Turkey Point units (fossil and nuclear) use this system like a radiator, discharging heated condenser water at one end and withdrawing cooled water at the other end for re-use. The discharge canal receives heated effluent from the plant and distributes flow into 32 feeder canals. Water in the feeder canals flows south, discharging into a single collector canal that distributes water to six return canals. Water in the return canals flows north to the plant intake. Flows attributable to the nuclear units amount to approximately 1.3 million gallons per minute. Incident rainfall, some plant stormwater runoff, treated process wastewater from the municipal supply, and, possibly, groundwater inflows compensate for evaporative cooling losses from this system.

Turkey Point units withdraw no makeup water from surface waters or groundwater, and no surface water flows into or from the canal system. The feeder and return canals are shallow, generally 1 to 3 feet deep, to promote evaporative cooling. Water in the canals is hypersaline due to the effects of evaporation, measuring approximately 40 to 50 parts per thousand. By way of comparison, Biscayne Bay salinity ranges from 24 to 44 parts per thousand, depending on rainfall and surface drainage (Ref. 3.1-1, Section II.E.3.b, page II-10). Canal maintenance activities include routine scouring of the canal bottoms and removal of aquatic vegetation to minimize flow restriction. Canals are cleared of aquatic vegetation approximately three times each year. Harvested vegetation, primarily a submerged aquatic plant called widgeongrass (*Ruppia maritima*), is composted on a berm within the canal system.

Interceptor Ditch

Along the northwest and west sides of the cooling canals, FPL constructed a ditch, called the Interceptor Ditch, that has no hydraulic connection to the cooling canals or other surface waters. The purpose of the ditch is to enable FPL to restrict inland movement of groundwater seeping from the cooling canals by pumping Interceptor Ditch water back into the cooling canals.



LEGEND

- National Park
- Everglades Mitigation Bank

FIGURE 3.1-2
Turkey Point Cooling Water Canals
LICENSE RENEWAL APPLICATION
TURKEY POINT UNITS 3 & 4

As described in Section 2.3, during the wet season (May to October) and early part of the dry season, a natural seaward groundwater gradient exists in the area of Turkey Point Units 3 & 4. Groundwater flow is southeasterly, towards Biscayne Bay and Card Sound. During the rest of the year, however, groundwater flow can reverse, flowing inland. During this time, without additional control, saline groundwater seepage from the canals could adversely affect freshwater habitats west of the site. To avoid this, FPL monitors water levels in the cooling canals, the Interceptor Ditch, and four groundwater-monitoring wells located west of the site. When monitoring results indicate that a natural seaward gradient does not exist, FPL pumps water from the Interceptor Ditch back into the cooling canals in order to create an artificial gradient into the ditch. This operation intercepts saline groundwater seepage from the canals, restricting westward movement of saline water to amounts that would occur without the existence of the cooling canals, and minimizing saltwater intrusion west of the site. Groundwater monitoring frequency is quarterly and Interceptor Ditch monitoring frequency is twice a month during the wet season, once a week during non-pumping periods of the dry season, and twice a week while pumping.

Typically, FPL only has to pump from the Interceptor Ditch during the dry season and annually pumps approximately 216 million gallons back into the cooling canals. FPL operates the Interceptor Ditch in accordance with an agreement with the South Florida Water Management District and reports monitoring results to the agency.

3.1.3 NON-RADIOACTIVE WASTE SYSTEMS

FPL uses a contact stabilization treatment plant for sanitary waste. The facility is located west of the power block area (see Figure 3.1-1) and consists of a sewage lift station, two flow equalization tanks, two aerobic digesters, two aeration tanks, a secondary clarifier system, two tertiary filters, a filter backwash system, a flow meter, two air blowers, a chlorine contact tank, a gas chlorine disinfection system, and an anoxic denitrification chamber. Treatment consists of anoxic/denitrification flow equalization, biological treatment using activated sludge, tertiary filtration, and chlorination. FPL disposes of treated wastewater in a 10-inch diameter, 50-foot deep underground injection well located adjacent to the treatment facility and reports average daily flow, carbonaceous biological oxygen demand (5-day), total suspended solids, fecal coliform bacteria, pH, total residual chlorine, and nitrate (as N) to the Florida Department of Environmental Protection. FPL disposes of residuals (wet sludge) at the Miami-Dade Water and Sewer Department's South District Wastewater Treatment Facility. Table 9.1-1 identifies the FPL permits for treatment plant and well operation.

3.1.4 TRANSMISSION SYSTEMS

"Corridor" is a general term used to identify the strip of land over which utilities construct transmission lines. A utility can own the land, in which case it holds the corridor as a property owner. In addition, others can own the land and the utility can own the right, called an easement, to install and maintain the transmission line over the land. In the case of an easement, the corridor is commonly called a right-of-way. In the case of outright ownership, the utility can lease the corridor to adjacent landowners or to others for uses that are compatible with transmission line operation. FPL controls Turkey Point transmission line corridors through a combination of ownership and easement.

The Turkey Point nuclear and fossil plants share a single switchyard at the site, with each plant supplying power to the 230-kilovolt transmission lines leaving the switchyard. Turkey Point transmission lines exit the site in two corridors (Figure 2.1-3), each of which is a combination of rights-of-way and ownership, with rights-of-way most common in urbanized areas and ownership most common in rural areas. The Florida City – Turkey Point transmission line leaves the plant site going west for approximately 5 miles, where it connects to the Florida City substation. The Florida City corridor is 330 feet wide and traverses undeveloped land for most of its distance.

Seven other lines leave the site, going north, in the second 330-foot corridor. This corridor extends approximately 19 miles to the Davis substation, located in southwest Miami at SW 136 Street and SW 127 Avenue. The Davis – Turkey Point Lines Numbers 1, 2, and 3 connect to the substation at this point. The Flagami – Turkey Point Lines Numbers 1 and 2 continue past the Davis substation an additional 13 miles to the Flagami substation, located on the west side of Miami on Flagler Street near SW 92 Avenue. The Doral – Turkey Point Line and the Levee – Turkey Point Lines continue past the Davis substation an additional 11 miles, where they separate to go to their individual substations. In total, approximately 67 miles of transmission line corridors connect Turkey Point Units 3 & 4 to offsite substations.

FPL maintains Turkey Point corridors using a combination of trimming, mowing, and herbicide application. In wet areas, such as mangrove swamps, FPL trims trees at the 14-foot level to maintain clearances. Typically, FPL only needs to do this at mid-span. In open, undeveloped areas FPL mows approximately five times per year. These are the most common management practices for the Florida City corridor and for the first 5 miles of the Davis corridor. Once the Davis corridor

turns west, it enters an extensive area of citrus groves and other agricultural lands where FPL maintenance is generally limited to mowing at road crossings. FPL uses herbicides primarily to control the exotic species melaleuca and Australian Pine, and requires use of applicators licensed by the State.

3.2 REFURBISHMENT ACTIVITIES

NRC

"...The report must contain a description of...the applicant's plans to modify the facility or its administrative control procedures....This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment..." 10 CFR 51.53(c)(2)

"...The incremental aging management activities carried out to allow operation of a nuclear power plant beyond the original 40-year license term will be from one of two broad categories: (1) SMITTR actions, most of which are repeated at regular intervals, and (2) refurbishment or replacement actions, which usually occur fairly infrequently and possibly only once in the life of the plant for any given item..." (Ref. 3.1-2, Section 2.6.3.1, page 2-41.) ["SMITTR" is defined at Ref. 3.1-2, Section 2.4, page 2-30, as surveillance, on-line monitoring, inspections, testing, trending, and recordkeeping]

The GEIS (Ref. 3.1-2) identifies refurbishment activities that utilities might perform for license renewal. Performing such refurbishment activities would necessitate changing administrative control procedures and modifying the facility. The GEIS analysis assumed that an applicant would begin any refurbishment work shortly after the NRC granted a renewed license and would complete the activities during five outages, including one major outage at the end of the 40th year of operation. The GEIS refers to this as the refurbishment period.

GEIS Table B.2 lists license renewal refurbishment activities that the NRC anticipated utilities might undertake. In identifying these activities, the GEIS intended to encompass actions that typically take place only once in the life of a nuclear power plant, if at all. The GEIS analysis assumed that a utility would undertake these activities solely for the purpose of extending plant operations beyond 40 years and would undertake them during the refurbishment period. The GEIS indicates that many plants will have undertaken various refurbishment activities to support the current license period, but that some plants might undertake such tasks only to support extended plant operations.

FPL has performed some major construction activities at Turkey Point Units 3 & 4 (e.g., steam generator repair). However, the Turkey Point Units 3 & 4 Integrated Plant Assessment that FPL has conducted under 10 CFR Part 54 and included as part of this Application has not identified the need to undertake any refurbishment or replacement actions to maintain the functionality of important systems, structures, and components during the Turkey Point Units 3 & 4 license renewal period. Therefore, no refurbishment would be conducted that would directly affect the environment or plant effluents.

3.3 PROGRAMS AND ACTIVITIES FOR MANAGING THE EFFECTS OF AGING

NRC

"...The report must contain a description of...the applicant's plans to modify the facility or its administrative control procedures....This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment..." 10 CFR 51.53(c)(2)

"...The incremental aging management activities carried out to allow operation of a nuclear power plant beyond the original 40-year license term will be from one of two broad categories: (1) SMITTR actions, most of which are repeated at regular intervals, and (2) refurbishment or replacement actions, which usually occur fairly infrequently and possibly only once in the life of the plant for any given item..." (Ref. 3.1-2, Section 2.6.3.1, page 2-41.) ["SMITTR" is defined at GEIS Section 2.4, page 2-30 as surveillance, on-line monitoring, inspections, testing, trending, and recordkeeping]

Appendix A of the Turkey Point Units 3 & 4 License Renewal Application is a supplement to the Updated Final Safety Analysis Report. In accordance with NRC requirements [10 CFR 54.21(d)], the supplement contains a description of the programs and activities for managing the effects of Turkey Point Units 3 & 4 aging. In addition to describing existing programs, the supplement describes proposed modifications (enhancements) to existing programs and proposed new programs and activities.

3.4 EMPLOYMENT

Current Workforce

FPL employs a workforce of approximately 775 permanent employees and 185 contractor employees at Turkey Point Units 3 & 4, a number that is less than the range of 600 to 800 personnel per reactor unit that the GEIS (Ref. 3.1-2, Section 2.3.8.1) estimates. Approximately 85 percent of the employees live in Miami-Dade County, 7 percent live in Monroe County, and 7 percent live in Broward County, with the rest living in various other locations.

FPL refuels each Turkey Point nuclear unit on an 18-month schedule, which means at least 1 refueling every year and 2 refuelings every third year. During refueling outages, site employment increases by as many as 800-900 workers for temporary (30 to 40 days) duty. These numbers are within the GEIS range of 200 to 900 additional workers per reactor outage.

License Renewal Increment

Performing the license renewal surveillance, on-line monitoring, inspections, testing, trending, and recordkeeping (SMITTR) activities that Section 3.3 references would necessitate increasing Turkey Point Units 3 & 4 staff workload by some increment. The size of this increment would be a function of the schedule within which FPL must accomplish the work and the amount of work involved.

The GEIS assumes that the NRC would renew a nuclear power plant license for a 20-year period plus the remaining duration of the current license and that it would issue the renewal approximately 10 years prior to license expiration. In other words, the renewed license would be effective for 30 years. The GEIS determined that the utility would initiate SMITTR activities at the time of issuance and would conduct license renewal SMITTR activities throughout the remaining 30-year life of the plant, sometimes during full power operation (Ref. 3.1-2, Section B.3.1.3) but mostly during normal refueling, and during 5-year and 10-year inservice inspections during refueling outages (Ref. 3.1-2, Table B.4).

FPL has determined that the GEIS scheduling assumptions are reasonably representative of Turkey Point Units 3 & 4 incremental license renewal workload scheduling. Many Turkey Point Units 3 & 4 license renewal SMITTR activities that Section 3.3 describes would have to be performed during outages. Although some

Turkey Point Units 3 & 4 license renewal SMITTR activities would be one-time efforts, others would be recurring, periodic activities that would continue for the life of the plant.

The GEIS estimates that no more than 60 additional personnel would be needed to perform license renewal SMITTR activities during the 3-month duration of a 10-year in-service refueling. Having established this upper value for what would be a single event in 20 years, the GEIS uses this number as the expected number of additional permanent workers needed per unit attributable to license renewal. GEIS Section C.3.1.2 uses this approach in order to "...provide a realistic upper bound to potential population-driven impacts..."

FPL expects that existing "surge" capabilities for routine activities, such as outages, will enable FPL to perform the increased SMITTR workload without adding Turkey Point Units 3 & 4 staff. For the purpose of performing its own analyses in this Environmental Report, FPL is adopting the GEIS approach with one alteration. FPL license renewal plant modifications would be SMITTR activities that would be performed mostly during outages, and FPL would generally stagger Turkey Point Units 3 & 4 outage schedules so that both units are not shut down at the same time. Therefore, FPL believes that it is unreasonable to assume that each unit would need an additional 60 workers. Instead, as a reasonably conservative high estimate, FPL is assuming that Turkey Point Units 3 & 4 would require no more than a total of 60 additional permanent workers to perform license renewal SMITTR activities.

Adding full-time employees to the plant workforce for operating during the license renewal period would have the indirect effect of creating additional jobs and related population growth in the community. Miami-Dade County planners use the value 3.0668 as the employment multiplier appropriate for the electrical services sector in the Miami-Dade County area, based on 1995 data. FPL has used this value to calculate the number of direct and indirect jobs supported by additional Turkey Point employees that might be needed during the license renewal period. Applying the multiplier, a total of 184 (60 $\times$ 3.0668) new jobs would be created in the Miami-Dade County area, where the total number of jobs are projected to be 1.208 million in the year 2000. In summary, FPL is assuming that 60 additional permanent workers during the license renewal period would create an additional 124 jobs in the community.

3.5 TURKEY POINT UNITS 1 & 2

Turkey Point Units 1 & 2 are fossil-fuel fired intermediate-load units adjacent to Units 3 & 4 (Figure 3.1-1). Units 1 & 2 each have net continuous ratings of 404 MW and primarily burn Number 6 fuel oil with natural gas available for startup. Approximately five barges per week deliver fuel oil. The two units employ 50 workers, use approximately 160 gallons per minute of municipal water, and discharge sanitary waste to septic systems. Each unit has its own 400-foot high stack. The fossil units share with the nuclear units the use of the cooling canal system, recirculating approximately 574,300 gallons per minute of condenser cooling water. The fossil units also share with the nuclear units use of the switchyard and transmission lines that emanate from the plant.

3.6 REFERENCES

Ref. 3.1-1 U.S. Atomic Energy Commission. *Final Environmental Statement Related to Turkey Point Plant; Florida Power & Light Company. Docket Nos. 50-250 and 50-251*. Directorate of Licensing, Washington, D.C. July 1972.

Ref. 3.1-2 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants.* NUREG-1437. Washington, D.C. May 1996.

Ref. 3.1-3 Florida Power & Light Company. *Turkey Point Units 3 & 4 Updated Final Safety Analysis Report.* Rev. 16. October 1999.

Ref. 3.1-4 U.S. Nuclear Regulatory Commission. "Florida Power & Light Company Turkey Point Unit 3 and Unit 4 Docket Nos. 50-250 and 50-251 Environmental Assessment and Finding of No Significant Impact." *Federal Register.* Vol. 61, No. 182 (September 18, 1996): 49176-8.

Ref. 3.1-5 U.S. Nuclear Regulatory Commission. *Final Environmental Statement Related to Steam Generator Repair at Turkey Point Plant, Units 3 & 4; Florida Power & Light Company.* Docket Nos. 50-250 and 50-251. NUREG-0743. Washington, D.C. March 1981.

4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MITIGATING ACTIONS

NRC

The environmental report shall discuss the, "...impact of the proposed action on the environment. Impacts shall be discussed in proportion to their significance...." 10 CFR 45(b)(1) as adopted by 51.53(c)(2)

Chapter 4 presents an assessment of the environmental consequences and potential mitigating actions associated with the renewal of the Turkey Point Units 3 & 4 operating licenses. The U.S. Nuclear Regulatory Commission (NRC) has identified and analyzed 92 environmental issues that it considers associated with nuclear power plant license renewal and has designated the issues as Category 1, Category 2, or NA. The NRC has designated the issues as "Category 1" if, after its analysis, the following criteria were met:

- The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic;

- 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 radioactive waste and spent-fuel disposal); and

- 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.

If the NRC analysis concluded that one or more of the Category 1 criteria could not be met, the NRC designated the issue as Category 2. The NRC requires plant-specific analysis for Category 2 issues. The NRC designated 2 issues as "NA," signifying that the categorization and impact definitions do not apply to these issues. The NRC rules do not require analyses of Category 1 issues that the NRC has resolved using generic findings (10 CFR 51, Appendix B, Table B-1) that the NRC based on its GEIS. An applicant may reference the generic findings or GEIS analyses for Category 1 issues. Appendix A of the Turkey Point Units 3 & 4 Environmental Report lists the 92 issues and identifies the Environmental Report section that addresses each issue.

CATEGORY 1 LICENSE RENEWAL ISSUES

NRC

"...The environmental report for the operating license renewal stage is not required to contain analyses of the environmental impacts of the license renewal issues identified as Category 1 issues in Appendix B to subpart A of this part." 10 CFR 51.53(c)(3)(i)

"...Absent new and significant information, the analysis for certain impacts codified by this rulemaking need only be incorporated by reference in an applicant's environmental report for license renewal...." (Ref. 4.0-1, page 28483).

Florida Power & Light Company (FPL) has determined that of the 69 Category 1 issues, 15 do not apply to Turkey Point Units 3 & 4 because they apply to design or operational features that do not exist at the facility. These features are intake and discharge from natural surface waterbodies, once-through cooling, cooling towers, and groundwater withdrawal. In addition, because FPL does not plan to conduct any refurbishment activities, the NRC findings for the seven Category 1 issues that apply only to refurbishment clearly overestimate Turkey Point Units 3 & 4 refurbishment impacts and do not apply. Table 4.0-1 lists these 22 issues and explains the FPL basis for determining that these issues are not applicable to Turkey Point Units 3 & 4.

Table 4.0-2 lists the 47 Category 1 issues that FPL has determined to be applicable to Turkey Point Units 3 & 4. The table includes the findings that the NRC codified and references to supporting GEIS analyses. FPL has reviewed the NRC findings and has identified no new and significant information, or become aware of any such information, that would make the NRC findings inapplicable to Turkey Point Units 3 & 4. Therefore, FPL adopts by reference the NRC findings for these Category 1 issues.

TABLE 4.0-1
CATEGORY 1 ISSUES THAT ARE NOT APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

	Issue	Basis for Inapplicability to Turkey Point Units 3 & 4
	Surface Water Quality, Hydrology, and Use (for all plants)	
1.	Impacts of refurbishment on surface water quality	Issue applies to activity, refurbishment, that Turkey Point Units 3 & 4 will not undertake
2.	Impacts of refurbishment on surface water use	Issue applies to activity, refurbishment, that Turkey Point Units 3 & 4 will not undertake
3.	Altered current patterns at intake and discharge structures	Issue applies to intake from, and discharge to, natural waterbody having current pattern to alter, not to a cooling pond[b] having no makeup or discharge such as at Turkey Point Units 3 & 4
4.	Altered salinity gradients	Issue applies to discharge to natural waterbody that has a salinity gradient to alter, not to a cooling pond[b] having no discharge such as at Turkey Point Units 3 & 4
5.	Altered thermal stratification of lakes	Issue applies to discharge to a lake, not to a cooling pond[b] having no discharge such as at Turkey Point Units 3 & 4
6.	Temperature effects on sediment transport capacity	Issue applies to discharge to natural waterbody that has a sediment transport capacity, not to a cooling pond[b] having no discharge such as at Turkey Point Units 3 & 4
12.	Water use conflicts (plants with once-through cooling systems)	Issue applies to a heat dissipation system, once-through cooling, that Turkey Point Units 3 & 4 does not have
	Aquatic Ecology (for all plants)	
14.	Refurbishment	Issue applies to activity, refurbishment, that Turkey Point Units 3 & 4 will not undertake
18.	Thermal plume barrier to migrating fish	Issue applies to a heat dissipation system feature, discharge into a waterbody that could have migrating fish, that Turkey Point Units 3 & 4 does not have
19.	Distribution of aquatic organisms	Issue applies to a heat dissipation system feature, discharge to a surface waterbody, that Turkey Point Units 3 & 4 does not have

TABLE 4.0-1 (Cont'd)
CATEGORY 1 ISSUES THAT ARE NOT APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

	Issue	Basis for Inapplicability to Turkey Point Units 3 & 4
	Aquatic Ecology (for plants with cooling-tower-based heat dissipation systems)	
28.	Entrainment of fish and shellfish in early life stages for plants with cooling-tower-based heat dissipation systems	Issue applies to a heat dissipation system feature, cooling towers, that Turkey Point Units 3 & 4 does not have
29.	Impingement of fish and shellfish for plants with cooling-tower-based heat dissipation systems	Issue applies to a heat dissipation system feature, cooling towers, that Turkey Point Units 3 & 4 does not have
30.	Heat shock for plants with cooling-tower-based heat dissipation systems	Issue applies to a heat dissipation system feature, cooling towers, that Turkey Point Units 3 & 4 does not have
	Groundwater Use and Quality	
31.	Impacts of refurbishment on groundwater use and quality	Issue applies to activity, refurbishment, that Turkey Point Units 3 & 4 will not undertake
32.	Groundwater use conflicts (potable and service water; plants that use < 100 gpm)	Issue applies to a plant feature, groundwater withdrawal, that Turkey Point Units 3 & 4 does not have
36.	Groundwater quality degradation (Ranney wells)	Issue applies to a heat dissipation system feature, Ranney wells, that Turkey Point Units 3 & 4 does not have
	Terrestrial Resources	
41.	Cooling tower impacts on crops and ornamental vegetation	Issue applies to a heat dissipation system feature, cooling towers, that Turkey Point Units 3 & 4 does not have
42.	Cooling tower impacts on native plants	Issue applies to a heat dissipation system feature, cooling towers, that Turkey Point Units 3 & 4 does not have
43.	Bird collisions with cooling towers	Issue applies to a heat dissipation system feature, cooling towers, that Turkey Point Units 3 & 4 does not have

TABLE 4.0-1 (Cont'd)
CATEGORY 1 ISSUES THAT ARE NOT APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

	Issue	Basis for Inapplicability to Turkey Point Units 3 & 4
		Human Health
54.	Radiation exposures to the public during refurbishment	Issue applies to activity, refurbishment, that Turkey Point Units 3 & 4 will not undertake
55.	Occupational radiation exposures during refurbishment	Issue applies to activity, refurbishment, that Turkey Point Units 3 & 4 will not undertake
72.	Aesthetic impacts (refurbishment)	Issue applies to activity, refurbishment, that Turkey Point Units 3 & 4 will not undertake

< = less than
gpm = gallons per minute
NRC = U.S. Nuclear Regulatory Commission

Notes: a. The NRC listed the issues in Table B-1 of 10 CFR 51 Appendix B. FPL added issue numbers for expediency.
b. The NRC has defined "cooling pond" as, "a man-made impoundment that does not impede the flow of a navigable system and that is used primarily to remove waste heat from condenser water prior to recirculating the water back to the main condenser..." The NRC has also classified the Turkey Point Units 3 & 4 cooling canals as a cooling pond. (Ref. 4.0-2, Section 4.4.1.1, page 4-51)

TABLE 4.0-2
CATEGORY 1 AND "NA" ISSUES THAT ARE APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

	Issue	NRC Findings[b]	GEIS, Ref. 4.0-2 (Section/Page)
	Surface Water Quality, Hydrology, and Use (for all plants)		
7.	Scouring caused by discharged cooling water	SMALL. 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.	4.4.2.2/4-53
8.	Eutrophication	SMALL. 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.	4.4.2.2/4-53
9.	Discharge of chlorine or other biocides	SMALL. Effects are not a concern among regulatory and resource agencies, and are not expected to be a problem during the license renewal term.	4.4.2.2/4-53
10.	Discharge of sanitary wastes and minor chemical spills	SMALL. 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.	4.4.2.2/4-53
11.	Discharge of other metals in waste water	SMALL. 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.	4.4.2.2/4-53
	Aquatic Ecology (for all plants)		
15.	Accumulation of contaminants in sediments or biota	SMALL. 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.	4.4.3/4-56 4.4.2.2/4-53
16.	Entrainment of phytoplankton and zooplankton	SMALL. 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.	4.4.3/4-56

TABLE 4.0-2 (Cont'd)
CATEGORY 1 AND "NA" ISSUES THAT ARE APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

	Issue	NRC Findings[b]	GEIS, Ref. 4.0-2 (Section/Page)
17.	Cold shock	SMALL. Cold shock has been satisfactorily mitigated at operating nuclear power 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.	4.4.3/4-56
20.	Premature emergence of aquatic insects	SMALL. Premature emergence has been found to be a localized effect at some operating nuclear power plants but has not been a problem and is not expected to be a problem during the license renewal term.	4.4.3/4-56
21.	Gas supersaturation (gas bubble disease)	SMALL. 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.	4.4.3/4-56
22.	Low dissolved oxygen in the discharge	SMALL. 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.	4.4.3/4-56
23.	Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	SMALL. 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.	4.4.3/4-56
24.	Stimulation of nuisance organisms (e.g., shipworms)	SMALL. Stimulation of nuisance organisms has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where previously it was a problem. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds, and is not expected to be a problem during the license renewal term.	4.4.3/4-56

TABLE 4.0-2 (Cont'd)
CATEGORY 1 AND "NA" ISSUES THAT ARE APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

	Issue	NRC Findings[b]	GEIS, Ref. 4.0-2 (Section/Page)
		GROUNDWATER USE AND QUALITY	
37.	Groundwater quality degradation (saltwater intrusion)	SMALL. Nuclear power plants do not contribute significantly to saltwater intrusion.	4.8.2.1/4-119
38.	Groundwater quality degradation (cooling ponds in salt marshes)	SMALL. Sites with closed-cycle cooling ponds may degrade groundwater quality. Because water in salt marshes is brackish, this is not a concern for plants located in salt marshes.	4.8.3/4-121
		Terrestrial Resources	
44.	Cooling pond impacts on terrestrial resources	SMALL. Impacts of cooling ponds on terrestrial ecological resources are considered to be of small significance at all sites.	4.4.4/4-58
45.	Power line right-of-way management (cutting and herbicide application)	SMALL. The impacts of right-of-way maintenance on wildlife are expected to be of small significance at all sites.	4.5.6.1/4-71
46.	Bird collision with power lines	SMALL. Impacts are expected to be of small significance at all sites.	4.5.6.2/4-74
47.	Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	SMALL. 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.	4.5.6.3/4-77
48.	Floodplains and wetlands on power line right-of-way	SMALL. 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.	4.5.7/4-81
		Air Quality	
51.	Air quality effects of transmission lines	SMALL. Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.	4.5.2/4-62

TABLE 4.0-2 (Cont'd)
CATEGORY 1 AND "NA" ISSUES THAT ARE APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

	Issue	NRC Findings[b]	GEIS, Ref. 4.0-2 (Section/Page)
		Land Use	
52.	Onsite land use	SMALL. Projected onsite land use changes required during refurbishment and the renewal period would be a small fraction of any nuclear power plant site and would involve land that is controlled by the applicant.	3.2/3-1
53.	Power line right-of-way	SMALL. Ongoing use of power line right-of-ways would continue with no change in restrictions. The effects of these restrictions are of small significance.	4.5.3/4-62
		Human Health	
56.	Microbiological organisms (occupational health)	SMALL. Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize worker exposures.	4.3.6/4-48
58.	Noise	SMALL. 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.	4.3.7/4-49
60.	Electromagnetic fields, chronic effects	UNCERTAIN. Biological and physical studies of 60-Hz electromagnetic fields have not found consistent evidence linking harmful effects with field exposures. However, research is continuing in this area and a consensus scientific view has not been reached.	4.5.4.2/4-67
61.	Radiation exposures to public (license renewal term)	SMALL. Radiation doses to the public will continue at current levels associated with normal operations.	4.6.2/4-87
62.	Occupational radiation exposures (license renewal term)	SMALL. 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.	4.6.3/4-95

TABLE 4.0-2 (Cont'd)
CATEGORY 1 AND "NA" ISSUES THAT ARE APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

	Issue	NRC Findings[b]	GEIS, Ref. 4.0-2 (Section/Page)
		Socioeconomics	
64.	Public services: public safety, social services, and tourism and recreation	SMALL. Impacts to public safety, social services, and tourism and recreation are expected to be of small significance at all sites.	3.7.4/3-14 (refurbishment – public services) 3.7.4.3/3-18 (refurbishment – safety) 3.7.4.4/3-19 (refurbishment – social) 3.7.4.6/3-20 (refurbishment – tourism, recreation) 4.7.3/4-104 (renewal – public services) 4.7.3.3/4-106 (renewal - safety) 4.7.3.4/4-107 (renewal - social) 4.7.3.6/4-107 (renewal - tourism, recreation)
67.	Public services, education (license renewal term)	SMALL. Only impacts of small significance are expected.	4.7.3.1/4-106
73.	Aesthetic impacts (license renewal term)	SMALL. No significant impacts are expected during the license renewal term.	4.7.6/4-111
74.	Aesthetic impacts of transmission lines (license renewal term)	SMALL. No significant impacts are expected during the license renewal term.	4.5.8/4-83

TABLE 4.0-2 (Cont'd)
CATEGORY 1 AND "NA: ISSUES THAT ARE APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

	Issue	NRC Findings[b]	GEIS, Ref. 4.0-2 (Section/Page)
		Postulated Accidents	
75.	Design basis accidents	SMALL. The NRC staff has concluded that the environmental impacts of design basis accidents are of small significance for all plants.	5.3.2/5-11 (design basis) 5.5.1/5-114 (summary)
		Uranium Fuel Cycle and Waste Management	
77.	Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high-level radioactive waste)	SMALL. Offsite impacts of the uranium fuel cycle have been considered by the Commission in Table S-3 of this part. Based on information in the GEIS, impacts on individuals from radioactive gaseous and liquid releases, including radon-222 and technetium-99, are small.	6.2.4/6-27 6.6/6-87
78.	Offsite radiological impacts (collective effects)	The 100-year environmental dose commitment to the U.S. population from the fuel cycle, high-level radioactive waste, and spent fuel disposal is calculated to be about 14,800 person rem, or 12 cancer fatalities, for each additional 20-year power reactor operating term. Much of this, especially the contribution of radon releases from mines and tailing piles, consists of tiny doses summed over large populations. This same dose calculation can theoretically be extended to include many tiny doses over additional thousands of years as well as doses outside the U.S. The result of such a calculation would be thousands of cancer fatalities from the fuel cycle, but this result assumes that even tiny doses have some statistical adverse health effect that will not ever be mitigated (for example, no cancer cure in the next thousand years), and that these dose projections over thousands of years are meaningful. However, these assumptions are questionable. In particular, science cannot rule out the possibility that there will be no cancer fatalities from these tiny doses. For perspective, the doses are very small fractions of regulatory limits, and even smaller fractions of natural background exposure to the same populations. Nevertheless, despite all the uncertainty, some judgement as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgement in every case. Even taking the uncertainties into account, the Commission concludes that	6.2.4/6-27 6.6/6-88

TABLE 4.0-2 (Cont'd)
CATEGORY 1 AND "NA" ISSUES THAT ARE APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

	Issue	NRC Findings[b]	GEIS, Ref. 4.0-2 (Section/Page)
		these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the collective effects of the fuel cycle, this issue is considered Category 1.	
79.	Offsite radiological impacts (spent fuel and high-level radioactive waste disposal)	For the high-level radioactive waste and spent fuel disposal component of the fuel cycle, there are no current regulatory limits for offsite releases of radionuclides for the current candidate repository site. However, if we assume that limits are developed along the lines of the 1995 National Academy of Sciences (NAS) report, "Technical Bases for Yucca Mountain Standards," and that in accordance with the Commission's Waste Confidence Decision, 10 CFR 51.23, a repository can and likely will be developed at some site which will comply with such limits, peak doses to virtually all individuals will be 100 millirem per year or less. However, while the Commission has reasonable confidence that these assumptions will prove correct, there is considerable uncertainty since the limits are yet to be developed, no repository application has been completed or reviewed, and uncertainty is inherent in the models used to evaluate possible pathways to the human environment. The NAS report indicated that 100 millirem per year should be considered as a starting point for limits for individual doses, but notes that some measure of consensus exists among national and international bodies that the limits should be a fraction of the 100 millirem per year. The lifetime individual risk from a 100 millirem annual dose limit is about 310^{-3}. Estimating cumulative doses to populations over thousands of years is more problematic. The likelihood and consequences of events that could seriously compromise the integrity of a deep geologic repository were evaluated by the Department of Energy in the, "Final Environmental Impact Statement: Management of Commercially Generated Radioactive	6.2.4/6-28 6.6/6-88

TABLE 4.0-2 (Cont'd)
CATEGORY 1 AND "NA" ISSUES THAT ARE APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

Issue	NRC Findings[b]	GEIS, Ref. 4.0-2 (Section/Page)
	Waste," October 1980. The evaluation estimated the 70-year whole-body dose commitment to the maximum individual and to the regional population resulting from several modes of breaching a reference repository in the year of closure, after 1,000 years, after 100,000 years, and after 100,000,000 years. Subsequently, the NRC and other federal agencies have expended considerable effort to develop models for the design and for the licensing of a high-level waste repository, especially for the candidate repository at Yucca Mountain. More meaningful estimates of doses to population may be possible in the future as more is understood about the performance of the proposed Yucca Mountain repository. Such estimates would involve very great uncertainty, especially with respect to cumulative population doses over thousands of years. The standard proposed by the NAS is a limit on maximum individual dose. The relationship of potential new regulatory requirements, based on the NAS report, and cumulative population impacts has not been determined, although the report articulates the view that protection of individuals will adequately protect the population for a repository at Yucca Mountain. However, EPA's generic repository standards in 40 CFR, Part 191, generally provide an indication of the order of magnitude of cumulative risk to population that could result from the licensing of a Yucca Mountain repository, assuming the ultimate standards will be within the range of standards now under consideration. The standards in 40 CFR 191 protect the population by imposing "containment requirements" that limit the cumulative amount of radioactive material released over 10,000 years. The cumulative release limits are based on EPA's population impact goal of 1,000 premature cancer deaths world-wide for a 100,000 metric tonne (MTHM) repository. Nevertheless, despite all the uncertainty, some judgement as to the regulatory NEPA implications of these matters should be made and it	

TABLE 4.0-2 (Cont'd)
CATEGORY 1 AND "NA" ISSUES THAT ARE APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

	Issue	NRC Findings[b]	GEIS, Ref. 4.0-2 (Section/Page)
		makes no sense to repeat the same judgement in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent fuel and high level waste disposal, this issue is considered Category 1.	
80.	Nonradiological impacts of the uranium fuel cycle	SMALL. The nonradiological impacts of the uranium fuel cycle resulting from the renewal of an operating license for any plant are found to be small.	6.2.2.6/6-20 (land use) 6.2.2.7/6-20 (water use) 6.2.2.8/6-21 (fossil fuel) 6.2.2.9/6-21 (chemical) 6.6/6-90 (conclusion)
81.	Low-level radioactive waste storage and disposal	SMALL. The comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts to the environment will remain small during the term of a renewed license. The maximum additional onsite land that may be required for low-level radioactive waste storage during the term of a renewed license, and associated impacts, will be small. Nonradiological impacts on air and water will be negligible. The radiological and nonradiological environmental impacts of long-term disposal of low-level waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient low-level waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.	6.4.2/6-36 ("low-level" definition) 6.4.3/6-37 (low-level volume) 6.4.4/6-48 (renewal effects) 6.6/6-90 (conclusion)
82.	Mixed waste storage and disposal.	SMALL. The comprehensive regulatory controls and the facilities and procedures that are in place ensure proper handling and storage, as well as negligible doses and exposure to toxic materials for the public and the environment at all plants. License renewal will not increase the small, continuing risk to human health and the environment posed by mixed	6.4.5/6-63 6.6/6-91 (conclusion)

TABLE 4.0-2 (Cont'd)
CATEGORY 1 AND "NA" ISSUES THAT ARE APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

	Issue	NRC Findings[b]	GEIS, Ref. 4.0-2 (Section/Page)
		waste at all plants. The radiological and nonradiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient mixed waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.	
83.	On site spent fuel	SMALL. The expected increase in the volume of spent fuel from an additional 20 years of operation can be safely accommodated on site with small environmental effects through dry or pool storage at all plants if a permanent repository or monitored retrievable storage is not available.	6.4.6/6-70 6.6/6-91 (conclusion)
84.	Nonradiological waste	SMALL. No changes to generating systems are anticipated for license renewal. Facilities and procedures are in place to ensure continued proper handling and disposal at all plants.	6.5/6-86 6.6/6-92 (conclusion)
85.	Transportation	SMALL. The impacts of transporting spent fuel enriched up to 5 percent uranium-235 with average burnup for the peak rod to current levels approved by the NRC up to 62,000 MWd/MTU and the cumulative impacts of transporting high-level waste to a single repository, such as Yucca Mountain, Nevada, are found to be consistent with the impact values contained in 10 CFR 51.52(c), Summary Table S-4-Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor. If fuel enrichment or burnup conditions are not met, the applicant must submit an assessment of the implications for the environmental impact values reported in §51.52.	Addendum 1 (Ref. 4.0-3)
		Decommissioning	
86.	Radiation doses	SMALL. Doses to the public will be well below applicable regulatory standards regardless of which decommissioning method is used. Occupational doses would increase no more than 1 man-rem caused by buildup of long-lived radionuclides during the license renewal term.	7.3.1/7-15

TABLE 4.0-2 (Cont'd)
CATEGORY 1 AND "NA" ISSUES THAT ARE APPLICABLE TO TURKEY POINT UNITS 3 & 4[a]

	Issue	NRC Findings[b]	GEIS, Ref. 4.0-2 (Section/Page)
87.	Waste management	SMALL. Decommissioning at the end of a 20-year license renewal period would generate no more solid wastes than at the end of the current license term. No increase in the quantities of Class C or greater than Class C wastes would be expected.	7.3.2/7-19 (impacts) 7.4/7-25 (conclusions)
88.	Air quality	SMALL. Air quality impacts of decommissioning are expected to be negligible either at the end of the current operating term or at the end of the license renewal term.	7.3.3/7-21 (air) 7.4/7-25 (conclusion)
89.	Water quality	SMALL. The potential for significant water quality impacts from erosion or spills is no greater whether decommissioning occurs after a 20-year license renewal period or after the original 40-year operation period, and measures are readily available to avoid such impacts.	7.3.4/7-21 (water) 7.4/7-25 (conclusion)
90.	Ecological resources	SMALL. Decommissioning after either the initial operating period or after a 20-year license renewal period is not expected to have any direct ecological impacts.	7.3.5/7-21 (ecological) 7.4/7-25 (conclusion)
91.	Socioeconomic impacts	SMALL. Decommissioning would have some short-term socioeconomic impacts. The impacts would not be increased by delaying decommissioning until the end of a 20-year relicense period, but they might be decreased by population and economic growth.	7.3.7/7-24 (socioeconomic) 7.4/7-25 (conclusion)
92.	Environmental Justice	NONE. The need for and the content of an analysis of environmental justice will be addressed in plant-specific reviews.	Not in GEIS

CFR = Code of Federal Regulations
EPA = U.S. Environmental Protection Agency
GEIS = Generic Environmental Impact Statement (Ref. 4.0-2)
Hz = Hertz
NA = Not applicable
NEPA = National Environmental Policy Act
NRC = U.S. Nuclear Regulatory Commission

Notes:
a. The NRC listed the issues in Table B-1 of 10 CFR 51 Appendix B. FPL added issue numbers for expediency.
b. The NRC has defined "SMALL" to mean that, for the issue, environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the NRC has concluded that those impacts that do not exceed permissible levels in the NRC's regulations are considered small. (10 CFR 51 Appendix B, Table B-1, Footnote 3)

CATEGORY 2 LICENSE RENEWAL ISSUES

NRC

"...The environmental report must contain analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for those issues identified as Category 2 issues in Appendix B to subpart A of this part...." 10 CFR 51.53(c)(3)(ii)

"The report must contain a consideration of alternatives for reducing adverse impacts, as required by §51.45(c), for all Category 2 license renewal issues...." 10 CFR 51.53(c)(3)(iii)

The NRC designated 21 issues as Category 2. Sections 4.1 through 4.20 address each of the Category 2 issues, beginning with a statement of the issue. As in the case of Category 1 issues, some Category 2 issues (8) apply to design or operational features that Turkey Point Units 3 & 4 do not have. In addition, some Category 2 issues (3) apply only to refurbishment activities. If the issue does not apply to Turkey Point Units 3 & 4, the section explains the basis for inapplicability.

For the 10 Category 2 issues that FPL has determined to be applicable to Turkey Point Units 3 & 4, the sections contain required analyses. These analyses include conclusions regarding the significance of the impacts relative to renewal of the operating licenses for Turkey Point Units 3 & 4 and discuss potential mitigative alternatives when applicable and to the extent required. FPL has identified the significance of the impacts associated with each issue as either small, moderate, or large, consistent with the criteria that NRC established in 10 CFR 51, Appendix B, Table B-1, Footnote 3, as follows:

Small - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small.

Moderate - Environmental effects are sufficient to alter noticeably but not to destabilize any important attribute of the resource.

Large - Environmental effects are clearly noticeable and are sufficient to destabilize any important attributes of the resource.

In accordance with National Environmental Policy Act practice, FPL considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts that are small receive less mitigative consideration than impacts that are large).

"NA" LICENSE RENEWAL ISSUES

The NRC determined that its categorization and impact finding definitions did not apply to two issues ("NA" = not applicable). FPL included these issues in Table 4.0-2. The NRC noted that applicants currently do not need to submit information on chronic effects from electromagnetic fields (10 CFR 51, Appendix B, Table B-1, Footnote 5). For the other "NA" issue, environmental justice, the NRC does not require information from applicants but noted that the issue will be addressed in individual license renewal reviews (10 CFR 51, Appendix B, Table B-1, Footnote 6). FPL has included an environmental justice analysis in Section 4.21, along with supporting demographic information in Section 2.12.

4.1 WATER USE CONFLICTS

NRC

"If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river whose annual flow rate is less than 3.15×10^{12} ft^3/year (9×10^{10} m^3/year), an assessment of the impact of the proposed action on the flow of the river and related impacts on instream and riparian ecological communities must be provided. The applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow." 10 CFR 51.53(c)(ii)(A)

"The issue has been a concern at nuclear power plants with cooling ponds and at plants with cooling towers. Impacts on instream and riparian communities near these plants could be of moderate significance in some situations..." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 13

This issue does not apply to Turkey Point Units 3 & 4 because the plant does not withdraw makeup water from a river. As Section 3.1.2 describes, Turkey Point Units 3 & 4 use a system of canals (that the NRC has classified as a cooling pond) to cool and recirculate condenser cooling water and does not obtain any makeup water from offsite surface waterbodies.

4.2 ENTRAINMENT OF FISH AND SHELLFISH IN EARLY LIFE STAGES

NRC

"If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(b) determinations...or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from...entrainment." 10 CFR 51.53(c)(3)(ii)(B)

"...The impacts of entrainment are small in early life stages at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems. Further, ongoing efforts in the vicinity of these plants to restore fish populations may increase the numbers of fish susceptible to intake effects during the license renewal period, such that entrainment studies conducted in support of the original license may no longer be valid...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 25

The issue of entrainment of the early life stages of fish and shellfish does not apply because Turkey Point Units 3 & 4 do not discharge to waters of the U.S. The cooling canal system (Section 3.1.2) is not subject to Clean Water Act jurisdiction and, thus, the system does not fall within the meaning of the NRC regulation and no additional requirements apply.

Until May 1, 1995, FPL operated Turkey Point Units 3 & 4 in accordance with a U.S. Environmental Protection Agency (EPA)-issued National Pollutant Discharge Elimination System (NPDES) permit. The EPA characterized the Turkey Point authorization to discharge under the NPDES program as a, "'No Discharge' NPDES Permit." Part IA of the permit expressly indicated that the permittee (i.e., FPL) was not authorized to discharge to waters of the U.S. Appendix E contains a copy of the last EPA-issued NPDES permit.

On May 1, 1995, the EPA granted the State of Florida authority to administer the NPDES permitting program within the State of Florida. The State has continued the EPA position regarding the status of Turkey Point cooling canal waters. Section IA of the State-issued permit indicates that Turkey Point is not permitted to discharge to surface waters of the State and the introductory page expressly indicates that the cooling canal system is not considered surface waters of the State. Appendix E contains a copy of the current State-issued NPDES permit.

Consistent with the EPA and State determinations that the Turkey Point cooling canal system is not "waters of the U.S." or "waters of the State," FPL is not required to prepare cooling water intake [316(b)] studies for Turkey Point Units 3 & 4. Entrainment issues are not applicable to the Turkey Point cooling canal system.

4.3 IMPINGEMENT OF FISH AND SHELLFISH

NRC

"If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(b) determinations...or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from...impingement...."10 CFR 51.53(c)(3)(ii)(B)

"...The impacts of impingement are small at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 26

The issue of impingement of fish and shellfish does not apply because Turkey Point Units 3 & 4 do not discharge to waters of the U.S. The cooling canal system (Section 3.1.2) is not subject to Clean Water Act jurisdiction and, thus, the system does not fall within the meaning of the NRC regulation and no additional requirements apply.

Consistent with the EPA and State determinations that the Turkey Point cooling canal system is not "waters of the U.S." or "waters of the State" (Section 4.2), FPL has not been required to prepare cooling water intake [316(b)] studies for Turkey Point Units 3 & 4. Impingement issues are not applicable to the Turkey Point cooling canal system.

4.4 HEAT SHOCK

NRC

"If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act... 316(a) variance in accordance with 40 CFR 125, or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from heat shock...." 10 CFR 51.53(c)(3)(ii)(B)

"...Because of continuing concerns about heat shock and the possible need to modify thermal discharges in response to changing environmental conditions, the impacts may be of moderate or large significance at some plants...."10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 27

The issue of heat shock does not apply because Turkey Point Units 3 & 4 do not discharge to waters of the U.S. The cooling canal system (Section 3.1.2) is not subject to Clean Water Act jurisdiction and, thus, the system does not fall within the meaning of the NRC regulation and no additional requirements apply.

Consistent with the EPA and State determinations that the Turkey Point cooling canal system is not "waters of the U.S." or "waters of the State" (Section 4.2), FPL has not been required to prepare cooling water thermal discharge [316(a)] studies for Turkey Point Units 3 & 4. Heat shock issues are not applicable to the Turkey Point cooling canal system.

4.5 GROUNDWATER USE CONFLICTS (PLANTS USING > 100 GPM OF GROUNDWATER)

NRC

"...If the applicant's plant...pumps more than 100 gallons (total onsite) of groundwater per minute, an assessment of the impact of the proposed action on groundwater use must be provided...." 10 CFR 51.53(c)(3)(ii)(C)

"...Plants that use more than 100 gpm may cause groundwater use conflicts with nearby groundwater users. Impacts from groundwater conflicts could be small, moderate, or large...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 33

This issue does not apply to Turkey Point Units 3 & 4 because the plant does not pump more than 100 gallons of groundwater per minute. As Section 3.1.2 describes, Turkey Point Units 3 & 4 are connected to a municipal water supply system. The only Turkey Point Units 3 & 4 groundwater wells are observation wells for the Interceptor Ditch and injection well operations.

4.6 GROUNDWATER USE CONFLICTS (PLANTS USING COOLING TOWERS WITHDRAWING MAKEUP WATER FROM A SMALL RIVER)

NRC

"...If the applicant's plant utilizes cooling towers...and withdraws makeup water from a river whose annual flow is less than 3.15 × 10^{12} ft^3/year (9 × 10^{10} m^3/year)....The applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow." 10 CFR 51.53(c)(3)(ii)(A)

"Water use conflicts may result from surface water withdrawals from small water bodies during low flow conditions which may affect aquifer recharge, especially if other groundwater or upstream surface water uses come on line before the time of license renewal." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 34

This issue does not apply to Turkey Point Units 3 & 4 because the plant does not use cooling towers. As Section 3.1.2 describes, Turkey Point Units 3 & 4 use a system of canals (classified by NRC as a cooling pond) to cool and recirculate condenser cooling water and do not obtain any makeup water from surface waterbodies.

4.7 GROUNDWATER USE CONFLICTS (PLANTS USING RANNEY WELLS)

NRC

"...If the applicant's plant uses Ranney wells... an assessment of the impact of the proposed action on groundwater use must be provided...." 10 CFR 51.53(c)(3)(ii)(C)

"...Ranney wells can result in potential groundwater depression beyond the site boundary. Impact of large groundwater withdrawal for cooling tower makeup at nuclear power plants using Ranney wells must be evaluated at the time of application for license renewal..." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 35

This issue does not apply to Turkey Point Units 3 & 4 because the plant does not use Ranney wells. As Section 3.1.2 describes, the only Turkey Point Units 3 & 4 groundwater wells are observation wells for the Interceptor Ditch and injection well operations.

4.8 DEGRADATION OF GROUNDWATER QUALITY

NRC

"...If the applicant's plant is located at an inland site and utilizes cooling ponds... an assessment of the impact of the proposed action on groundwater quality must be provided...." 10 CFR 51.53(c)(3)(ii)(D)

"...Sites with closed-cycle cooling ponds may degrade groundwater quality. For plants located inland, the quality of the groundwater in the vicinity of the ponds must be shown to be adequate to allow continuation of current uses..." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 39

"For plants with cooling ponds located in a salt marsh (South Texas and Turkey Point), groundwater quality is not a significant concern....Therefore, for plants with cooling ponds located in salt marshes, this is a category 1 issue...." (Ref. 4.0-2, Section 4.8.3, page 4-122)

This issue is not applicable to Turkey Point Units 3 & 4 because the plant is not located at an inland site. As Section 2.3 discusses, Turkey Point Units 3 & 4 are located in a coastal salt marsh. GEIS Section 4.8.3 (Ref. 4.0-2) mentions Turkey Point Units 3 & 4 as being in a salt marsh and concludes that degradation of groundwater quality at such a location is not a significant issue (i.e., is Category 1).

4.9 IMPACTS OF REFURBISHMENT ON TERRESTRIAL RESOURCES

NRC

The environmental report must contain an assessment of "...the impact of refurbishment and other license-renewal-related construction activities on important plant and animal habitats...." 10 CFR 51.53(c)(3)(ii)(E)

"...Refurbishment impacts are insignificant if no loss of important plant and animal habitat occurs. However, it cannot be known whether important plant and animal communities may be affected until the specific proposal is presented with the license renewal application...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 40

"...If no important resources would be affected, the impacts would be considered minor and of small significance. If important resources could be affected by refurbishment activities, the impacts would be potentially significant...." (Ref. 4.0-2, Section 3.6, page 3-6)

The NRC made impacts to terrestrial resources a Category 2 issue because the significance of ecological impacts cannot be determined without considering site-specific and project-specific details (Ref. 4.0-2, Section 3.6). Aspects of the site and the project to be ascertained are (1) the identification of important ecological resources, (2) the nature of refurbishment activities, and (3) the extent of impacts to plant and animal habitat.

This issue is not applicable to Turkey Point Units 3 & 4 because, as Section 3.2 discusses, FPL has no plans for refurbishment or other license-renewal-related construction activities at Turkey Point Units 3 & 4.

4.10 THREATENED OR ENDANGERED SPECIES

NRC

"All license renewal applicants shall assess the impact of refurbishment and other license-renewal-related construction activities on important plant and animal habitats. Additionally, the applicant shall assess the impact of the proposed action on threatened and endangered species in accordance with the Endangered Species Act." 10 CFR 51.53(c)(3)(ii)(E)

"Generally, plant refurbishment and continued operation are not expected to adversely affect threatened or endangered species. However, consultation with appropriate agencies would be needed at the time of license renewal to determine whether threatened or endangered species are present and whether they would be adversely affected." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 49

The NRC made impacts to threatened or endangered species a Category 2 issue because the status of many species is being reviewed, and a site-specific assessment is required to determine whether any identified species could be affected by refurbishment activities or continued plant operations through the renewal period. In addition, compliance with the Endangered Species Act requires consultation with the appropriate federal agency (Ref. 4.0-2, Sections 3.9 and 4.1).

Section 2.4 discusses ecological habitats at Turkey Point Units 3 & 4 and along associated transmission lines. Section 2.5 discusses terrestrial and aquatic species that occur, or may occur, at Turkey Point Units 3 & 4 and along associated transmission lines and that have special status (e.g., threatened, endangered, or State special concern). To date, the effects of Turkey Point Units 3 & 4 on these species have been positive, through habitat protection and enhancement.

As discussed in Section 3.2, FPL has no plans to conduct refurbishment or construction activities at Turkey Point Units 3 & 4 during the license renewal period. Therefore, there would be no refurbishment-related impacts to special status species, and no further analysis of refurbishment-related impacts is required. A positive impact on special-status species would be realized by the continuation of habitat protection and enhancement programs supported by continued operation of Turkey Point Units 3 & 4.

The Turkey Point cooling canal system provides breeding habitat for the endangered American crocodile. FPL follows a site management plan with the objective of accommodating the maintenance requirements of the cooling canal system with the life history requirements of the crocodile. For example,

maintenance activities are scheduled to avoid disturbing breeding adults or hatchlings. All activity in the vicinity of the canals is minimized throughout the year. In addition, FPL supports a program to tag and monitor individual animals as part of studies on crocodile natural history.

Endangered Florida manatees and threatened and endangered sea turtles (loggerhead, green, and leatherback) use Card Sound and Biscayne Bay. Turkey Point Units 3 & 4 do not discharge cooling water to Card Sound or the Bay, nor are there any permitted NPDES discharges to these waters. Water from the cooling canals seeps as groundwater to the Bay and Card Sound. The range of salinities in the cooling canal water (40 to 50 parts per thousand; Section 3.1.2) is similar to the range in Biscayne Bay (24 to 44 parts per thousand; Section 2.2). No impact is expected in Biscayne Bay or Card Sound as a result of the continued operation of Turkey Point Units 3 & 4. Manatees also occur in the Turkey Point barge turning basin, the old discharge channel, and state canals, but Turkey Point Units 3 & 4 operations do not affect these waters.

FPL has initiated contacts with the U.S. Fish and Wildlife Service (FWS), the National Marine Fisheries Service (NMFS), and the Florida Fish and Wildlife Conservation Commission (FWCC) regarding Turkey Point Units 3 & 4 license renewal. Copies of the contact letters and agency responses are provided in Appendix B of the Turkey Point Units 3 & 4 Environmental Report. Based on the FPL analysis and results of correspondence with FWS, NMFS, and FWCC, license renewal impacts to threatened, endangered, or other special-status species would be SMALL.

4.11 AIR QUALITY DURING REFURBISHMENT (NON-ATTAINMENT OR MAINTENANCE AREAS)

NRC

"...If the applicant's plant is located in or near a nonattainment or maintenance area, an assessment of vehicle exhaust emissions anticipated at the time of peak refurbishment workforce must be provided in accordance with the Clean Air Act as amended...." 10 CFR 51.53(c)(3)(ii)(F)

"...Air quality impacts from plant refurbishment associated with license renewal are expected to be small. However, vehicle exhaust emissions could be cause for concern at locations in or near nonattainment or maintenance areas. The significance of the potential impact cannot be determined without considering the compliance status of each site and the numbers of workers expected to be employed during the outage...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 50

The NRC made impacts to air quality during refurbishment a Category 2 issue because vehicle exhaust emissions could be cause for some concern, and a general conclusion about the significance of the potential impact could not be drawn without considering the compliance status of each site and the number of workers expected to be employed during the outage (Ref. 4.0-2, Section 3.3). Information needed would include (1) the attainment status of the plant-site area and (2) number of additional vehicles as a result of refurbishment activities.

As Section 2.13 discusses, Turkey Point Units 3 & 4 is located in an air quality maintenance area. However, this issue is not applicable to Turkey Point Units 3 & 4 because, as Section 3.2 discusses, FPL has no plans for refurbishment at Turkey Point Units 3 & 4.

4.12 IMPACT ON PUBLIC HEALTH OF MICROBIOLOGICAL ORGANISMS

NRC

"If the applicant's plant uses a cooling pond, lake, or canal or discharges into a river having an annual average flow rate of less than 3.15 × 10^{12} ft^3/year (9 × 10^{10} m^3/year), an assessment of the impact of the proposed action on public health from thermophilic organisms in the affected water must be provided." 10 CFR 51.53(c)(3)(ii)(G)

"These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals that discharge to small rivers. Without site-specific data, it is not possible to predict the effects generically." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 57

The NRC designated impacts to public health from thermophilic organisms a Category 2 issue because the magnitude of the potential public health impacts associated with thermal enhancement of *Naegleria fowleri* could not be determined generically. The NRC noted, in the GEIS, that impacts of nuclear power plant cooling towers and thermal discharges are considered to be of small significance if they do not enhance the presence of microorganisms that are detrimental to water quality and public health (Ref. 4.0-2, Section 4.3.6). However, because FPL employees and contractors work in the cooling canal system, it is prudent for FPL to evaluate the possibility of pathogenic microbial communities in the cooling canal system. Activities in the canal system include aquatic weed removal, maintenance of the berms and canals, and monitoring of crocodiles. Some site facilities are adjacent to the cooling canal system, and FPL employees and contractors travel on the canals in airboats.

The cooling canals at Turkey Point Units 3 & 4 are too harsh an environment to support the survival and reproduction of many species of pathogenic microorganisms. Three factors contribute to this, both separately and in synergy: high temperature (35°C -38°C), hypersalinity (approximately 40-50 parts per thousand), and high UV penetration due to latitude and the shallowness of the canals (Sections 2.2 and 3.1.2). Two species of potential concern, *Naegleria fowleri* and *Legionella* sp., can be eliminated on the basis of habitat requirements. Both are freshwater organisms endemic to lakes, streams, and moist soil (Ref. 4.12-1). Other pathogenic bacteria species, however, can resist high salinities (Ref. 4.12-2), but typically go into a state that is considered "viable" but not "culturable." This means that populations within harsh environments are likely to remain low, with greater proliferation possible only if transferred to more favorable conditions. Since the Turkey Point Units 3 & 4 cooling canals form a closed

system that does not discharge to other water bodies, the harsh conditions would generally assure the continuance of low microbial populations. When pathogenic bacteria are stressed by high salinity and UV radiation (at levels of natural sunlight exposure typical for the Turkey Point Units 3 & 4 cooling canals), pathogenicity and culturability may be lost even though the organisms remain viable (Ref. 4.12-3). In addition, culturable bacteria numbers decrease significantly faster in seawater than in freshwater when exposed to natural sunlight (Ref. 4.12-4). Another factor suppressing bacterial populations in high temperature water is a natural predator-prey relationship. For example, the natural elimination of *Salmonella* sp. by protozoa in sea water has been shown to increase with temperature (Ref. 4.12-5).

Given the poor conditions for supporting populations of pathogenic organisms, such organisms in the Turkey Point Units 3 & 4 cooling canals do not constitute a significant public health issue. In addition, no pathway for significant human exposure exists, since there is no mechanism for inhalation exposure from aerosol production (such as spray nozzles or cooling towers), and restrictions against swimming and fishing preclude both direct contact and ingestion routes. These conclusions are supported by Dr. Richard L. Tyndall, Oak Ridge National Laboratory, author of NRC publications NUREG CR-2980 (Ref. 4.12-6) and NUREG CR-3364 (Ref. 4.12-7).

FPL has consulted with the Florida Department of Health, which concurred that there is minimal public health risk from the cooling canals at Turkey Point Units 3 & 4. Copies of the consultation request and agency response are in Appendix C of the Turkey Point Units 3 & 4 Environmental Report.

FPL concludes from this evaluation that there has been no known impact of Turkey Point Units 3 & 4 operation on public health from microbiological (thermophilic) organisms, and such impacts are not likely to occur as a result of license renewal, and there would be no impacts to mitigate. Because the definition of "small" includes impacts that are not detectable, the appropriate characterization of the impact on public health of microbiological organisms is SMALL.

4.13 ELECTRIC SHOCK FROM TRANSMISSION-LINE-INDUCED CURRENTS

NRC

"If the applicant's transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the National Electrical Safety Code (NESC) for preventing electric shock from induced currents, an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines must be provided." 10 CFR 51.53 (c)(3)(ii)(H)

"Electrical shock resulting from direct access to energized conductors or from induced charges in metallic structures have not been found to be a problem at most operating plants and generally are not expected to be a problem during the license renewal term. However, site-specific review is required to determine the significance of the electric shock potential at the site." 10 CFR Part 51, Subpart A, Appendix B, and Table B-1, Issue 59

4.13.1 BACKGROUND

The NRC made impacts of electric shock from transmission lines a Category 2 issue because without a review of each plant's transmission line conformance with the National Electrical Safety Code® criteria, the NRC could not determine the significance of the electrical shock potential. Information to be ascertained includes (1) change in line use and voltage since last analysis, (2) conformance with National Electrical Safety Code® (NESC®) standards, and (3) potential change in land use along transmission lines since initial National Environmental Policy Act review.

The electrical shock hazard assessment is to be performed on the lines that were constructed specifically to connect the plant to the transmission system. Turkey Point Units 3 and 4 share the same site with fossil-powered Units 1 and 2. All four units share the same switchyard (Section 3.1.4). Fossil generation and switchyard operation preceded the operation of the nuclear power plant. It was, therefore, difficult to characterize any of the lines leaving the switchyard as being specifically constructed to support nuclear power plant operation. All eight lines are analyzed below to confirm that these lines comply with the current NESC® clearance requirements for limiting electrical shock hazard (Ref. 4.13-1, Section 232 C.1.c). The NESC® requires that transmission lines be designed to limit the steady-state current due to electrostatic effects to 5 milliamperes (mA) root mean square (rms). This condition must be met for the largest anticipated truck, vehicle, or piece of equipment under the line, if it were short-circuited to ground.

4.13.2 ANALYSIS OF SHOCK SAFETY

The scope of the electric shock hazard analysis for Turkey Point Units 3 & 4 was from the plant main transformers to the switchyard and from the switchyard north to the Davis, Flagami, Levee, and Doral substations. In addition, the transmission line to the west from the switchyard to the Florida City substation was also analyzed (Figure 2.1-3).

There are four 230-kilovolt (kV) lines that connect the Turkey Point switchyard to the startup and main transformers of the plant. These lines were constructed prior to 1972, before the NESC® adopted a steady-state limit for short-circuit current. For this reason, FPL has conducted an evaluation of the lines' conformance to the 1997 NESC® (latest version). This analysis was conducted assuming the largest vehicle under the lines would be a semi tractor-trailer, 13.5 feet high by 8.5 feet wide by 53 feet long. These specifications are based on Florida Department of Transportation limits on vehicle size. The minimum vertical clearance to the roadbed is 38.1 feet calculated at 120°F.

Calculation of the maximum short-circuit current was performed based on the methodology described in Electric Power Research Institute guidance (Ref. 4.13-2). The parameters of the worst-case lines (voltage, current, conductor position) were entered into the EZEMF computer program (Ref. 4.13-3), to determine the maximum electric field strength 1 meter above the road. The maximum calculated electric field was 2.00 kV/m. Centering the tractor trailer at this point under and perpendicular to the phase conductors, the maximum short-circuit current was calculated assuming the maximum electric field value applied to the entire truck length.

FPL determined that the maximum steady-state short-circuit current under these conditions is 1.60 mA rms. The lines connecting the plant to the switchyard, therefore, conform to the 1997 NESC®, which requires the short-circuit current to be less than 5 mA rms.

FPL used a similar approach in evaluating the eight circuits that leave the Turkey Point switchyard (see Figure 2.1-3 for location and Section 3.1.4 for description). FPL found that the maximum electric field strength for these circuits is in the corridor between the Turkey Point site and the Davis substation. This value is 5.4 kV/m, which, when combined with the minimum clearance of 25 feet, corresponds to a short-circuit value of 4.32 mA. The maximum allowable electric field strength would be 6.23 kV/m to achieve the 5 mA rms short-circuit current

allowed by the NESC®. Therefore, the maximum expected short-circuit current would be below the allowable of 5 mA rms.

4.13.3 SUMMARY

All the circuits considered within the scope of this analysis meet NESC® requirements. Therefore, pursuant to 10 CFR 51.53(c)(3)(ii)(H) and based on the above analyses, the impact of the potential for electrical shock is SMALL and mitigation is not warranted.

4.14 HOUSING IMPACTS

NRC

The environmental report must contain, "...[a]n assessment of the impact of the proposed action on housing availability..." 10 CFR 51.53(c)(3)(ii)(I)

"Housing impacts are expected to be of small significance at plants located in a medium or high population area and not in an area where growth control measures that limit housing development are in effect. Moderate or large housing impacts of the workforce associated with refurbishment may be associated with plants located in sparsely populated areas or areas with growth control measures that limit housing development." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 63

"...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 occurs." (Ref. 4.0-2, Section 4.7.1.1)

The NRC made housing impacts a Category 2 issue because impact magnitude depends on local conditions that the NRC could not predict for all plants at the time of GEIS publication (Ref. 4.0-2, Section 3.7.2). Local conditions that need to be ascertained are (1) population categorization as small, medium, or high; and (2) applicability of growth control measures.

Refurbishment activities and continued operations could result in housing impacts due to increased staffing. As described in Section 3.2, FPL does not plan to perform refurbishment activities. FPL concludes that there would be no refurbishment-related impacts to area housing and, therefore, no analysis is required. Accordingly, the following discussion focuses on impacts of continued operations on local housing availability.

As described in Section 2.6, Turkey Point Units 3 & 4 are located in a high population area. Miami-Dade County, as noted in Section 2.8, is not subject to growth control measures that limit housing development. In 10 CFR Part 51, Subpart A, Appendix B, Table B-1 (Issue 63), the NRC concludes that impacts to housing are expected to be of small significance at plants located in "high" population areas where growth control measures are not in effect. Therefore, FPL expects housing impacts to be small.

This conclusion is supported by the following site-specific housing analysis. The maximum impact to area housing is calculated using the following assumptions: (1) all direct and indirect jobs would be filled by in-migrating residents; (2) the residential distribution of new residents would be similar to current worker

distribution; and (3) each new job created (direct and indirect) represents one housing unit. As described in Section 3.4, approximately 85 percent of the Turkey Point Units 3 & 4 employees reside in Miami-Dade County. Therefore, the focus of the housing impact analysis is on this county. As described in Section 3.4, FPL's conservative estimate of 60 license renewal employees could generate the demand for 184 housing units (60 direct and 124 indirect jobs). If it is assumed that 85 percent of the 184 new workers would locate in Miami-Dade County, consistent with current employee trends, a need for 156 new housing units would be created. In an area with a population of over 2 million, this would not create a discernible change in housing availability, change rental rates and housing values, or spur housing construction or conversion. Given the magnitude of impact, which is SMALL, mitigative measures would not be necessary or effective.

4.15 PUBLIC UTILITIES: PUBLIC WATER SUPPLY AVAILABILITY

NRC

The environmental report must contain, "...an assessment of the impact of population increases attributable to the proposed project on the public water supply." 10 CFR 51.53(c)(3)(ii)(I)

"An increased problem with water shortages at some sites may lead to impacts of moderate significance on public water supply availability." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 65

"Impacts on public utility services are considered small if little or no change occurs in the ability to respond to the level of demand and thus there is no need to add capital facilities. Impacts are considered moderate if overtaxing of facilities during peak demand periods occurs. Impacts are considered large if existing service levels (such as quality of water and sewage treatment) are substantially degraded and additional capacity is needed to meet ongoing demands for services." (Ref. 4.0-2, Section 3.7.4.5)

The NRC made public utility impacts a Category 2 issue because an increased problem with water availability may occur in conjunction with plant demand and plant-related population growth as a result of current water shortages in some areas (Ref. 4.0-2, Section 4.7.3.5). Local information needed would be a description of water shortages experienced in the area and an assessment of the public water supply system's available capacity.

The NRC's analysis of impacts to the public water supply system considered both plant demand and plant-related population growth demands on local water resources. As discussed in Section 3.2, FPL plans no refurbishment, so plant demand would not be affected by refurbishment activities.

The impact to the local water supply systems resulting from plant-related population growth can be determined by calculating the amount of water that would be required by these individuals. The average American uses between 50 and 80 gallons per day for personal use (Ref. 4.15-1, page 2). As described in Section 3.4, FPL's conservative estimate of 60 license renewal employees could generate a total of 184 new jobs. This could result in a population increase of 497 in the area (184 jobs multiplied by 2.7 average number of persons per household in Miami-Dade County). Using this consumption rate, the plant-related population increase would require an additional 25,000 to 40,000 gallons per day. This amount represents less than one percent of the current treatment capacity of the Alexander Orr, Jr., Water Treatment Plant. Therefore, the impacts resulting from

plant-related population growth to the public water supply would be SMALL, requiring no additional capacity and not warranting mitigation.

4.16 EDUCATION IMPACTS FROM REFURBISHMENT

NRC

The environmental report must contain, "...an assessment of the impact of the proposed action on public schools (impacts from refurbishment activities only) within the vicinity of the plant...." 10 CFR 51.53(c)(3)(ii)(I)

"...Most sites would experience impacts of small significance but larger impacts are possible depending on site- and project-specific factors...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 66

"...small impacts are associated with project-related enrollment increases of 3 percent or less. Impacts are considered small if there is no change in the school systems' abilities to provide educational services and if no additional teaching staff or classroom space is needed. Moderate impacts are associated with 4 to 8 percent increases in enrollment, and if a school system must increase its teaching staff or classroom space even slightly to preserve its pre-project level of service.... Large impacts are associated with enrollment increases greater than 8 percent...." (Ref. 4.0-2, Section 3.7.4.1)

The NRC made impacts to education a Category 2 issue because site-specific and project-specific factors determine the significance of impacts (Ref. 4.0-2, Section 3.7.4.1). Local factors to be ascertained include (1) project-related enrollment increases and (2) status of the student/teacher ratio.

This issue is not applicable to Turkey Point Units 3 & 4 because, as Section 3.2 discusses, FPL has no plans for refurbishment activities at Turkey Point Units 3 & 4.

4.17 OFFSITE LAND USE

4.17.1 REFURBISHMENT

NRC

The environmental report must contain, "...an assessment of the impact of the proposed action on land-use (impacts from refurbishment activities only) within the vicinity of the plant...." 10 CFR 51.53(c)(3)(ii)(I)

"...Impacts may be of moderate significance at plants in low population areas...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 68

"...if plant-related population growth is less than 5 percent of the study area's total population, off-site 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 60 persons per square mile, and at least one urban area with a population of 100,000 or more within 50 miles...." (Ref. 4.0-2, Section 3.7.5)

The NRC made impacts to offsite land use as a result of refurbishment activities a Category 2 issue because land-use changes could be considered beneficial by some community members and adverse by others. Local conditions to be ascertained include (1) plant-related population growth, (2) patterns of residential and commercial development, and (3) proximity to an urban area of at least 100,000.

This issue is not applicable to Turkey Point Units 3 & 4 because, as Section 3.2 discusses, FPL has no plans for refurbishment activities at Turkey Point Units 3 & 4.

4.17.2 OFFSITE LAND USE: LICENSE RENEWAL TERM

NRC

The environmental report must contain, "...[a]n assessment of the impact of the proposed action on ...land-use...within the vicinity of the plant..." 10 CFR 51.53(c)(3)(ii)(I)

"Significant changes in land use may be associated with population and tax revenue changes resulting from license renewal." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 69

"...if plant-related population growth is less than five percent of the study area's total population off-site land-use changes would be small..." (Ref. 4.0-2, Section 3.7.5)

"If the plant's tax payments are projected to be small relative to the community's total revenue, new tax-driven land-use changes during the plant's license renewal term would be small, especially where the community has preestablished patterns of development and has provided adequate public services to support and guide development." (Ref. 4.0-2, Section 4.7.4.1)

The NRC made impacts to offsite land use during the license renewal term a Category 2 issue because land use changes may be perceived to be beneficial by some community members and adverse by others. Therefore, the NRC could not assess the potential significance of site-specific offsite land-use impacts (Ref. 4.0-2, Section 4.7.4.1). Site-specific factors to consider in an assessment of new tax-driven land-use impacts include (1) the size of plant-related population growth compared to the area's total population, (2) the size of the plant's tax payments relative to the community's total revenue, (3) the nature of the community's existing land use pattern, and (4) the extent to which the community already has public services in place to support and guide development.

The GEIS presents an analysis of offsite land use for the renewal term that is characterized by two components, population-driven and tax-driven impacts (Ref. 4.0-2, Section 4.7.4.1). Based on the GEIS case study analysis, the NRC concludes that all new population-driven land-use changes during the license renewal term at all nuclear power plants would be small. Population growth caused by license renewal would represent a much smaller "percentage of the local area's" total population than the percentage presented by operations-related growth (Ref. 4.0-2, Section 4.7.4.2).

As described in Section 3.2, no refurbishment or construction activities will be associated with Turkey Point Units 3 & 4 license renewal. FPL therefore does not anticipate any new tax payments that would influence offsite land use. As shown in Table 2.9-1 in Section 2.9, FPL annual property tax payments to Miami-Dade County, from 1995 through 1998, for Turkey Point Units 3 & 4 represented less than 2 percent of the County's total annual property tax revenue and less than one

percent of Miami-Dade County's annual operating budget. The NRC has determined that the significance of tax payments is small if payments are less than 10 percent of a taxing jurisdiction's revenue (Ref. 4.0-2, Section 4.7.2.1). The NRC has further determined that if a plant's tax payments are projected to be small, license renewal tax-driven land-use changes would most likely be SMALL with very little new development and minimal changes to the area's land-use patterns (Ref. 4.0-2, Section 4.7.4.1). FPL concurs with the NRC determination and concludes that mitigative measures would be unwarranted.

4.18 TRANSPORTATION

NRC

"All applicants shall assess the impact of highway traffic generated by the proposed project on the level of service of local highways during periods of license renewal refurbishment activities and during the term of the renewed license." 10 CFR 51.53(c)(3)(ii)(J)

"Transportation impacts (level of service) of highway traffic generated during plant refurbishment and during the term of the renewed license are generally expected to be of small significance. However, the increase in traffic associated with the additional workers and the local road and traffic control conditions may lead to impacts of moderate or large significance at some sites." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 70

"Small impacts would be associated with a free flowing traffic stream where users are unaffected by the presence of other users (level of service A) or stable flow in which the freedom to select speed is unaffected but the freedom to maneuver is slightly diminished (level of service B)." (Ref. 4.0-2, Section 3.7.4.2)

The NRC made impacts to transportation a Category 2 issue because impact significance is determined primarily by road conditions existing at the time of the project, which the NRC could not forecast for all plants (Ref. 4.0-2, Section 3.7.4.2). Local road conditions to be ascertained are (1) level of service conditions, and (2) incremental increase in traffic associated with refurbishment activities and license renewal staff.

As described in Section 3.2, no refurbishment activity is planned and so no refurbishment impacts to local transportation are anticipated.

As noted in Section 2.11.2, access to Turkey Point Units 3 & 4 is via SW 344 Street, also called East Palm Drive, which carries a level-of-service (LOS) designation of "B." GEIS Section 3.7.4.2 (Ref. 4.0-2) concluded that impacts to roads with an LOS designation of "B" are small because the operation of individual users is not substantially affected by the presence of other users. At this level, no delays occur and no improvements are needed.

The current workforce associated with Turkey Point Units 3 & 4 is 980 employees (FPL and contractors). Once or twice a year an additional 800-900 workers participate in periodic refueling. The FPL conservative projection of 60 additional employees associated with "operating over the license renewal term" for Turkey Point Units 3 & 4 represents approximately a 6 percent increase in the current

number of employees and an even smaller percentage of the employees present on site during periodic refueling. Given these employment projections and the level-of-service designation of "B" for the access road to Turkey Point Units 3 & 4, it is consistent with the GEIS to conclude that impacts to transportation would be SMALL and mitigative measures would be unwarranted.

4.19 HISTORIC AND ARCHAEOLOGICAL RESOURCES

NRC

The environmental report must contain an assessment of, "...whether any historic or archaeological properties will be affected by the proposed project." 10 CFR 51.53(c)(3)(ii)(K)

"Generally, plant refurbishment and continued operation are expected to have no more than small adverse impacts on historic and archaeological resources. However, the National Historic Preservation Act requires the Federal agency to consult with the State Historic Preservation Officer to determine whether there are properties present that require protection. 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 71

"Sites are considered to have small impacts to historic and archeological resources if (1) the State Historic Preservation Officer (SHPO) identifies no significant resources on or near the site; or (2) the SHPO identifies (or has previously identified) significant historic resources but determines they would not be affected by plant refurbishment, transmission lines, and license-renewal term operations and there are no complaints from the affected public about the character; and (3) if the conditions associated with moderate impacts do not occur." (Ref. 4.0-2, Section 3.7.7)

The NRC made impacts to historic and archeological resources a Category 2 issue because determinations of impacts to historic and archeological resources are site-specific in nature, and the National Historic Preservation Act mandates that determination of impacts must be made through consultation with the State Historic Preservation Officer (SHPO) (Ref. 4.0-2, Section 4.7.7.3).

FPL plans no land-disturbing refurbishment activities. Therefore, no refurbishment-related impacts are anticipated.

As described in Section 2.14, no known archaeological or historic sites of significance were threatened during construction of Turkey Point Units 3 & 4 in the 1970s. No historic or prehistoric cultural materials have been found on the adjacent Everglades Mitigation Bank. Transmission line rights-of-way have been categorized and inventoried. No known archaeological or historic sites of significance have been identified. Therefore, continued use of transmission lines and rights-of-way are projected to cause little or no impact.

FPL has initiated discussions with the SHPO regarding Turkey Point Units 3 & 4 license renewal, and the SHPO has determined that it is unlikely that archaeological or historical sites would be affected. Copies of the correspondence with the SHPO are provided in Appendix D of the Turkey Point Units 3 & 4 Environmental Report.

FPL concludes that continued operation of Turkey Point Units 3 & 4 would have no adverse impacts to historic resources; hence, there would be no impacts to mitigate. Because the definition of "small" includes impacts that are not detectable, the appropriate characterization of the impact on historic and archaeological resources is SMALL.

4.20 SEVERE ACCIDENT MITIGATION ALTERNATIVES

NRC

The environmental report must contain a consideration of alternatives to mitigating severe accidents, "...if the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environmental assessment..." 10 CFR 51.53(c)(3)(ii)(L).

"The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to ground water, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives." 10 CFR Part 51, Subpart A, Appendix B, Table B-1 (Issue 76).

The term "accident" refers to any unintentional event (i.e., outside the normal or expected plant operational envelope) that results in the release or a potential for release of radioactive material to the environment. Generally, the NRC categorizes accidents as "design basis" or "severe." Design basis accidents are those for which the risk is great enough that an applicant is required to design and construct a plant to prevent unacceptable accident consequences. Severe accidents are those considered too unlikely to warrant design controls.

Historically, the NRC has not included in its EISs or environmental assessments any analysis of alternative ways to mitigate the environmental impact of severe accidents. A 1989 court decision ruled that, in the absence of an NRC finding that severe accidents are remote and speculative, severe accident mitigation alternatives (SAMAs) should be considered in the NEPA analysis [*Limerick Ecology Action v. NRC*, 869 F.d 719 (3rd Cir. 1989)]. For most plants, including Turkey Point Units 3 & 4, license renewal is the first licensing action that would necessitate consideration of SAMAs.

The NRC concludes in its generic license renewal rulemaking that the unmitigated environmental impacts from severe accidents meet the Category 1 criteria, but the NRC has made consideration of mitigation alternatives a Category 2 issue because ongoing regulatory programs related to mitigation [i.e., Individual Plant Examination (IPE) and Accident Management] are not complete for all plants. Since these programs have identified plant programmatic and procedural improvements (and in a few cases, minor modifications) as cost-effective in reducing severe accident and risk consequences, the NRC thought it premature to draw a generic conclusion as to whether severe accident mitigation would be required for license renewal. Site-specific information to be presented in the environmental report includes:

(1) potential SAMAs; (2) benefits and costs of implementing potential SAMAs; and (3) sensitivity of analysis to changes to key underlying assumptions.

The Turkey Point Probabilistic Safety Assessment (PSA) model is maintained current with the existing plant configuration and operating practices via programmatic review of design and procedure changes. The model is also updated regularly as a result of the availability of new data and the advances in PSA technology. The model is also used via application of the plant on-line risk monitor to evaluate the risk associated with real or proposed plant configurations. An outage risk model is used during outages to predict and monitor the availability of key shutdown functions and compliance with the outage risk administrative procedure as affected by the scheduled removal of components from service. Additionally, the Turkey Point PSA model has been used to better focus maintenance and inspection activities associated with motor operated valves (MOVs), air operated valves (AOVs), and Category 1 piping inside Containment. These types of applications are expected to increase. The combined effect of these activities is expected to result in an overall plant risk reduction, which will be factored into any future consideration of alternatives to mitigating severe accidents.

4.20.1 METHODOLOGY OVERVIEW

The methodology to perform the SAMA analysis is based primarily on the handbook used by the NRC to analyze benefits and costs of its regulatory activities, NUREG/BR-0184 (Ref. 4.20-1), subject to consideration of plant-specific SAMAs identified by FPL.

Environmental impact statements and environmental reports are prepared using a sliding scale in which impacts of greater concern and mitigating measures of greater potential value receive more detailed analysis than impacts of less concern and mitigating measures of less potential value. Accordingly, FPL uses less detailed feasibility investigative and cost estimation techniques for SAMAs having disproportionately high costs and low benefits and more detailed evaluations for the most viable candidates.

Initial input for the SAMA benefits analysis is the plant's probabilistic risk assessment model. This model is the internal events risk model. This model is an updated version of the IPE (Ref. 4.20-2). The IPE included core damage sequence quantification for both Turkey Point Units 3 & 4. The evaluation determined that no appreciable difference exists between the risk profiles of the two units, and one model (Unit 3), which includes crossties and dual-unit initiators, will suffice to

represent both units. Therefore, the SAMA analysis is based on the current Unit 3 PSA model.

The following is a brief outline of the approach taken in the SAMA analysis:

- Establish the Base Case – Use NUREG/BR-0184 to evaluate severe accident impacts.

- Offsite exposure – Monetary value of consequences (dose) to offsite population;

  Use the Turkey Point Units 3 & 4 PSA model to determine total accident frequency (core damage frequency and containment release frequency); Melcor Accident Consequences Code System (MACCS2) to convert release input to public dose; and NUREG/BR-0184 methodology to convert dose to present worth dollars (based on valuation of $2,000 per person-rem and a present worth discount factor of 7 percent).

- Offsite economic costs – Monetary value of damage to offsite property;

  Use the PSA model to determine total accident frequency (core damage frequency and containment release frequency); MACCS2 to convert release input to offsite property damage; and NUREG/BR-0184 methodology to convert offsite property damage to present worth dollars.

- Onsite exposure costs – Monetary value of dose to workers;

  Use NUREG/BR-0184 best estimate occupational dose values for immediate and long-term dose, then apply NUREG/BR-0184 methodology to convert dose to present worth dollars (based on valuation of $2,000 per person-rem and a present worth discount factor of 7 percent).

- Onsite economic costs – Monetary value of damage to onsite property;

  Use NUREG/BR-0184 best estimate cleanup and decontamination costs, then apply NUREG/BR-0184 methodology to convert onsite property damage estimate to present worth dollars. Replacement power costs are included.

- SAMA Identification – Identify potential SAMAs from the following sources:

  – Severe Accident Mitigation Design Alternative (SAMDA) analyses submitted in support of original licensing activities for other operating nuclear power plants and advanced light-water reactor plants;

  – NRC and industry documentation discussing potential plant improvements; and

  – Documented insights provided by the plant staff.

- Preliminary Screening – Eliminate obviously non-viable candidates, based upon:

  – SAMA improvements that modify features not applicable to Turkey Point Units 3 & 4; or

  – SAMA improvements already implemented at the plant.

- Final Disposition of Remaining SAMAs – Eliminate candidates based on cost-benefit:

  – Implementation of SAMA would require extensive plant reconstruction, or the cost of implementing SAMA would exceed maximum benefit for Base Case evaluation; or

  – Benefit/Cost Evaluation – Evaluate benefits and costs of implementing the SAMA:

    -- Benefit calculation – Estimate benefits of implementing each SAMA individually;

    -- Existing Level 2 modeling used;

    -- SAMA impacts – Calculate impacts (i.e., onsite/offsite dose and damages) by manipulating the plant model to simulate revised plant risk following implementation of each individual SAMA;

-- Averted SAMA impacts – Calculate benefits for each SAMA in terms of averted consequences. Averted consequences are the arithmetic differences between the calculated impact for the base case and revised impact following implementation of each individual SAMA; and

-- SAMA Benefits – Calculate total benefit for each SAMA.

– Cost estimate – Estimate cost of implementing each evaluated SAMA. The detail of the cost estimate must be commensurate with the benefit; if a benefit is very low, it is not necessary to perform a detailed cost estimate to determine that the SAMA is not cost beneficial–engineering judgement can be applied.

- Sensitivity Analysis – Determine the effect that changing the discount rate would have on the cost-benefit calculation.

- Conclusions – Identify SAMAs that are cost beneficial, if any, and implementation plans or basis for not implementing.

The FPL SAMA analysis for Turkey Point Units 3 & 4 is presented in the following sections. These sections provide a detailed discussion of the process presented above.

4.20.2 ESTABLISHING THE BASE CASE

The purpose of establishing the base case is to provide the baseline for determining the risk reductions that would be attributable to the implementation of potential SAMAs. This severe accident risk, based on the PSA model, is calculated through use of the IPE Level 2 and the MACCS2 Level 3 model, based upon site-specific meteorology, population characteristics, and economic information.

The primary source of data relating to the base case is the PSA model. The model is the latest version of the Turkey Point risk model and uses probabilistic risk analysis (PRA) techniques to:

- Develop an understanding of severe accident behavior;

- Understand the most likely severe accident consequences;

- Gain a quantitative understanding of the overall probabilities of core damage and fission product releases; and

- Evaluate hardware and procedure changes to assess the overall probabilities of core damage and fission product releases.

The PSA model includes internal events (e.g., loss of feedwater event, loss-of-coolant accident) and is far more advanced than the IPE submitted to the NRC in June 1991 (Ref. 4.20-2). Due to this continuous refinement, the PSA model is considered a "living" plant risk model. The PSA model is periodically updated as a result of:

- Equipment Performance – As data collection progresses, estimated failure rates and system unavailabilities change.

- Plant Configuration Changes – There is a time lag between changes to the plant and incorporation of those changes into the PSA model.

- Modeling Changes – The PSA model is continually refined to incorporate the latest state of knowledge. For example, if a new design calculation indicates that the heat-up rates of various plant areas are not as significant as initially estimated, then this information is incorporated into the model.

The PSA model describes the results of the first two levels of the PSA for the plant. These levels are defined as follows: Level 1 – determines core damage frequencies based on system analyses and human factors evaluations; and Level 2 – determines the physical and chemical phenomena that affect the performance of the containment and other radiological release mitigation features to quantify accident behavior and release of fission products to the environment. The scope of plant challenges considered in the PSA model includes only internal events (e.g., turbine trips, loss of main feedwater, internal floods).

Using the results of these analyses, the next step is to perform a Level 3 PRA analysis, which calculates the hypothetical impacts of severe accidents on the surrounding environment and members of the public. The MACCS2 computer code is used for determining the offsite impacts for the Level 3 analysis, whereas the magnitude of the onsite impacts (in terms of clean-up and decontamination costs and occupational dose) is based on information provided in NUREG/BR-0184 (Ref. 4.20-1). The principal phenomena analyzed are atmospheric transport of radionuclides; mitigating actions (i.e., evacuation, condemnation of contaminated

crops and milk) based on dose projection; dose accumulation by a number of pathways, including food and water ingestion; and economic costs. Input for the Level 3 analysis includes the reactor core radionuclide inventory, source terms from the IPE (as applied to the PSA model), site meteorological data, projected population distribution (within 50-mile radius) for the year 2025, emergency response evacuation modeling, and economic data. Appendix F.1 describes the MACCS input data and assumptions.

The Level 3 analysis looks at the source term for each of 51 different release modes associated with endstates of the containment event tree. Because the analysis is based on probabilistic risk input, the analytical results relate the frequency of an impact to the magnitude of the impact (i.e., frequency versus risk). In general, severe accidents having the greatest predicted impact have the lowest predicted probability of occurrence.

4.20.2.1 Offsite Exposure Costs

The Level 3 base case analysis shows an annual offsite exposure risk of 10.88 person-rem. This calculated value is converted to a monetary equivalent (dollars) via application of the NRC's conversion factor of $2,000 per person-rem (Refs. 4.20-1 and 4.20-3). This monetary equivalent is then discounted to present value using the NRC standard formula (Ref. 4.20-1):

$$APE = \left(F_S D_{P_S} - F_A D_{P_A}\right) R \frac{1 - e^{-rt_f}}{r} \qquad (1)$$

where:

- APE = monetary value of accident risk avoided due to population doses, after discounting
- R = monetary equivalent of unit dose ($2,000/person-rem)
- F = accident frequency (events/yr)
- D_P = population dose factor (person-rem/event)
- S = subscript denoting status quo (current conditions)
- A = subscript denoting after implementation of proposed action
- r = real discount rate = 7 percent (as a fraction, 0.07)
- t_f = years remaining until end of facility life (20 years)

Using a 20-year period for remaining plant life and a 7 percent discount rate results in the monetary equivalent value presented in Table 4.20-1.

4.20.2.2 Offsite Economic Costs

The Level 3 analysis shows an annual offsite economic risk of $22,850. Calculated values of offsite economic costs caused by severe accidents are also discounted to present value. Discounting is performed in the same manner as for the public health risks in accordance with the following equation:

$$AOC = \left(F_S P_{D_S} - F_A P_{D_A}\right)\frac{1 - e^{-rt_f}}{r}$$

where:

AOC = monetary value of accident risk avoided due to offsite property damage, after discounting

P_D = offsite property loss factor (dollars/event)

The resulting monetary equivalent is presented in Table 4.20-1.

4.20.2.3 Onsite Exposure Costs

Values for occupation exposure associated with severe accidents are not derived from the PSA model, but, instead, are obtained from information published by the NRC (Ref. 4.20-1). The values for occupational exposure consist of "immediate dose" and "long-term dose." The best estimate value provided by the NRC for immediate occupational dose is 3300 person-rem, and for long-term occupational

TABLE 4.20-1
ESTIMATED PRESENT DOLLAR VALUE EQUIVALENT FOR SEVERE ACCIDENTS AT TURKEY POINT UNITS 3 & 4

Parameter	Present Dollar Value
Offsite population dose	$234,207
Offsite economic costs	$245,932
Onsite dose	$6,153
Onsite economic costs	$315,254
Total	$801,546

dose is 20,000 person-rem (over a ten-year cleanup period). The following equations are applied to these values to calculate monetary equivalents:

Immediate Dose

For a currently operating facility, NUREG/BR-0184 recommends calculating the immediate dose present value with the following equation:

Equation (1):

$$W_{IO} = \left(F_S D_{IO_S} - F_A D_{IO_A}\right) R \frac{1 - e^{-rt_f}}{r} \qquad (1)$$

where:

W_{IO} = monetary value of accident risk avoided due to immediate doses, after discounting
IO = subscript denoting immediate occupational dose
R = monetary equivalent of unit dose ($/person-rem)
F = accident frequency (events/yr)
D_{IO} = immediate occupational dose (person-rem/event)
S = subscript denoting status quo (current conditions)
A = subscript denoting after implementation of proposed action
r = real discount rate
t_f = years remaining until end of facility life

The values used in the analysis are:

R = $2000/person-rem
r = 0.07
D_{IO} = 3,300 person-rem/accident (best estimate)
t_f = 20 years

Assuming F_A is zero for the base case, the monetary value of the immediate dose associated with the plant accident risk is:

$$W_{IO} = (F_S D_{IO_S}) R \frac{1 - e^{-rt_f}}{r}$$

$$= 3300 * F * \$2000 * \frac{1 - e^{-.07*20}}{.07}$$

The core damage frequency for the base case is 1.62 X 10^{-5}/year; therefore,

$$W_{IO} = \$1,148$$

Long-Term Dose

For a currently operating facility, NUREG/BR-0184 recommends calculating the long-term dose present value with the following equation:

Equation (2):

$$W_{LTO} = (F_S D_{LTO_S} - F_A D_{LTO_A}) R * \frac{1 - e^{-rt_f}}{r} * \frac{1 - e^{-rm}}{rm} \qquad (2)$$

where:

W_{LTO} = monetary value of accident risk avoided long-term doses, after discounting, ($)
LTO = subscript denoting long-term occupational dose
m = years over which long-term doses accrue

The values used in the analysis are:

R = $2000/person rem
r = .07
D_{LTO} = 20,000 person-rem/accident (best estimate)
m = "as long as 10 years"
t_f = 20 years

For the basis discount rate, assuming F_A is zero, the monetary value of the long-term dose associated with the plant accident risk is:

$$W_{LTO} = (F_S D_{LTO_S}) R * \frac{1-e^{-rt_f}}{r} * \frac{1-e^{-rm}}{rm}$$

$$= (F_S \times 20000)\$2000 * \frac{1-e^{-.07*20}}{.07} * \frac{1-e^{-.07*10}}{.07*10}$$

The core damage frequency for the base case is 1.62 X 10^{-5}/year; therefore,

$$W_{LTO} = \$5,005$$

Total Occupational Exposures

As shown in Table 4.20-1, combining equations (1) and (2) above and using the above numerical values, the long-term accident-related onsite (occupational) exposure avoided (AOE) is:

$$AOE = W_{IO} + W_{LTO} (\$)$$

The bounding value for occupational exposure (AOE_B) is:

$$AOE_B = W_{IO} + W_{LTO} = \$1,148 + \$5,005 = \$6,153$$

4.20.2.4 Onsite Economic Costs[1]

Cleanup/Decontamination

The total cost of cleanup/decontamination of a power reactor facility subsequent to a severe accident is estimated in NUREG/BR-0184 at $\$1.5 \times 10^9$; this same value

[1] Calculated values presented in this and subsequent subsections were calculated using a spreadsheet and may differ slightly from values calculated from the numbers provided; this is due to rounding performed on the numbers presented in this document.

is adopted for these analyses. Considering a 10-year cleanup period, the present value of this cost is:

$$PV_{CD} = \left(\frac{C_{CD}}{m}\right)\left(\frac{1-e^{-rm}}{r}\right)$$

where:

PV_{CD} = present value of the cost of cleanup/decontamination
CD = subscript denoting cleanup/decontamination
C_{CD} = total cost of the cleanup/decontamination effort, $\$1.5 \times 10^9$
m = cleanup period (10 years)
r = discount rate (7 percent)

Therefore:

$$PV_{CD} = \left(\frac{\$1.5E+9}{10}\right)\left(\frac{1-e^{-.07*10}}{.07}\right)$$

$$PV_{CD} = \$1.079E+9$$

This cost is integrated over the license renewal period as follows:

$$U_{CD} = PV_{CD}\frac{1-e^{-rt_l}}{r}$$

where:

U_{CD} = net present value of cleanup/decontamination over the life of the plant

Based upon the values previously assumed:

$$U_{CD} = \$1.161E+10$$

Replacement Power Costs

Replacement power costs, U_{RP}, are an additional contributor to onsite costs. These are calculated in accordance with NUREG/BR-0184, Section 5.6.7.2.[2] Since replacement power will be needed for that time period following a severe accident, for the remainder of the expected generating plant life, long-term power replacement calculations have been used. The calculations are based on the 910-MWe reference plant and, for conservatism, the values are not scaled down for the 760-MWe output of Turkey Point Units 3 & 4. The present value of replacement power is calculated as follows:

$$PV_{RP} = \left(\frac{\$1.2E+8}{r}\right)\left(1 - e^{-rt_f}\right)^2$$

where:

PV_{RP} = present value of the cost of replacement power for a single event
t_f = years remaining until end of facility life
r = discount rate

The $\$1.2 \times 10^8$ value has no intrinsic meaning but is a substitute for a string of non-constant replacement power costs that occur over the lifetime of a "generic" reactor after an event (Ref. 4.20-1). This equation was developed per NUREG/BR-0184 for discount rates between 5 percent and 10 percent only.

The sensitivity analysis considers the use of a 3 percent discount rate. For discount rates between 1 percent and 5 percent, Ref. 4.20-1 indicates that a linear interpolation is appropriate between present values of $\$1.2 \times 10^9$ at 5 percent and $\$1.6 \times 10^9$ at 1 percent. So for discount rates in this range, the following equation was used to perform this linear interpolation.

$$PV_{RP} = (\$1.6E+9) - \left(\frac{[(\$1.6E+9) - (\$1.2E+9)]}{[5\% - 1\%]} * [r_s - 1\%]\right)$$

[2] The section number for Section 5.6.7.2 apparently contains a typographical error. This section is a subsection of 5.7.6 and follows 5.7.6.1. However, the section number as it appears in the NUREG will be used in this document.

where:

r_s = discount rate (small), between 1 percent and 5 percent

To account for the entire lifetime of the facility, U_{RP} was then calculated from PV_{RP}, as follows:

$$U_{RP} = \frac{PV_{RP}}{r}\left(1 - e^{-rt_f}\right)^2$$

where:

U_{RP} = present value of the cost of replacement power over the life of the facility

Again, this equation is only applicable in the range of discount rates from 5 percent to 10 percent. NUREG/BR-0184 states that for lower discount rates, linear interpolations for U_{RP} are recommended between $\$1.9 \times 10^{10}$ at 1 percent and $\$1.2 \times 10^{10}$ at 5 percent. Therefore, for the sensitivity analysis, which considers a 3 percent discount rate, the following equation was used to perform this linear interpolation:

$$U_{RP} = (\$1.9E+10) - \left(\frac{[(\$1.9E+10) - (\$1.2E+10)]}{[5\% - 1\%]} * [r_s - 1\%]\right)$$

where:

r_s = discount rate (small), between 1 percent and 5 percent

Based upon the values previously assumed,

$$U_{RP} = \$7.89E+9$$

Repair and Refurbishment

FPL has no plans for repair/refurbishment following a severe accident; therefore, there is no contribution to averted onsite costs from this source.

Total Onsite Economic Costs

The total averted onsite economic cost is, therefore:

$$AOSC = F * (U_{CD} + U_{RP})$$

where:

AOSC = averted onsite economic cost
F = annual frequency of the event

The core damage frequency for the base case is 1.62×10^{-5}/year; therefore,

$$AOSC = \$321,407$$

4.20.3 SAMA IDENTIFICATION AND SCREENING

The NRC and the nuclear industry have documented analyses of methods to mitigate severe accident impacts for existing and new plant designs and for in-system evaluations. Appendix F.2 lists documents from which FPL has gathered descriptions of candidate SAMAs. In addition, FPL considered the insights into possible plant-specific improvements gained through the preparation of the IPE (Ref. 4.20-2). Table F.2-1, in Appendix F.2, lists the 169 candidate SAMAs that FPL identified for analysis and identifies the sources of the information. The first step in the analysis is to eliminate non-viable SAMAs through preliminary screening.

4.20.3.1 Preliminary Screening

The purpose of the preliminary SAMA screening is to eliminate from further consideration enhancements that are obviously not viable for implementation at Turkey Point Units 3 & 4. Screening criteria include:

- Criterion "A" - Enhancements not applicable to Turkey Point Units 3 & 4 (e.g., applicable only to boiling water reactors); and

- Criterion "B" - Enhancements already implemented at Turkey Point Units 3 & 4 (e.g., add a switchgear room high-temperature alarm).

Table F.2-1 of Appendix F.2 provides a brief discussion of each candidate SAMA and its disposition, whether eliminated from further consideration as not applicable, as already implemented, or designated for further analysis. Based on this preliminary screening, 93 candidate SAMAs were eliminated, and 76 of the original SAMAs were designated for further analysis.

4.20.3.2 Final Screening/Cost-Benefit Analysis

FPL estimates the costs of implementing each SAMA through the application of engineering judgment, estimates from other licensee's submittals, and site-specific cost estimates (if necessary). Evaluation is based on a single unit implementation basis. The cost estimates do not include the cost of replacement power during extended outages required to implement the modifications, nor do they include contingency costs associated with unforeseen implementation obstacles. Estimates based on modifications that were implemented or estimated in the past are presented in terms of dollar values at the time of implementation (or estimation), and are not adjusted to present-day dollars.

In the performance of the cost-benefit analyses two basic values were assumed, the minimum cost of a procedure change and the minimum cost of a hardware change. The minimum cost associated with implementation of a procedure change was assumed to be $30,000, and the minimum cost associated with development and implementation of an integrated hardware modification package (including post-implementation costs, e.g., training) was assumed to be $70,000.

Screening based on level of benefit achieved is carried out in two steps. The first step involves calculating the maximum benefit that could possibly be provided by any one SAMA or combination of SAMAs. This maximum theoretical benefit is based upon the elimination of all plant risk and equates to the previously calculated base case risk. As shown in Table 4.20-1, the monetized value of this risk is approximately $801,546. Therefore, any SAMA having an estimated single-unit cost of implementation exceeding this value is not considered cost-beneficial and is screened from further consideration.

The next step involves performing a benefits analysis on the remaining SAMAs (Section 4.20.2 discusses benefit calculations in more detail). The methodology for determining whether a SAMA is beneficial consists of determining whether the benefit provided by implementation of the SAMA exceeds the expected cost of implementation. Since the plant does not have an external events PSA model, the expected cost of each unscreened SAMA is compared with twice the calculated

benefit of that SAMA[3]. Where the benefits of the SAMAs are small, engineering judgement is used as the basis for costs. The benefit is defined as the sum of the dollar equivalents for each severe accident impact (offsite exposure, offsite economic costs, occupational exposure, and onsite economic costs). In general, if the expected cost exceeds twice the calculated benefit, the SAMA is considered not to be cost-beneficial.

The result of implementation of each SAMA would be a change in the plant's severe accident risk (i.e., a change in frequency or consequence of severe accidents). The methodology for calculating the magnitude of these changes is straightforward. First, the severe accident risk after implementation of each SAMA is calculated using the same methodology as for the base case. A spreadsheet is used to combine the results of the Level 2 model with the Level 3 model to calculate these post-SAMA risks. The results of the benefit analyses for each of the SAMAs are presented in Table 4.20-2.

Each SAMA evaluation is performed in a bounding fashion. Bounding evaluations are performed to address the generic nature of the initial SAMA concepts. Such bounding calculations overestimate the benefit, and thus are conservative calculations. For example, one SAMA deals with installing digital large break loss-of-coolant accident (LOCA) protection; the bounding calculation to estimate the

[3] A review of the Individual Plant Examination for External Events (IPEEE) analysis relative to potential SAMAs indicates that only internal fire events may have some functional impact on certain SAMAs. Specifically, if a fire erupts in a zone where SAMA-related equipment is located, or a SAMA-related human action must be performed, then fire-induced damage to the equipment or failure of human action due to the fire may affect the total SAMA benefit.
There are three factors that affect the fire contribution to total CDF: fire frequency for a given fire zone, conditional probability that a fire will result in equipment damage, and availability of the alternate or protected shutdown train. The IPEEE concluded that no Unit 3 or 4 fire zones are significant risk contributors that would result in failure to achieve a safe shutdown condition.
In addition, no SAMA was found to specifically provide redundancy to plant safe shutdown capabilities in order to reduce the external event (i.e., fire) contribution. Based on this review, no SAMAs were identified to be especially beneficial for reducing external event contributions.
Finally, the total contribution of external events is estimated to be 4×10^{-5} per year. In the original IPE, the internal events core damage frequency was 1×10^{-4} per year, making the external events contribution to the total CDF approximately 30 percent. The external events analysis is not maintained as a living model, while the internal events model is, with the current CDF 6.12×10^{-5} per year. It is expected that the external events contribution to CDF would also be reduced by the features that reduced the CDF due to internal events, so the approximation of doubling the internal events CDF to represent the total (internal and external events) CDF appears reasonable.

benefit of this improvement is total elimination of large breaks. Such a calculation obviously overestimates the benefit, but if the inflated benefit indicates that the SAMA is not cost-beneficial, then the purpose of the analysis is satisfied.

Two types of evaluations are used in determining the benefit of the SAMAs, model requantification and importance measure analysis. Some of the SAMAs involve modification of system models; these SAMAs are evaluated by making relatively simple, bounding changes to one or more system models and requantifying the full model. This results in a new set of plant damage state frequencies that are analyzed to determine the impact on public risk. An example of such an evaluation is the estimation of the benefit of less dependence on Auxiliary Building Ventilation. This SAMA is evaluated in a bounding manner by modifying the fault trees such that the Emergency Core Cooling System (ECCS) pumps are not dependent on any Auxiliary Building Ventilation; this results in an upper limit on the improvement that is possible through more reliable ventilation.

Other SAMAs are more quickly evaluated simply by examining (through importance measures) the contribution of specific components or human actions to the core damage frequency. For example, the SAMA associated with use of fuel cells instead of lead-acid batteries is examined in this manner. Failure to recover offsite power prior to battery failure was examined to estimate the impact of extending the duration of direct current (DC) power availability; this failure was found to contribute essentially nothing (approximately 0 percent) to core damage frequency. Thus, the benefit is estimated to be negligibly small from extending DC life through use of fuel cells. For the cases in which the impact on risk is estimated through use of component or human action contribution to core damage frequency (CDF), it is assumed that the benefit is approximately proportional to the reduction in CDF.

As described above for the base case, values for avoided public and occupational health risk are converted to a monetary equivalent (dollars) via application of the NRC's conversion factor of $2,000 per person-rem (Ref. 4.20-1) and discounted to present value. Values for avoided offsite economic costs are also discounted to present value. The formula for calculating net value for each SAMA is as follows:

$$\text{Net value} = (\$APE + \$AOC + \$AOE + \$AOSC) - COE$$

where:

$APE = monetized value of averted public exposure ($)
$AOC = monetized value of averted offsite costs ($)
$AOE = monetized value of averted occupational exposure ($)
$AOSC = monetized value of averted onsite costs ($)
COE = cost of enhancement ($)

If the net value of a SAMA is negative, the cost of the enhancement is greater than the benefit and the SAMA is not cost beneficial. The expected cost of each SAMA (COE) was determined by either utilizing applicable cost estimates published in NRC submittals from other licensees or by expert judgement by knowledgeable plant staff. The first step in the process is to review previous licensee SAMDA submittals [e.g., the Watts Bar Nuclear Plant SAMDA evaluation (Ref. 4.20-4)]. If these previous submittals contain costs for a specific SAMDA, the SAMDA description is reviewed to determine if the cost estimate can reasonably be applied to Turkey Point Units 3 & 4, based on the plant design and licensing bases and knowledge of implementing plant modifications. If the previous licensee submittals do not contain cost estimates or if these cost estimates cannot be applied, an expert panel reviews the benefit to determine whether the SAMA can be implemented for a cost equivalent to twice the benefit.

The cost-benefit comparison and disposition of each remaining SAMA are presented in Table 4.20-2.

4.20.4 SENSITIVITY ANALYSIS

NUREG/BR-0184 recommends using a 7 percent real (i.e., inflation-adjusted) discount rate for value-impact analysis and notes that a 3 percent discount rate should be used for sensitivity analysis to indicate the sensitivity of the results to the choice of discount rate. This reduced discount rate takes into account the additional uncertainties (i.e., interest rate fluctuations) in predicting costs for activities that would take place several years in the future. Analyses presented in Section 4.20.3 use the 7 percent discount rate in calculating benefits of all the unscreened SAMAs. FPL also performs a sensitivity analysis by substituting the lower discount rate and recalculating the benefit of the candidate SAMAs. Reducing the discount rate increases the benefit of potential SAMAs but does not change any decision concerning whether they are cost beneficial.

4.20.5 RESULTS

FPL analyzed 169 conceptual alternatives for mitigating severe accident impacts. Preliminary screening eliminated 93 SAMAs from further consideration, based on inapplicability to the plant design or features already incorporated into the current design and/or procedures and programs. During the final disposition, the 76 remaining SAMA candidates were eliminated because the cost is expected to exceed twice their benefit or because of disproportionately high implementation costs.

Using the 7 percent real discount rate recommended by NUREG/BR-0184, 76 SAMA candidates for which the evaluation has been completed were determined not to be cost-beneficial. With a 3 percent discount rate, as used in the sensitivity analysis, the magnitude of the benefit changes, but again no SAMA candidates were determined to be cost-beneficial.

In summary, based on the results of this SAMA analysis, FPL found no SAMAs that were cost-beneficial associated with license renewal.

TABLE 4.20-2
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
7	Increase charging pump lube oil capacity.	3	5	< $31K	> 2 x Benefit	Screen out	Charging pumps have connection for cooling by service water (SW); unavailability is dominated by pump failures. Analysis case SEALCSF determined the benefit from eliminating all contribution from reactor coolant pump (RCP) seal LOCAs to be < $31K. In order to implement this alternative, plant hardware modifications would be needed. The cost of this would be greater than the benefit obtained.
8	Eliminate RCP thermal barrier dependence on Component Cooling Water (CCW), such that loss of CCW does not result directly in core damage.	3	5	< $31K	> 2 x Benefit	Screen out	Charging pumps have connection for cooling by SW; unavailability is dominated by pump failures. Analysis case SEALCSF determined the benefit from eliminating all contribution from RCP seal LOCAs to be < $31K. In order to implement this alternative, plant hardware modifications would be needed. The cost of this would be greater than the benefit obtained.
9	Provide additional SW pump.	3	5	< $31K	> 2 x Benefit	Screen out	CCW cooled by Intermediate Cooling Water; can cross-tie to opposite unit CCW if Intermediate Cooling Water is lost. Analysis case SEALCSF determined the benefit from eliminating all contribution from RCP seal LOCAs to be < $31K. In order to implement this alternative, additional hardware would need to be installed (plant modification). The cost of this would be greater than the benefit obtained.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
10	Create an independent RCP seal injection system, with dedicated diesel.	3	5	< $31K	> 2 x Benefit	Screen out	Analysis case SEALCSF determined the benefit from eliminating all contribution from RCP seal LOCAs to be < $31K. In order to implement this alternative, additional hardware would need to be installed (plant modification). The cost of this would be greater than the benefit obtained.
11	Create an independent RCP seal injection system, without dedicated diesel.	3	5	< $31K	> 2 x Benefit	Screen out	Analysis case SEALCSF determined the benefit from eliminating all contribution from RCP seal LOCAs to be < $31K. In order to implement this alternative, additional hardware would need to be installed (plant modification). The cost of this would be greater than the benefit obtained.
12	Use existing hydro test pump for RCP seal injection.	3	5	< $31K	> 2 x Benefit	Screen out	Analysis case SEALCSF determined the benefit from eliminating all contribution from RCP seal LOCAs to be < $31K. In order to implement this alternative, plant hardware modifications would be needed to allow timely connection of the hydro pump for seal injection. The cost of this would be greater than the benefit obtained.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
13	Replace ECCS pump motors with air-cooled motors.	3	5	< $31K	> 2 x Benefit	Screen out	Analysis case SEALCSF determined the benefit from eliminating all contribution from RCP seal LOCAs to be < $31K. In order to implement this alternative, plant hardware modifications would be needed to allow timely connection of the hydro pump for seal injection. The cost of this would be greater than the benefit obtained.
15	Add a third CCW pump.	3	5	< $31K	> 2 x Benefit	Screen out	Analysis case SEALCSF determined the benefit from eliminating all contribution from RCP seal LOCAs to be < $31K. In order to implement this alternative, additional hardware would need to be installed (plant modification). The cost of this would be greater than the benefit obtained.
16	Prevent charging pump flow diversion from the relief valves.	3	5	< $31K	> 2 x Benefit	Screen out	Analysis case SEALCSF determined the benefit from eliminating all contribution from RCP seal LOCAs to be < $31K. The actual benefit would be much less, since the failure rate for relief valve premature opening is only 0.000004/hour (IEEE Std 500). In order to implement this alternative, plant hardware modifications would be needed to direct relief valve flow back to the system. The cost of this would be greater than the benefit obtained.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
25	Develop procedures for temporary HVAC.	0	0	<$15.3K	>2 x Benefit	Screen out	Proc 0-ONOP-025.3 describes using portable fans and blocking doors open for DC Equipment Room. RAB ventilation not expected to be required except for residual hear removal (RHR) rooms. Per Ref. 4.20-4, the RHR pumps must have room cooling when pumping hot water (as opposed to pumping Refueling Water Storage Tank water); the RHR pumps would survive without HVAC if temporary measures are taken within 1/2 hour of commencing to pump hot water. Opening the doors to the rooms would provide adequate room cooling. Analysis case RABCSF determined the benefit from eliminating all contribution from failure of RAB ventilation to be <$15.3K. However, another analysis was run using a more realistic Level 3 model [RABCSF(L3)] and the resulting benefit was <$10.7K; therefore, this SAMA will screen out. In order to implement this alternative, plant procedure modifications would be needed. The cost of this would be greater than the benefit obtained.
31	Develop an enhanced drywell spray system.	12	26	<$177K	>2 x Benefit	Screen out	Analysis case SGCRVLP2 determined the benefit from eliminating all contribution from containment spray failure to be less than $177K. In order to implement this alternative, substantial plant hardware modifications would be needed. The cost of this would be greater than the benefit obtained.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
32	Provide a dedicated existing drywell spray system.	12	26	<$177K	>2 x Benefit	Screen out	Analysis case SGCRVLP2 determined the benefit from eliminating all contribution from containment spray failure to be less than $162K. In order to implement this alternative, substantial plant hardware modifications would be needed. The cost of this would be greater than the benefit obtained.
33	Install a containment vent large enough to remove ATWS decay heat.	Note 1	Note 1	<$802K [maximum attainable benefit (MAB)]	>2 x Benefit	Screen out	Turkey Point Units 3 & 4 containment design has 2-inch Instrument Air bleed line; purge valve to vent for small venting demand should be very costly (unfiltered version of SAMA Number 34) The costs associated with the plant modifications required to implement this alternative are greater than the benefit. Screened out due to expected high cost.
34	Install a filtered containment vent to remove decay heat.	Note 1	Note 1	<$802K (MAB)	Industry estimate $20M	Screen out	TVA estimate $20M (Ref. 4.20-4); expected to well exceed MAB. The costs associated with the plant modifications required to implement this alternative are greater than the benefit. Screened out due to expected high cost.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
35	Install an unfiltered hardened containment vent.	Note 1	Note 1	< $802K (MAB)	Industry estimate $20M	Screen out	TVA estimate $20M (Ref. 4.20-4); expected to well exceed MAB. The costs associated with the plant modifications required to implement this alternative are greater than the benefit. Screened out due to expected high cost.
38	Create a giant concrete crucible with heat removal potential under the basemat to contain molten debris.	Note 1	Note 1	< $802K (MAB)	Industry estimate $108M	Screen out	For an existing plant, design and installation of this SAMA are not considered feasible. The costs associated with the plant modifications required to implement this alternative are greater than the benefit. S80 estimate $108M (Ref. 4.20-5); expected to well exceed MAB.
39	Create a water-cooled rubble bed on the pedestal.	Note 1	Note 1	< $802K (MAB)	Industry estimate $18M	Screen out	For an existing plant, design and installation of this SAMA are not considered feasible. The costs associated with the plant modifications required to implement this alternative are greater than the benefit. S80 estimate $18M (Ref. 4.20-5); expected to well exceed MAB.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
46	Provide containment inerting capability.	Note 1	Note 1	< $802K (MAB)	Industry estimate $10.9M	Screen out	Turkey Point Units 3 & 4 do not have hydrogen recombiners (operation of ECCS also mitigates hydrogen levels); but have provisions to obtain within 7 days post accident (including needed penetrations). Hydrogen concentration or pockets are not likely based on IPE insights. TVA estimate $10.9M (Ref. 4.20-4); cost expected to well exceed MAB. The costs associated with the plant modifications required to implement this alternative are greater than the benefit.
47	Use fire water spray pump for containment spray.	5	7	< $49K	> 2 x Benefit	Screen out	The RHR pumps can back up the spray pumps when alternating current (AC) is available, thus the primary benefit for Feedwater (FW) backup would be during Station Blackout (SBO). Analysis case No LOG determined the benefit of eliminating all Loss of Grid events. Based on this analysis, the maximum benefit to be obtained from use of firewater spray during blackout is less than $49K. The costs associated with the plant modifications required to implement this alternative are greater than the benefit.
48	Install a passive containment spray system.	12	26	< $177K	> 2 x Benefit	Screen out	Analysis case SGCRVLP2 determined the benefit from eliminating all contribution from containment spray failure to be less than $177K. In order to implement this alternative, substantial plant hardware modifications would be needed. The cost of this would be greater than the benefit obtained.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
50	Increase containment design pressure.	Note 1	Note 1	< $481K	> 2 x Benefit	Screen out	If containment failure were eliminated, maximum benefit would be elimination of all offsite dose/loss. Benefit is < $481K. Cost would be expected to be > 2 x benefit.
53	Create another building, maintained at a vacuum, to be connected to Containment.	Note 1	Note 1	< $802K (MAB)	Industry estimate > $10M	Screen out	For an existing plant, design and installation of this SAMA are not considered feasible. Industry cost estimate > $10M (Ref. 4.20-6); expected to well exceed MAB.
54	Add ribbing to the containment shell.	Note 1	Note 1	< $481K	> 2 x Benefit	Screen out	For an existing plant, design and installation of this SAMA are not considered feasible (also Turkey Point Units 3 & 4 do not have steel containments). Very costly, extensive reconstruction of Containment; expected to well exceed MAB.
57	Provide an additional diesel generator.	8	10	< $72K	> 2 x Benefit Industry estimate $431K (Ref. 4.20-5) to $25M (Ref. 4.20-6)	Screen out	Analysis case EDG5 determined the maximum benefit from installation of another diesel generator to be < $72K. The cost of installation of another diesel generator is expected to greatly exceed twice this expected benefit.
59	Use fuel cells instead of lead-acid batteries.	0	Note 2	~ $0	> 2 x Benefit	Screen out	Event U3BATDEP for operator failure to recover offsite power prior to battery depletion has CDF Risk Reduction Worth (RRW) = 1. Indicates battery depletion not a large contributor. Based on this contribution to CDF, the maximum benefit to be obtained from fuel cells is nearly zero.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
67	Develop procedures to repair or change out failed 4kV breakers.	0	Note 2	~$0	>2 x Benefit	Screen out	The Turkey Point Units 3 & 4 PRA indicates that 4kV breaker failure has minimal contribution to CDF (RRW = 1). Based on this contribution to CDF, the maximum benefit to be obtained from procedures to change out or repair breakers is nearly zero.
71	Install gas turbine generators.	5	7	<$49K	Industry estimate $10M (Ref. 4.20-6)	Screen out	Analysis case No LOG determined the benefit of eliminating all Loss of Grid events. Based on this analysis, the maximum benefit to be obtained from a gas turbine generator is less than $49K. The costs associated with the plant modifications required to implement this alternative are greater than the benefit.
75	Provide a connection to alternate offsite power source.	5	7	<$49K	>2 x Benefit (assuming distance >2 miles) Industry estimate $1M/mile	Screen out	Analysis case No LOG determined the benefit of eliminating all Loss of Grid events. Based on this analysis, the maximum benefit to be obtained from an additional offsite power source connection is less than $49K. In 1994 at CCNPP, BGE installed a 500kV line at a cost of $1M/mile. This would exceed FPL benefit.
76	Implement underground offsite power lines.	5	7	<$49K	>2 x Benefit	Screen out	Analysis case No LOG determined the benefit of eliminating all Loss of Grid events. Based on this analysis, the maximum benefit to be obtained from underground offsite power lines is less than $49K. The distance that would be necessary to bury cabling would be significant given that the severe weather to which the plant is susceptible (primarily hurricanes) typically affects a broad area.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
79	Install a redundant spray system to depressurize the primary system during a Steam Generator Tube Rupture (SGTR).	0	0	< $1K	> 2 x Benefit	Screen out	Analysis case NO-SGTR determined the benefit from eliminating all contribution from SGTR to be < $1K. In order to implement this alternative, additional hardware would need to be installed (plant modification) and procedure modifications written to provide additional direction.
80	Improve SGTR coping abilities.	0	0	< $1K	> 2 x Benefit	Screen out	Analysis case NO-SGTR determined the benefit from eliminating all contribution from SGTR to be < $1K. In order to implement this alternative, additional hardware would need to be installed (plant modification) and procedure modifications written to provide additional direction.
81	Add other SGTR coping features.	0	0	< $1K	> 2 x Benefit	Screen out	Per System 80+ (Ref. 4.20-5), relief valve return to Containment requires major redesign. Increasing secondary pressure capacity requires new secondary system. Analysis case NO-SGTR determined the benefit from eliminating all contribution from SGTR to be < $1K. In order to implement this alternative, additional hardware would need to be installed (plant modification) and procedure modifications written to provide additional direction.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
82	Increase secondary-side pressure capacity such that a SGTR would not cause the relief valves to lift.	0	0	< $1K	> 2 x Benefit	Screen out	Per System 80+ (Ref. 4.20-5), relief valve return to Containment requires major redesign. Increasing secondary pressure capacity requires new secondary system. Analysis case NO-SGTR determined the benefit from eliminating all contribution from SGTR to be < $1K. In order to implement this alternative, additional hardware would need to be installed (plant modification) and procedure modifications written to provide additional direction.
83	Replace steam generators with new design.	0	0	< $1K	> 2 x Benefit	Screen out	Original Turkey Point Units 3 & 4 steam generators replaced with newer design. Analysis case NO-SGTR determined the benefit from eliminating all contribution from SGTR to be < $1K. In order to implement this alternative, additional hardware would need to be installed (plant modification) and procedure modifications written to provide additional direction.
84	Direct steam generator flooding after a SGTR, prior to core damage.	0	0	< $1K	> 2 x Benefit	Screen out	Analysis case NO-SGTR determined the benefit from eliminating all contribution from SGTR to be < $1K. In order to implement this alternative, additional hardware would need to be installed (plant modification) and procedure modifications written to provide additional direction.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
85	Implement a maintenance practice that inspects 100 percent of the tubes in a steam generator.	0	0	< $1K	> 2 x Benefit	Screen out	Analysis case NO-SGTR determined the benefit from eliminating all contribution from SGTR to be < $1K. In order to implement this alternative, additional hardware would need to be installed (plant modification) and procedure modifications written to provide additional direction.
87	Locate RHR inside Containment.	Note 1	Note 1	< $802K (MAB)	> 2 x Benefit	Screen out	For an existing plant, relocating the RHR inside the Containment is not feasible, as it would require an entirely new RHR system.
88	Self-actuating containment isolation valves.	0	0	< $1K	> 2 x Benefit	Screen out	Except for 4 valves, Turkey Point Units 3 & 4 containment isolation valves fail safe on loss of electric/air, and require only ESFAS CI signal. Analysis case CI-OK determined the benefit from eliminating all contribution from early Containment failure (including containment isolation failure) to be < $1K. In order to implement this alternative, additional hardware would need to be installed (plant modification).
89	Install additional instrumentation for Interfacing System Loss-of-Coolant Accident (ISLOCA) sequences.	0	3	< $16K	> 2 x Benefit	Screen out	Analysis case NO-ISLOCA determined the benefit from eliminating all contribution from ISLOCA to be < $16K. In order to implement this alternative, additional hardware would need to be installed (plant modification) and procedure modifications written to provide additional direction.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
90	Increase frequency of valve leak testing.	0	3	< $16K	> 2 x Benefit	Screen out	Analysis case NO-ISLOCA determined the benefit from eliminating all contribution from ISLOCA to be < $16K. In order to implement this alternative, additional hardware would need to be installed (plant modification) and procedure modifications written to provide additional direction.
91	Improve operator training on ISLOCA coping.	0	3	< $16K	> 2 x Benefit	Screen out	Analysis case NO-ISLOCA determined the benefit from eliminating all contribution from ISLOCA to be < $16K. In order to implement this alternative, additional hardware would need to be installed (plant modification) and procedure modifications written to provide additional direction.
92	Install relief valves in the Component Cooling Water System.	0	3	< $16K	> 2 x Benefit	Screen out	This mechanism not identified as a contributor to ISLOCA at Turkey Point Units 3 & 4. Even so, case NO-ISLOCA determined the benefit from eliminating all contribution from ISLOCA to be < $16K. In order to implement this alternative, additional hardware would need to be installed (plant modification).
95	Ensure all ISLOCA releases are scrubbed.	0	3	< $16K	> 2 x Benefit	Screen out	Analysis case NO-ISLOCA determined the benefit from eliminating all contribution from ISLOCA to be < $16K. In order to implement this alternative, additional hardware would need to be installed (plant modification) and procedure modifications written to provide additional direction.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
96	Add redundant and diverse limit switch to each containment isolation valve.	0	3	<$17K	>2 x Benefit	Screen out	Analysis case NO-ISLOCA determined the benefit from eliminating all contribution from ISLOCA to be <$16K. Analysis case CI-OK determined the benefit from eliminating all contribution from early Containment failure (including containment isolation failure) to be <$1K. In order to implement this alternative, additional hardware would need to be installed (plant modification).
97	Modify swing direction of doors separating Turbine Building basement from areas containing safeguards equipment.	0	Note 2	~$0	>2 x Benefit	Screen out	This SAMA is clearly not applicable to Turkey Point Units 3 & 4 Turbine Building designs. The IPE indicates, for the two internal flooding scenarios that were considered credible by the analysis, both have CDFs of <0.0000005; improvement would yield no measurable benefit.
98	Improve inspection of rubber expansion joints on main condenser.	0	Note 2	~$0	>2 x Benefit	Screen out	Benefit would be very small since there were no significant internal flooding issues in the IPE analysis of internal flooding. The IPE indicates that the CDF for this event is <0.0000005; improvement would yield no measurable benefit.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
99	Deploy internal flood prevention and mitigation enhancements.	0	Note 2	~$0	>2 x Benefit	Screen out	Benefit would be very small since there were no significant internal flooding issues in the IPE analysis of internal flooding. The IPE indicates, for the two internal flooding scenarios that were considered credible by the analysis, both have CDFs of <0.0000005; improvement would yield no measurable benefit.
101	Implement digital feedwater upgrade.	9	Note 2	<$68.2K	~$580K	Screen out	The Turkey Point Units 3 & 4 PRA indicates that loss of feedwater events have an 8.5 percent contribution to CDF. Based on this contribution to CDF, the maximum benefit to be obtained from a digital feedwater upgrade is less than $68.2K.
111	Use firewater as a backup for steam generator inventory.	1	Note 2	<$8.1K	>2 x Benefit	Screen out	Turkey Point Units 3 & 4 have many sources of secondary makeup including a diesel-driven standby steam generator feed pump. The Turkey Point Units 3 & 4 PRA indicates that this pump has less than a 1 percent contribution to CDF (RRW = 1.009). The benefit of another diesel-driven source would be less than the value of the first. Based on this contribution to CDF, the maximum benefit to be obtained from use of firewater as a backup source is less than $8.1K.
115	Create passive secondary-side coolers.	Note 1	Note 1	<$802K (MAB)	>2 x Benefit	Screen out	For an existing plant, design and installation of this SAMA are not considered feasible, as it would involve major changes in plant structures.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
116	Provide capability for diesel-driven, low-pressure vessel makeup.	NA	NA	NA	NA	Screen out	Unborated water for safety injection implies applicability to boiling water reactor (BWR), not pressurized water reactor (PWR). Diesel-driven high head safety injection (HHSI) is evaluated separately for SAMA Numbers 117, 118, and 124.
117	Provide an additional high-pressure injection pump with independent diesel.	21	15	<$131K	>2 x Benefit	Screen out	Analysis case HHDDPCSF determined the benefit from addition of a diesel-driven HHSI pump and elimination of HHSI common-cause failure to be less than $131K. In order to implement this alternative, plant hardware modifications would be needed. See also SAMA Numbers 118, 124.
118	Install independent AC high-pressure injection system.	21	15	<$131K	>2 x Benefit	Screen out	Analysis case HHDDPCSF determined the benefit from addition of a diesel-driven HHSI pump and elimination of HHSI common-cause failure to be less than $131K. In order to implement this alternative, plant hardware modifications would be needed. See also SAMA Numbers 117, 124.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
121	Stop low-pressure injection pumps earlier in medium or large LOCAs.	11	6	< $67K	> 2 x Benefit	Screen out	Analysis case OPERCSF determined the benefit from stopping the low-head safety injection pumps earlier to be less than $67K. In order to implement this alternative, procedure modifications would be needed. The cost of this may be less than the total benefit obtained. However, there is a risk trade-off made when changing the time at which to stop the pumps. Stopping the pumps earlier in the sequence would introduce a risk due to error of commission (stopping pump too soon). Because the current procedures for recirculation swapover are reasonable and operators are well-trained, this potential risk trade-off is considered to be greater than any benefit that may be gained.
123	Upgrade Chemical and Volume Control System to mitigate small LOCAs.	1	Note 2	< $8.1K	> 2 x Benefit	Screen out	The Turkey Point Units 3 & 4 PRA indicates that HHSI pump independent failure has less than a 1 percent contribution to CDF (RRW = 1.008). Based on this contribution to CDF, the maximum benefit to be obtained from use of the Chemical and Volume Control System to mitigate small LOCAs is less than $8.1K.
124	Install an active high-pressure safety injection system.	21	15	< $131K	> 2 x Benefit	Screen out	Although there is already an active safety injection system, system analysis case HHDDPCSF was used to consider additional redundancy by determining the benefit from the addition of a diesel-driven HHSI pump and elimination of HHSI common-cause failure to be less than $131K. In order to implement this alternative, plant hardware modifications would be needed. See also SAMA Numbers 117, 118.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
126	Replace two of the four safety injection pumps with diesel pumps.	21	15	<$131K	>$890K (Ref. 4.20-4)	Screen out	Analysis case HHDDPCSF determined the benefit from addition of a diesel-driven HHSI pump and elimination of HHSI common-cause failure to be less than $131K. In order to implement this alternative, plant hardware modifications would be needed.
129	Improve the reliability of the Automatic Depressurization System.	2	Note 2	<$16.4K	>2 x Benefit	Screen out	The Turkey Point Units 3 & 4 PRA indicates that power operated relief valve (PORV) failure-to-open events have less than a 2 percent contribution to CDF. Based on this contribution to CDF, the maximum benefit to be obtained from a digital feedwater upgrade is less than $16.4K.
131	Create automatic swapover to recirculation on Refueling Water Storage Tank depletion.	10	5	<$56K	~$450K (Ref. 4.20-4)	Screen out	Analysis case OperCSI estimated the benefit of an automatic swapover system to be <$56K.
134	Install nitrogen bottles as backup gas supply for safety relief valves.	2	Note 2	<$13K	>2 x Benefit	Screen out	The Turkey Point Units 3 & 4 PRA indicates that loss of all instrument air and compressor failures have less than a 2 percent total contribution to CDF (RRW=1.016). Based on this contribution to CDF, the maximum benefit to be obtained from nitrogen bottles is less than $13K.
135	Install motor generator set trip breakers in Control Room.	1	Note 2	<$4.1K	>2 x Benefit	Screen out	The Turkey Point Units 3 & 4 PRA indicates failure to manually trip the breakers has less than a 1 percent contribution to CDF (X3OPKMT RRW=1.005). Based on this contribution to CDF, the maximum benefit to be obtained from relocating the motor generator set trip breakers is less than $4.1K. In addition, Turkey Point Units 3 & 4 have capability to remove power from control rods.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
140	Install a system of relief valves that prevents any equipment damage from a pressure spike during an ATWS.	2	Note 2	< $4.1K	> 2 x Benefit	Screen out	For moderator temperature coefficient (MTC) > -7 pcm/degree F, pressure relief is not possible and would exceed Stress Level C (Ref. 4.20-2, Section 1.0, pg. 125 & 146); so this SAMA would have no effect. For MTC > -20 percent milli (pcm)/degree F pressure relief is needed and provided by 3 SRVs or 2 SRVs + 2 PORVs (Ref. 4.20-2, pg. 125 & 146). The Turkey Point Units 3 & 4 PRA indicates unfavorable MTC and Safety Relief Valve/PORV failures have less than a 3 percent contribution to CDF (event ZZMTCUNFAV RRW = 1.001, SRV RRW = 1.0, PORV fail to open RRW = 1.01 each). Based on this contribution to CDF, the maximum benefit to be obtained from an ATWS pressure relief system is less than $4.1K.
144	Create/enhance Reactor Coolant System depressurization ability.	0	Note 2	~ $0	> 2 x Benefit	Screen out	The Turkey Point Units 3 & 4 PRA indicates depressurization failures have insignificant contribution to CDF (RRW = 1). Based on this contribution to CDF, the maximum benefit to be obtained enhancing depressurization capability is nearly zero.
146	Defeat 100 percent load rejection capability. INTERPRET AS "PROVIDE 100 percent..."	5	Note 2	$41K	> 2 x Benefit	Screen out	Automatic depressurization valves and condenser dump valves open on reactor trip. The Turkey Point Units 3 & 4 PRA indicates failure of secondary steam relief is assumed negligible (Ref. 4.20-2, pg. 96), and only T2 initiators (transient with PORV demand) are assumed to result in PORV demand (Ref. 4.20-2, pg. 91). T2 initiators and stuck open PORVs have approximately a 5 percent contribution to CDF. Based on this contribution to CDF, the maximum benefit to be obtained from 100 percent load rejection is less than $41K.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
148	Install secondary-side guard pipes up to the MSIVs.	0	Note 2	~$0	>2 x Benefit	Screen out	The Turkey Point Units 3 & 4 PRA indicates steam line break initiators (upstream or downstream of MSIVs) are insignificant to CDF (RRW = 1). Based on this contribution to CDF, the maximum benefit to be obtained from secondary-side guard pipes is nearly zero.
149	Install digital large break LOCA protection.	2	Note 2	<$16.2K	>2 x Benefit	Screen out	Turkey Point Units 3 & 4 installed a new Reactor Protective System, in 1992, that is partly computer based. The Turkey Point Units 3 & 4 PRA indicates large break LOCA has less than a 2 percent contribution to CDF. Based on this contribution to CDF, the maximum benefit to be obtained from digital large break LOCA protection is less than $16.2K.
151	Provide self-cooled ECCS seals.	0	Note 2	~$0	>2 x Benefit	Screen out	CCW is also required for pump motor cooling; thus, elimination of seal cooling would not prevent pump failure. Benefit is $0.
152	Separate non-vital buses from vital buses.	1	Note 2	<$4.1K	>2 x Benefit	Screen out	This SAMA would help prevent breaker failures associated with the 480V buses. The Turkey Point Units 3 & 4 PRA indicates 480V breaker failures have less than a 0.5 percent contribution to CDF. Based on this contribution to CDF, the maximum benefit to be obtained from separating vital and non-vital buses is less than $4.1K.
155	Provide a centrifugal charging pump.	3	Note 2	<$20.1K	>2 x Benefit	Screen out	The Turkey Point Units 3 & 4 PRA indicates charging pump failures have less than a 2.5 percent contribution to CDF. Based on this contribution to CDF, the maximum benefit to be obtained from a centrifugal charging pump is less than $20.1K.

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
156	Provide a motor operated auxiliary feedwater pump.	0	Note 2	~$0	>2 x Benefit	Screen out	Turkey Point Units 3 & 4 have many sources of secondary makeup including a motor-driven standby steam generator feed pump. The Turkey Point Units 3 & 4 PRA indicates that this pump has an insignificant contribution to CDF (RRW = 1). The benefit of another motor-driven source would be less than the value of the first. Based on this contribution to CDF, the maximum benefit to be obtained from a motor-driven auxiliary feedwater pump is nearly zero.
157	Provide containment isolation design per General Design Criteria and Standard Review Plan.	0	0	< $1K	>2 x Benefit	Screen out	Analysis case CI-OK determined the benefit from eliminating all contribution from early Containment failure (including containment isolation failure) to be < $1K. In order to implement this alternative, additional hardware would need to be installed (plant modification).
159	Provide Auxiliary Building vent/seal structure.	0	3	< $16K	>2 x Benefit	Screen out	The intent is to reduce leakage from the Auxiliary Building after an ISLOCA. Analysis case NO-ISLOCA determined the benefit from eliminating all contribution from ISLOCA to be < $16K. In order to implement this alternative, additional hardware would need to be installed (plant modification).
160	Add charcoal filters on Auxiliary Bldg. exhaust.	0	3	< $16K	>2 x Benefit	Screen out	Analysis case NO-ISLOCA determined the benefit from eliminating all contribution from ISLOCA to be < $16K. In order to implement this alternative, additional hardware would need to be installed (plant modification).

TABLE 4.20-2 (Cont'd)
DISPOSITION OF SAMAS RELATED TO TURKEY POINT

SAMA Number	Potential Improvement	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Basis for Conclusion
161	Add penetration valve leakage control system.	0	3	< $17K	> 2 x Benefit	Screen out	Analysis case CI-OK determined the benefit from eliminating all contribution from early Containment failure (including containment isolation failure) to be < $1K. Analysis case NO-ISLOCA determined the benefit from eliminating all contribution from ISLOCA to be < $16K. In order to implement this alternative, additional hardware would need to be installed (plant modification).
165	Man SSF continuously to align coolant makeup system for RCP seal cooling.	3	5	< $31K	> 2 x Benefit	Screen out	Analysis case SEALCSF determined the benefit from eliminating all contribution from RCP seal LOCAs to be < $31K. The Oconee SAMA evaluation estimated the cost of continuously manning the SSF to have a present value of $5 million; therefore, is expected to greatly exceed twice the benefit for Turkey Point Units 3 & 4.
167	Replace reactor vessel with stronger vessel.	Note 1	Note 1	< $802K (MAB)	> 2 x Benefit	Screen out	For an existing plant, design and installation of this SAMA is expected to greatly exceed 2MAB.

Note 1: Reduction in CDF was not estimated because the cost is expected to be much greater than the MAB and the item was screened.
Note 2: Reduction in CDF estimated as a percentage reduction, therefore, reduction in person-rem was not directly calculated.

4.21 ENVIRONMENTAL JUSTICE

NRC

"The need for and the content of an analysis of environmental justice will be addressed in plant-specific reviews." 10 CFR 51, Subpart A, Appendix B, Table B-1

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (Ref. 4.21-1), requires Executive agencies to identify and address, as appropriate, "disproportionately high and adverse human health or environmental effects," from their programs, policies, and activities on minority and low-income populations. The Presidential Memorandum that accompanied Executive Order 12898 emphasized the importance of using existing laws, including the National Environmental Policy Act (NEPA), to identify and address environmental justice concerns, "including human health, economic, and social effects, of Federal actions."

Although the NRC is not subject to Executive Order 12898, it has voluntarily committed to conducting environmental justice reviews of actions under its jurisdiction and has issued procedural guidance (Ref. 4.21-2, Attachment 4). The guidance does not provide a standard approach, or formula, for identifying and addressing environmental justice issues. Instead, it offers general principles for conducting an environmental justice analysis under NEPA. The NRC guidance makes clear that if no significant impacts are anticipated from the proposed action, then, "...no member of the public will be substantially affected," and, as a consequence, "...there can be no disproportionate high and adverse effects or impacts on any member of the public including minority or low-income populations."

FPL has reviewed and adopted by reference NRC findings for Category 1 issues that FPL determined are applicable to Turkey Point Units 3 & 4 (Section 4.0). The NRC had concluded that environmental impacts for each of these issues would be SMALL. FPL has addressed each Category 2 issue and has performed required analyses for those that FPL determined are applicable to Turkey Point Units 3 & 4 (Sections 4.1 through 4.20). For each applicable Category 2 issue, FPL has concluded that the environmental impacts would be SMALL. These include:

- Threatened or endangered species
- Electric shock from transmission-line-induced currents

- Housing, public water supply, offsite land use, and transportation
- Historic and archaeological resources

Based on the FPL review, Turkey Point Units 3 & 4 license renewal would result in no significant impact. No member of the public would be substantially affected and, as a consequence, there would be no disproportionately high and adverse impacts on any member of the public, including minority and low-income populations. In such instances, a qualitative review of potential environmental justice impacts is adequate and no mitigation measures need be described. Section 2.12 describes minority and low-income populations in the vicinity of Turkey Point Units 3 & 4.

4.22 REFERENCES

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Ref. 4.0-2 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437. Washington, D.C. May 1996.

Ref. 4.0-3 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants.* Section 6.3, "Transportation," and Table 9.1, "Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants." NUREG-1437, Vol. 1, Addendum 1. Washington, D.C. August 1999.

Ref. 4.12-1 Taylor, E. J., ed. *Dorland's Illustrated Medical Dictionary*. 27th Edition. W.B. Saunders Co., Philadelphia, Pa. 1985.

Ref. 4.12-2 Dupray, E., A. Derrien and R. Pichon. "Osmoregulation by Trehalose Synthesis in *Salmonella manhattan* after Exposure to Waste Waters." *Lett. Appl. Microbiol*. Vol. 20, No. 3, (1995): 148-51.

Ref. 4.12-3 Caro, A., P. Got, J. Lesne, S. Binard and B. Baleux. "Viability and Virulence of Experimentally Stressed Nonculturable Salmonella typhimurium." *Appl. Environ. Microbiol*. Vol. 65, No. 7 (1999): 3229-32.

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Ref. 4.12-7 Tyndall, R. L. (Oak Ridge National Laboratory). *Presence of Pathogenic Microorganisms In Power Plant Cooling Waters: Final Report*. NUREG/CR-3364 (ORNL/TM-8809). Oak Ridge, Tenn., 1 October 1981 to 30 June 1983.

Ref. 4.13-1 Institute of Electrical and Electronics Engineers, Inc. *National Electrical Safety Code, 1997 Edition*. New York, NY. 1996.

Ref. 4.13-2 Electric Power Research Institute. *Transmission Line Reference Book 345kV and Above*. 2nd Edition. Palo Alto, CA 1987.

Ref. 4.13-3 Florida Electric Power Coordinating Group (FCG). *EZEMF Computer Code*. (EZEMF was developed by EzWare in 1998. The formulas for the electric and magnetic effects were derived from the Corona and Field Effect Program (Version 3), CORONA3, written by Paul Kingery in June 1991. Previous versions of Bonneville Power Administration Corona and Field Effects Program were used as a guide. Bonneville Power Administration, US Department of Energy, is the source for the electric and magnetic calculations. The original version of the program was written for a CDC6600 by Vernon L. Chartier (with help from others). The first PC version (CORONAII) was written by Douglass Lewis in December 1984. A variety of changes were made to that program by Russell S. Senior for T. Dan Bracken, Inc.)

Ref. 4.15-1 Fetter, Jr., C. W. *Applied Hydrogeology*. Charles E. Merrill Publishing Co./Bell & Howell Co., Columbus, OH 1980.

Ref. 4.20-1 U.S. Nuclear Regulatory Commission. *Regulatory Analysis Technical Evaluation Handbook.* NUREG/BR-0184. Washington, D.C. January 1997.

Ref. 4.20-2 Florida Power & Light Company. *Turkey Point Units 3 & 4 Probabilistic Risk Assessment Individual Plant Examination; Final Report*. Florida City, Fla. June 1991.

Ref. 4.20-3 Nuclear Energy Institute. *Industry Guidelines for Preparing an Environmental Report Operating License Renewal Stage In Accordance With 10 CFR 51.53*. Washington, D.C. NEI 98-06, Rev. 0. July 1998.

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Ref. 4.20-5 CESSAR Design Certification. "Use of PRA in the Design Process." Appendix U, Section 19.15.5. December 31, 1993.

Ref. 4.20-6 Baltimore Gas and Electric Company. *Calvert Cliffs Nuclear Power Plant Units 1 and 2, License Renewal Application*. Vol. 3. Lusby, MD. April 1998.

Ref. 4.21-1 The President. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." *Federal Register*. Vol. 59, No. 32 (February 16, 1994).

Ref. 4.21-2 U.S. Nuclear Regulatory Commission Office of Nuclear Reactor Regulation. *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues*. Revision 2 Washington, D.C. 1999.

5.0 ASSESSMENT OF NEW AND SIGNIFICANT INFORMATION

5.1 DISCUSSION

NRC

"The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware." 10 CFR 51.53(c)(3)(iv)

The NRC licenses the operation of domestic nuclear power plants and provides for license renewal, requiring a license renewal application that includes an environmental report (10 CFR 54.23). NRC regulations, 10 CFR 51, prescribe the environmental report content and identify the specific analyses the applicant must perform. In an effort to perform the environmental review efficiently and effectively, the NRC has resolved most of the environmental issues generically, but requires an applicant's analysis of all the remaining issues.

While NRC regulations do not require an applicant's environmental report to contain analyses of the impacts of those environmental issues that have been generically resolved [10 CFR 51.53(c)(3)(i)], the regulations do require that an applicant identify any new and significant information of which the applicant is aware [10 CFR 51.53(c)(3)(iv)]. The purpose of this requirement is to alert the NRC staff to such information so that the staff can determine whether to seek the Commission's approval to waive or suspend application of the Rule with respect to the affected generic analysis. The NRC has explicitly indicated, however, that an applicant is not required to perform a site-specific validation of GEIS conclusions (Ref. 5.1-1, page C9-13, Concern Number NEP.015).

FPL assumes new and significant information would be the following:

- Information that identifies a significant environmental issue not covered in the GEIS and codified in the regulation, or

- Information that was not covered in the GEIS analyses and which leads to an impact finding different from that codified in the regulation.

The NRC does not define the term "significant." For the purpose of its review, FPL used guidance available in Council on Environmental Quality (CEQ) regulations. The

National Environmental Policy Act (NEPA) authorizes CEQ to establish implementing regulations for federal agency use. The NRC requires license renewal applicants to provide the NRC with input, in the form of an environmental report, that the NRC will use to meet NEPA requirements as they apply to license renewal (10 CFR 51.10). CEQ guidance provides that federal agencies should prepare environmental impact statements for actions that would significantly affect the environment (40 CFR 1502.3), to focus on significant environmental issues (40 CFR 1502.1), and to eliminate from detailed study issues that are not significant [40 CFR 1501.7(a)(3)]. The CEQ guidance includes a lengthy definition of "significantly" that requires consideration of the context of the action, and the intensity or severity of the impact(s) (40 CFR 1508.27). FPL assumed that moderate or large impacts, as defined by the NRC, would be significant. Section 4.0 presents the NRC definitions of "moderate" and "large" impacts.

FPL is aware of no new and significant information regarding the environmental impacts of Turkey Point Units 3 & 4 license renewal.

5.2 REFERENCES

Ref. 5.1-1 U.S. Nuclear Regulatory Commission. *Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response*. NUREG-1529. Washington, D.C. May 1996.

6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

6.1 LICENSE RENEWAL IMPACTS

FPL has reviewed the environmental impacts from renewing Turkey Point Units 3 & 4 operating licenses and has concluded that all of the impacts would be small and would not require mitigation. This Environmental Report documents the FPL basis for its conclusion. Section 4.0 incorporates by reference NRC findings for the 47 Category 1 issues that apply to Turkey Point Units 3 & 4, all of which have impacts that are SMALL (Table 4.0-2). The rest of Chapter 4 analyzes Category 2 issues, all of which are either not applicable or have impacts that would be SMALL. Table 6.1-1 identifies the impacts that Turkey Point Units 3 & 4 license renewal would have on resources associated with Category 2 issues.

TABLE 6.1-1
ENVIRONMENTAL IMPACTS RELATED TO LICENSE RENEWAL AT TURKEY POINT UNITS 3 & 4

No.	Issue	Environmental Impact
	Surface Water Quality, Hydrology, and Use (for all plants)	
13	Water use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)	NONE. The issue does not apply because Turkey Point Units 3 & 4 do not withdraw makeup water from a small river.
	Aquatic Ecology (for all plants with once-through and cooling pond heat dissipation systems)	
25	Entrainment of fish and shellfish in early life stages	NONE. The issue does not apply because Turkey Point Units 3 & 4 do not withdraw from waters of the U.S.
26	Impingement of fish and shellfish	NONE. The issue does not apply because Turkey Point Units 3 & 4 do not withdraw from waters of the U.S.
27	Heat shock	NONE. The issue does not apply because Turkey Point Units 3 & 4 do not discharge to waters of the U.S.
	Groundwater Use and Quality	
33	Groundwater use conflicts (potable and service water, and dewatering; plants that use more than 100 gpm)	NONE. The issue does not apply because Turkey Point Units 3 & 4 do not withdraw groundwater.
34	Groundwater use conflicts (plants using cooling towers withdrawing makeup water from a small river)	NONE. The issue does not apply because Turkey Point Units 3 & 4 do not use cooling towers.
35	Groundwater use conflicts (Ranney wells)	NONE. The issue does not apply because Turkey Point Units 3 & 4 do not use Ranney wells.
39	Groundwater quality degradation (cooling ponds at inland sites)	NONE. The issue does not apply because Turkey Point Units 3 & 4 are not located at an inland site.
	Terrestrial Resources	
40	Refurbishment impacts	NONE. The issue does not apply because there will be no Turkey Point Units 3 & 4 refurbishment.
	Threatened or Endangered Species	
49	Threatened or endangered species	SMALL. The habitat protection and enhancement programs for the endangered American crocodile would continue. No other impacts to threatened or endangered species were identified.

TABLE 6.1-1 (Cont'd)
ENVIRONMENTAL IMPACTS RELATED TO LICENSE RENEWAL AT TURKEY POINT UNITS 3 & 4

No.	Issue	Environmental Impact
		Air Quality
50	Air quality during refurbishment (nonattainment and maintenance areas)	NONE. The issue does not apply because there will be no Turkey Point Units 3 & 4 refurbishment.
		Human Health
57	Microbiological organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river)	NONE. The issue does not apply because Turkey Point Units 3 & 4 do not discharge to a small river. FPL evaluated the potential for microbiological organisms adversely affecting visitors or employees. The harsh environment of the cooling canals is not conducive to the survival of pathogenic microbiological organisms.
59	Electromagnetic fields, acute effects (electric shock)	SMALL. All circuits meet National Electrical Safety Code requirements for limiting induced shock.
		Socioeconomics
63	Housing impacts	SMALL. No impacts are expected because no additional employees are expected. Analyzed impact from adding as many as 60 employees during the license renewal term; 154 housing units would be required in an area with a population greater than 2 million. This impact would be small.
65	Public services: public utilities	SMALL. No impacts are expected because no additional employees are expected. Analyzed impact from adding as many as 60 employees during the license renewal term; this could result in as many as 497 new county residents and an additional 40,000 gallons of water per day demand on county water systems. This would be less than 1 percent of the daily capacity of the water system. This impact would be small.
66	Public services: education (refurbishment)	NONE. This issue does not apply because there will be no Turkey Point Units 3 & 4 refurbishment.
68	Offsite land use (refurbishment)	NONE. This issue does not apply because there will be no Turkey Point Units 3 & 4 refurbishment.

TABLE 6.1-1 (Cont'd)
ENVIRONMENTAL IMPACTS RELATED TO LICENSE RENEWAL AT TURKEY POINT UNITS 3 & 4

No.	Issue	Environmental Impact
69	Offsite land use (license renewal term)	SMALL. FPL annual property tax payments for Turkey Point Units 3 & 4 are less than 2 percent of the county's total annual property tax revenue and less than 1 percent of its annual operating budget. License renewal tax-driven land-use changes would generate very little new development and minimal changes in the area's land-use patterns.
70	Public services: transportation	SMALL. No impacts are expected because no additional employees are expected. Analyzed impact from adding as many as 60 employees during the license renewal period would be small.
71	Historic and archaeological resources	SMALL. No impacts to historic or archaeological resources were identified.
	Severe Accident Management	
76	Severe accidents	SMALL. FPL identified no cost-effective severe accident mitigation measures.
	Environmental Justice	
92	Environmental justice	SMALL. No disproportionately high or adverse impacts to minority or low-income populations.

6.2 MITIGATION

NRC

"The report must contain a consideration of alternatives for reducing adverse impacts...for all Category 2 license renewal issues..." 10 CFR 51.53(c)(3)(iii)

"The environmental report shall include an analysis that considers and balances...alternatives available for reducing or avoiding adverse environmental effects...." 10 CFR 51.45(c) as incorporated by 10 CFR 51.53(c)(2) and 10 CFR 51.53(c)

All impacts of Turkey Point Units 3 & 4 license renewal are beneficial or small, and would not require mitigation. Current operations include mitigation activities that would continue during the term of the license renewal. Turkey Point Units 3 & 4 would continue to discharge cooling water into the cooling canal system to protect Biscayne Bay and Card Sound aquatic environments from any discharge impacts. The Interceptor Ditch at the west side of the canal system restricts movement of saline water from the cooling canals inland to the freshwater habitats west of the canals. Water level is measured in the cooling canals, the Interceptor Ditch, and at four groundwater monitoring wells. If the groundwater movement is not from west to east, FPL pumps water from the Interceptor Ditch into the canals to create an artificial gradient from the freshwater habitats into the ditch.

The cooling canals are breeding habitat for the endangered American crocodile. FPL maintains a crocodile management program that specifies when and how to perform canal maintenance activities that minimize disturbance to breeding or nesting crocodiles. FPL plants native vegetation and creates small ponds on the berms between the canals to create nesting sanctuaries.

6.3 UNAVOIDABLE ADVERSE IMPACTS

NRC

The environmental report shall discuss any, "...adverse environmental effects which cannot be avoided should the proposal be implemented..." 10 CFR 45(b)(2) as adopted by 51.53(c)(2)

This Environmental Report adopts by reference the NRC findings for applicable Category 1 issues, including discussions of any unavoidable adverse impacts (Table 4.0-2). FPL examined 21 Category 2 issues and environmental justice and identified no unavoidable adverse impacts of the license renewal.

Although not expected, for purposes of analysis, FPL assumed that license renewal could necessitate adding as many as 60 additional staff. The addition of 60 households to the three-county area where the majority of the current Turkey Point Units 3 & 4 workers reside could result in small impacts to housing availability, transportation infrastructure, or public water supplies.

6.4 IRREVERSIBLE OR IRRETRIEVABLE RESOURCE COMMITMENTS

NRC

The environmental report shall discuss any, "...irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented..." 10 CFR 45(b)(5) as adopted by 51.53(c)(2)

The continued operation of Turkey Point Units 3 & 4 for the license renewal term will result in irreversible and irretrievable resource commitments, including:

- Nuclear fuel, which is burned in the reactor and converted to radioactive waste
- Land required to store or dispose of this spent nuclear fuel and low-level radioactive wastes generated as a result of plant operations
- Elemental materials that will become radioactive
- Materials, used for the normal industrial operations of the plant, that cannot be recovered or recycled or that are consumed or reduced to unrecoverable forms

6.5 SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

NRC

The environmental report shall discuss the, "...relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity..." 10 CFR 45(b)(4) as adopted by 51.53(c)(2)

The current balance between short-term use and long-term productivity at the Turkey Point Units 3 & 4 site was basically set once the units began operating in the 1970s. The Final Environmental Statement for Turkey Point Units 3 & 4 operations (Ref. 6.5-1, Section VII) evaluated the impacts of the short-term use of the land, particularly the 6,700 acres of salt marsh dedicated to cooling canals, versus the long-term productivity of that land. The evaluation concluded that if the land was returned to a natural condition after cessation of operations, the impact to long-term productivity would not be significant. Continued operations for an additional 20 years would not alter this conclusion. To the contrary, the short-term use of the cooling canals would continue making possible long-term productivity of the American crocodile population by sustaining a breeding population of this endangered species.

6.6 REFERENCES

Ref. 6.5-1 U.S. Atomic Energy Commission. *Final Environmental Statement Related to Turkey Point Plant; Florida Power & Light Company. Docket Nos. 50-250 and 50-251.* Directorate of Licensing, Washington, D.C. July 1972.

7.0 ALTERNATIVES TO THE PROPOSED ACTION

NRC

The environmental report shall discuss, "Alternatives to the proposed action...." 10 CFR 51.45(b)(3), as adopted by reference at 10 CFR 51.53(c)(2).

"...The report is not required to include discussion of need for power or economic costs and benefits of ... alternatives to the proposed action except insofar as such costs and benefits are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation...." 10 CFR 51.53(c)(2)

"While many methods are available for generating electricity, and a huge number of combinations or mixes can be assimilated to meet a defined generating requirement, such expansive consideration would be too unwieldy to perform given the purposes of this analysis. Therefore, NRC has determined that a reasonable set of alternatives should be limited to analysis of single, discrete electric generation sources and only electric generation sources that are technically feasible and commercially viable..." (Ref. 7.0-1, Section 8.1)

"...The consideration of alternative energy sources in individual license renewal reviews will consider those alternatives that are reasonable for the region, including power purchases from outside the applicant's service area...." (Ref. 7.0-2, Section II.H, page 66541)

Chapter 7 evaluates alternatives to Turkey Point Units 3 & 4 license renewal. The chapter identifies actions that FPL might take, and associated environmental impacts, if the NRC does not renew the plant operating licenses. The chapter also identifies alternative actions that FPL has evaluated but determined to be unreasonable, and presents the information upon which FPL bases those determinations.

FPL divided its alternatives discussion into two categories: "no action" and "alternatives that meet system generating needs." In determining the level of detail and analysis necessary for each category, FPL relied on the NRC decision-making standard for license renewal:

"...the NRC staff, adjudicatory officers, and Commission shall determine whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decision makers would be unreasonable." [10 CFR 51.95(c)(4)].

FPL determined that as long as the Environmental Report provides information sufficient to clearly indicate whether an alternative would have a smaller, comparable, or greater environmental impact than the proposed action, the document would support NRC decision making. Providing additional detail or

analysis would serve no function if it would only bring to light more adverse impacts of alternatives to license renewal. This approach is consistent with regulations of the Council on Environmental Quality, which provide that the consideration of alternatives (including the proposed action) devote substantial enough treatment that reviewers may evaluate their comparative merits [40 CFR 1502.14(b)]. Chapter 7 provides only sufficient detail about alternatives to establish the basis for necessary comparisons to the Chapter 4 discussion of impacts from the proposed action.

In characterizing environmental impacts from alternatives, FPL has used the same definitions of "SMALL," "MODERATE," and "LARGE" that the Chapter 4 Introduction presents.

7.1 NO-ACTION ALTERNATIVE

FPL is using the phrase "no-action alternative" to refer to a scenario in which the NRC does not renew the Turkey Point Units 3 & 4 operating licenses. Components of this alternative include replacing the generating capacity of Turkey Point Units 3 & 4, or otherwise meeting FPL's generating needs, and decommissioning the facility as described below.

Turkey Point Units 3 & 4 annually provide approximately 9.6 terawatt-hours of electricity to the grid that supplies electricity to all of FPL customers. This is equivalent to the electrical need of approximately 440,000 customers. FPL believes that any alternative would be unreasonable if it did not include replacing this capacity. Replacement could be accomplished by (1) building new generating capacity, (2) purchasing power from outside the FPL system, or (3) reducing power requirements through demand reduction. Section 7.2.1 describes each of these possibilities in detail, and Section 7.2.2 describes environmental impacts from feasible alternatives.

The NRC *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) defines decommissioning as the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits release of the property for unrestricted use and termination of the license. The GEIS-evaluated decommissioning options include immediate decontamination and dismantlement (DECON) and safe storage of the stabilized and defueled facility (SAFSTOR) for a period of time, followed by decontamination and dismantlement. Regardless of the option chosen, decommissioning must be completed within a 60-year period (Ref. 7.0-1, Chapter 7). Under the no-action alternative, FPL would continue operating Turkey Point Units 3 & 4 until the current licenses expire, then initiate decommissioning activities in accordance with NRC requirements. The GEIS describes decommissioning activities based on an evaluation of a larger reactor than Turkey Point Units 3 & 4 (the "reference" pressurized-water reactor is the 1,175-MW Trojan Nuclear Plant). This description bounds decommissioning activities that FPL would conduct at Turkey Point Units 3 & 4.

As the GEIS notes, the NRC has evaluated environmental impacts from decommissioning. NRC-evaluated impacts include occupational and public dose; impacts of waste management; and impacts to air, water, ecological, and socioeconomic resources. The NRC has indicated that the decommissioning environmental effects of greatest concern (i.e., radiation dose and releases to the environment) are substantially less than the same effects resulting from reactor

operations (Ref. 7.1-1, page 4-15). FPL adopts by reference the GEIS conclusions regarding environmental impacts of decommissioning.

FPL notes that decommissioning activities and their impacts are not discriminators between the proposed action and the no-action alternative. FPL will have to decommission Turkey Point Units 3 & 4 regardless of the NRC decision on license renewal; license renewal would only postpone decommissioning for another 20 years. The NRC has established, in the GEIS, that the timing of decommissioning operations does not substantially influence the environmental impacts of decommissioning. FPL adopts by reference the NRC findings to the effect that delaying decommissioning until after the renewal term would have small environmental impacts (10 CFR 51 Appendix B, Table B-1, Decommissioning). The discriminators between the proposed action and the "no-action alternative" lie within the choice of generation replacement options that compose the "no-action alternative." Section 7.2.2 analyzes the impacts from these options.

FPL concludes that the decommissioning impacts under the "no-action alternative" would not be substantially different from those occurring following license renewal, as identified in the GEIS. These impacts would be temporary and would occur at the same time as the impacts from meeting system generating needs.

7.2 ALTERNATIVES THAT MEET SYSTEM GENERATING NEEDS

Decisions regarding reasonable alternatives for meeting electric reliability needs in Florida are made primarily by two entities, utility companies and the Florida Public Service Commission (FPSC). The current mix of generation in Florida is one indicator of what these entities believe have been and continue to be feasible alternatives within the State. In 1996, Florida's electric utility industry had a total generating capability of 40.8 gigawatts-electric fueled by oil (37 percent); coal (29 percent); gas (23 percent); nuclear (11 percent); and other, which includes hydroelectric, geothermal, biomass, wind, solar thermal, and photovoltaic (0.1 percent). Based on 1996 generation, utilization of this capability was dominated by coal (45 percent), followed by gas (21 percent), nuclear (18 percent), oil (16 percent), and other (0.1 percent) (Ref. 7.2-1).

The differences between capability and utilization are reflections of preferential usage influenced primarily by the economics of dispatching the various types of units. For example, nuclear energy represented 11 percent of installed capability but produced 18 percent of the electricity generated. This reflects the state's preferential reliance on nuclear energy as a base-load generating source. Figures 7.2-1 and 7.2-2 illustrate Florida's generating capabilities and utilization.

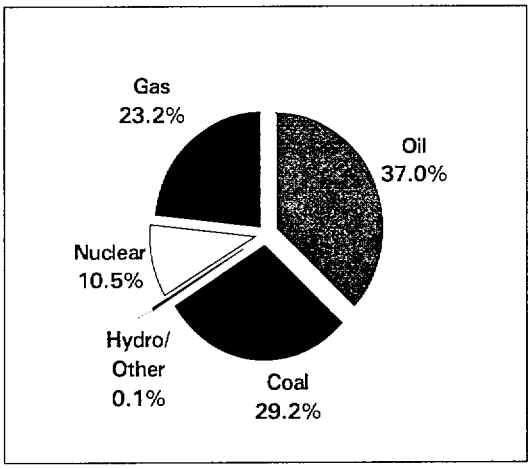

Figure 7.2-1. Florida Generation Capability (1996) (Ref. 7.2-1)

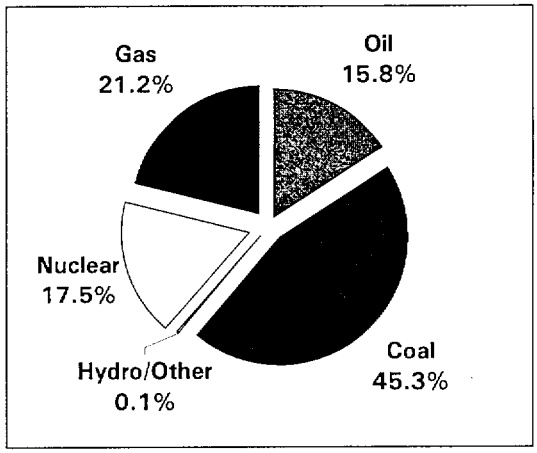

Figure 7.2-2. Florida Generation Utilization (1996) (Ref. 7.2-1)

Florida has experienced a drop in oil-fired generation that is at least partially attributable to FPSC Order 9552 and Rule 25-17.016, which the FPSC issued during the 1980s to reduce reliance on oil as a generation fuel. The FPSC has since repealed the Rule and Order.

FPL's generation mix is slightly different than the state composite, reflecting a higher reliance on nuclear (26 percent in 1998) and a lower reliance on coal (7 percent in 1998). Figure 7.2-3 illustrates the FPL energy mix. FPL's 1999 ten-year power plant site plan provides detailed fuel and energy source forecasts through 2008 (Ref. 7.2-2).

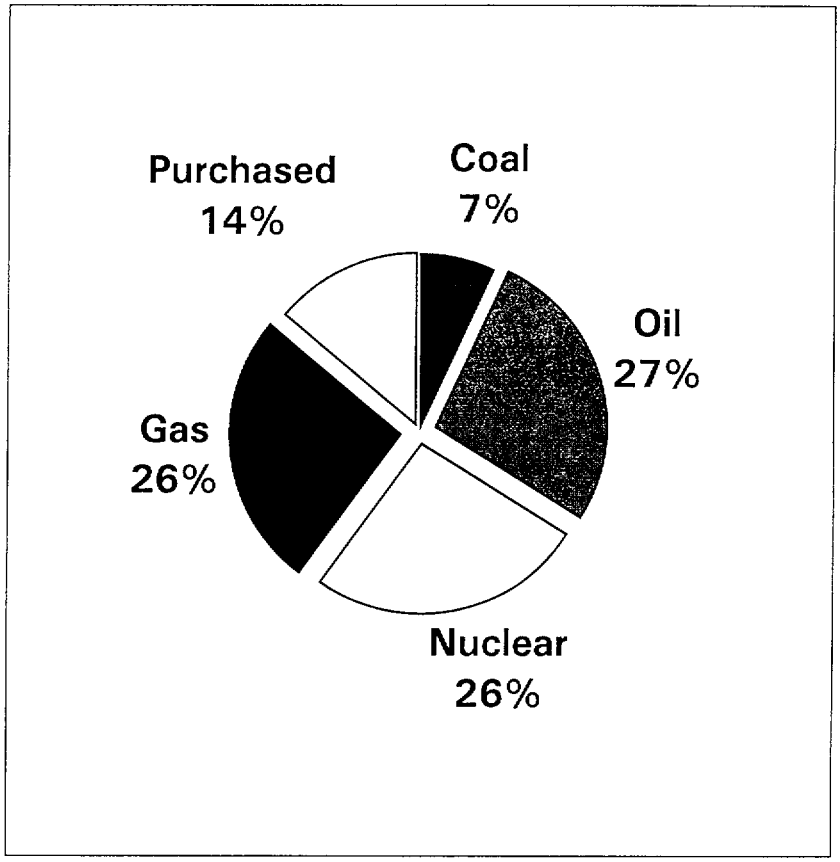

Figure 7.2-3. FPL Generation Utilization (1998) (Ref. 7.2-3)

7.2.1 ALTERNATIVES CONSIDERED

7.2.1.1 BUILD NEW GENERATING CAPACITY

The NRC indicated in the GEIS that while many methods are available for generating electricity, and a huge number of combinations or mixes can be assimilated to meet system needs, such expansive consideration would be too unwieldy given the purposes of the alternatives analysis. Therefore, the NRC determined that a reasonable set of alternatives should be limited to analysis of single, discrete electric generation sources and only electric generation technologies that are technically reasonable and commercially viable (Ref. 7.0-1, Section 8.1, page 8-1). Consistent with the NRC determination, FPL has not evaluated mixes of generating sources.

FPL periodically performs a rigorous evaluation of generating technologies and annually reviews what it considers to be the most viable options. In 1991 FPL conducted a study which concluded that the capability of FPL's system would be insufficient to meet peak load and required reserves beginning in 1998. FPL initiated a selection process for a new generating unit, considering not only commercially existing supply technologies, but also emerging technologies that might prove to be feasible later on. The 38 generation options FPL evaluated and the evaluation results are summarized in Table 7.2-1.

Of the nine alternative generation options that the NRC evaluated in the GEIS (wind, solar photovoltaic, solar thermal power, hydro, geothermal, wood waste, municipal solid waste, energy crops, and advanced light-water reactor), the FPL study addressed all but energy crops and advanced light-water reactor. FPL has reviewed the analysis of energy crops and advanced light-water reactor technologies application that the NRC performed for the Calvert Cliffs Nuclear Power Plant license renewal (Ref. 7.2-4, Section 8.2.4) and, for the same reasons expressed by the NRC, FPL believes that these are not reasonable alternatives to Turkey Point Units 3 & 4 license renewal. Consistent with the GEIS, Table 7.2-1 indicates the FPL conclusion that new coal- and gas-fired generation are economical, technically mature, and technically feasible. Table 7.2-1 also presents favorably the technology of Orimulsion (Orimulsion is an emulsified form of Orinoco tar, a natural asphalt produced in Venezuela). However, FPL discontinued its attempt to introduce that technology to Florida following protracted regulatory and legal proceedings.

TABLE 7.2-1
1991 TECHNICAL FEASIBILITY EVALUATION OF FPL GENERATION OPTIONS

Technology	Economic Candidate	Technical Maturity	Technical Feasibility
Coal			
Steam, wet limestone, FGD, 400 MW	No	Existing	Feasible
Steam, wet limestone, FGD, 800 MW	Yes	Existing	Feasible
Steam, dry FGD, sub-critical	No	Existing	Limited fuel range
Atmospheric fluidized bed, circulating	No	Existing	Scale-up limitations
Atmospheric fluidized bed, bubbling	No	Demonstration	Feasible
Pressurized fluidized bed, bubbling combined cycle	No	Demonstration	Feasible
Coal gasification, combined cycle	Yes	Demonstration	Feasible
Oil/Gas			
Oil, steam, wet limestone, FGD, 400 MW	No	Existing	Feasible, but undesirable primary fuel
Conventional combustion turbine	No	Existing	Feasible, but not as good as advanced CT
Advanced combustion turbine	Yes	Existing	Feasible
Intercooled injected gas turbine	No	Demonstration	Feasible
Conventional combined cycle	No	Existing	Feasible, but not as good as advanced CT
Advanced combined cycle	Yes	Existing	Feasible
Advanced combustion turbine repowering	No	Existing	Feasible
Fuel Cell			
Phosphoric acid	No	Demonstration	Feasible
Molten carbonate	No	Demonstration	Feasible
Solid oxide	No	Prototype	Feasible
Orimulsion			
Orimulsion, steam, wet limestone, FGD, subcritical, 800 MW	Yes	Existing	Feasible
Nuclear			
Pressurized water reactor	No	Existing	Feasible
Liquid metal fast breeder reactor	No	Prototype	Feasible
Advanced passive reactor	No	Design	Feasible
Hydro			
Conventional 400 MW	No	Existing	Insufficient resources

TABLE 7.2-1 (Cont'd)
1991 TECHNICAL FEASIBILITY EVALUATION OF FPL GENERATION OPTIONS

Technology	Economic Candidate	Technical Maturity	Technical Feasibility
Renewables			
Geothermal	No	Existing	Insufficient resources
Wind turbines	No	Existing	Insufficient resources
Hybrid solar central receiver	No	Existing	Concern over Florida solar resources
Solar photovoltaic	No	Existing	Concern over production capabilities
Ocean thermal	No	No major sponsor	Feasible
Ocean current	No	No major sponsor	Feasible
Ocean wave	No	Existing	Insufficient resources
Ocean tidal	No	Existing	Insufficient resources
Wood-fired steam	No	Existing	Insufficient resources
Municipal refuse steam	No	Existing	Insufficient resources
Storage			
Lead acid battery	No	Existing, with supply limitations	Feasible
Advanced battery	No	Developmental	Feasible
Pumped hydro	No	Existing	Inappropriate geography
Compressed air – rock, salt, aquifer	No	Existing	Inappropriate geology
Compressed air – vessel	No	Existing	Feasible, but limited application
Superconducting magnetic energy	No	No major sponsor	Feasible

CT = combustion turbine
FGD = flue gas desulfurization
MW = megawatts

Table 7.2-2 presents the results of the most recent FPL annual review of alternative generation options. As shown, the FPL review has focused on constructing coal-, oil-, and gas-fired units and repowering existing units. Consistent with Table 7.2-2, FPL has evaluated one coal-fired technology, pulverized coal, and one gas-fired technology, combined cycle, as potential alternatives to Turkey Point Units 3 & 4 license renewal. In addition, FPL has evaluated oil-fired steam technology. Although FPL believes this presently to be an economically infeasible alternative (Table 7.2-1), FPL also believes that the presence of the existing oil-fired units co-located at the Turkey Point site (Section 3.5) provides a basis for further evaluation. The following sections discusses these alternatives in more detail.

FPL has implemented a program of repowering existing units in order to meet its current predictions of load growth. "Repowering" means converting existing generating technology to combined cycle technology. Because FPL has evaluated combined cycle technology as one alternative to Turkey Point Units 3 & 4 license renewal, FPL believes that its alternative evaluation bounds repowering as an alternative. Therefore, FPL will not separately evaluate repowering as an alternative to Turkey Point Units 3 & 4 license renewal.

Generation capacity changes in the FPL system, planned for 1999 through 2008, are projected to add 3,292 (summer) to 3,603 (winter) megawatts (Ref. 7.2-2, Section III.B and Schedule 8). These changes reflect upgrades to existing units, capacity enhancements, scheduled changes in the delivered amounts of purchased power, repowering of existing units, and new unit construction. Since these generation capacity changes have been credited in the FPL Ten Year Plan as necessary to meet projected customer demand and reserve margins (Ref. 7.2-2, Schedule 7.1), the capacity gains are not available to replace Turkey Point Units 3 & 4 capacity.

The following sections present fossil-fuel fired generation and imported power as reasonable alternatives to license renewal. In an attempt to present fossil-fuel fired generation in as benign an environmental light as possible, FPL began its analyses by analyzing hypothetical new fossil-fuel fired units at the existing Turkey Point site. FPL concluded that this approach could minimize environmental impacts by building on previously disturbed land and by making the most use possible of existing facilities, such as transmission lines, roads and parking areas, office buildings, and the cooling canal system. It must be emphasized, however, that these are hypothetical scenarios and FPL does not have plans for such construction at Turkey Point.

TABLE 7.2-2
1999 TECHNICAL FEASIBILITY EVALUATION OF FPL GENERATION OPTIONS

Technology	Economic Candidate	Technical Maturity	Technical Feasibility
Coal			
Circulating fluidized bed, 400 MW	Yes	Existing	Feasible
Pulverized coal, 400 MW	Yes	Existing	Feasible
Oil/Gas			
Combined cycle, H Machine, 400 MW	Yes	Design	Feasible
Combined cycle, G Machine, 300 MW	Yes	Existing	Feasible
Combined cycle, H Machine, 800 MW	Yes	Design	Feasible
Combustion turbine, 150 MW	Yes	Existing	Feasible
Combined cycle, F Machine, 500 MW	Yes	Existing	Feasible
Repowering of existing steam units	Yes	Existing	Feasible

MW = megawatt

Coal-fired Generation

A scenario of, for example, three 462-MW coal-fired units could be assumed to replace the 1,386-MW Turkey Point Units 3 & 4 capacity. However, FPL's experience indicates that although customized unit sizes can be built, using standardized sizes is more economical. As Table 7.2-2 shows, FPL has evaluated 400- and 800-MW coal-fired unit sizes. Assuming three 400-MW units, for a total of 1,200 MW, would result in slightly less generating capacity than a one-for-one replacement of Turkey Point Units 3 & 4. Assuming four 400-MW units (or two 800-MW units), for a total of 1,600 MW, would result in excess capacity. In order to avoid overestimating environmental impacts from the coal-fired alternative, FPL will analyze an alternative that consists of three 400-MW coal fired units.

The NRC has evaluated coal-fired generation alternatives for the Calvert Cliffs Nuclear Power Plant (Ref. 7.2-4, Section 8.2.1) and for the Oconee Nuclear Station (Ref. 7.2-5, Section 8.2.1). For Calvert Cliffs, the NRC analyzed three 600-MW units. FPL has reviewed the NRC analysis and believes it to be germane to the Turkey Point Units 3 & 4 alternatives analysis. In defining the Turkey Point Units 3 & 4 coal-fired alternative, FPL has used site- and Florida-specific input and has scaled from the NRC analysis, where appropriate.

Table 7.2-3 presents the basic coal-fired alternative emission control characteristics. FPL based its emission control technology and percent control assumptions on alternatives that the U.S. Environmental Protection Agency has identified as being available for minimizing emissions (Ref. 7.2-6). Coal and calcium hydroxide would be delivered by barge to the existing Turkey Point receiving dock. At this time, FPL is unaware of a marine terminal capable of supplying the coal or calcium hydroxide.

One difference between the Turkey Point coal-fired alternative and the alternative that the NRC analyzed for Calvert Cliffs is the FPL choice of spray drying technology (dry scrubber) for flue gas desulfurization rather than a wet scrubber. The saline groundwater at Turkey Point Units 3 & 4 would be incompatible with the chemistry of a flue gas desulfurization scrubbing process and the higher corrosivity of the saline groundwater would increase the construction, operation, and maintenance costs. For these reasons, water for potable, boiler makeup, and pollution control uses would be obtained from the existing municipal water supply and flue gas desulfurization would use dry technology.

TABLE 7.2-3
COAL-FIRED ALTERNATIVE

Characteristic	Basis
Unit size = 400 MW ISO rating net[a]	Standard size (FPL experience)
Unit size = 424 MW ISO rating gross[a]	Calculated based on 6 percent onsite power usage (FPL experience): 400 MW x 1.06
Number of units = 3	Calculated to be $\leq$ Turkey Point Units 3 & 4 capacity of 1,386 MW
Boiler type = tangentially fired, dry-bottom	Minimizes nitrogen oxides emissions (Ref. 7.2-6)
Fuel type = bituminous, pulverized coal	Typical for coal used in Florida (FPL experience)
Fuel heating value = 11,976 Btu/lb	Typical for coal used in Florida (Ref. 7.2-7)
Fuel ash content by weight = 8.2 percent	Typical for coal used in Florida (Ref. 7.2-7)
Fuel sulfur content by weight = 1.61 percent	Typical for coal used in Florida (Ref. 7.2-7)
Fuel NO_X content = 9.7 lb/ton	Typical for pulverized coal, tangentially fired, dry-bottom (Ref. 7.2-7)
Heat rate = 9,600 Btu/Kwh	Typical for coal steam turbines (FPL experience)
Capacity factor = 0.9	Typical for large coal-fired units (FPL experience)
NO_X control = low NO_X burners, overfire air (60 percent reduction)	Best available for minimizing NO_X emissions (Ref. 7.2-6). FPL experience is that selective catalytic reduction does not work for coal.
Particulate control = fabric filters or electrostatic precipitators (99.9 percent removal efficiency)	Best available for minimizing particulate emissions (Ref. 7.2-6)
SO_x control = Calcium hydroxide slurry, vaporizes in spray vessel (90 percent removal efficiency)	Best available for minimizing SO_x emissions in absence of freshwater source (Ref. 7.2-6)

Btu = British thermal unit
ISO rating = International Standards Organization rating at standard atmospheric conditions of 59°F, 60 percent relative humidity, and 14.696 pounds of atmospheric pressure per square inch
Kwh = kilowatt hour
lb = pound
MW = megawatt
NO_X = nitrogen oxides
Ref. = Reference
SO_x = sulfur oxides

Notes: a. The difference between "net" and "gross" is electricity consumed on site.

Oil-Fired Generation

Use of oil as an energy source for power generation in Florida has declined, presumably due to past Florida Public Service Commission policies that encouraged alternatives that minimized use of oil as a generation fuel. FPL has no recent experience evaluating new oil-fired generation options and, unlike coal- and gas-fired technologies, is not aware of any preferential sizing for oil-fired units. However, in order to make the oil-fired alternative most directly comparable to the coal- and gas-fired alternatives, FPL assumed three 400-MW units. As for the coal-fired alternative, FPL assumed construction at the Turkey Point site with fuel delivery by barge. Table 7.2-4 presents the basic oil-fired alternative characteristics.

FPL has assumed a capacity factor for the oil-fired alternative, 90 percent, that is the same as that for the coal- and gas-fired alternatives. This assumption makes the three alternatives most directly comparable but FPL notes, that from a practical standpoint, the oil-fired capacity factor would probably be closer to 50 percent. This reduced capacity factor would be a reflection of the high cost of fuel oil, rather than any limitation inherent in the technology. The utility might choose to operate other technologies or purchase power before using the oil-fired alternative. FPL believes, however, that its alternatives analysis remains valid because the impacts of other technologies and power purchase remain bounded by the alternatives analysis.

Gas-Fired Generation

As previously discussed for coal-fired generation, FPL experience indicates that standardized gas-fired unit sizes are available and are more economical than customized unit sizes. FPL has analyzed three 400-MW gas-fired units, described in Table 7.2-5. Unlike the coal- and oil-fired alternatives, however, FPL has concluded that economic and environmental costs associated with constructing a gas pipeline make Turkey Point an unreasonable site for the gas-fired alternative. FPL based its conclusion on work done with the Florida Gas Transmission Company to supply natural gas to the FPL Fort Myers plant. This project involved constructing 100 miles of pipeline and supporting facilities along the Gulf side of Florida, from Hillsborough County near Tampa, south through Polk, Hardee, DeSoto, Charlotte, and Lee Counties. Extending such a pipeline to Turkey Point would involve constructing an additional 150 miles of pipeline through ecologically sensitive Everglades habitat. Accordingly, FPL has defined the more likely gas-fired

alternative as construction at a hypothetical site near the center of the state, north of Miami.

TABLE 7.2-4
OIL-FIRED ALTERNATIVE

Characteristic	Basis
Unit size = 400 MW ISO rating net[a]	Standard size (FPL experience)
Unit size = 416 MW ISO rating gross[a]	Calculated based on 4 percent onsite power usage (FPL experience): 400 MW x 1.04
Number of units = 3	Calculated to be $\leq$ Turkey Point Units 3 & 4 capacity of 1,386 MW
Fuel type = No. 6 fuel oil	Typical for oil-fire in Florida (FPL experience)
Fuel heating value = 152,639 Btu/gal	Typical for No. 6 fuel oil used in Florida (Ref. 7.2-7)
Fuel ash content by weight = 2.09 percent	Typical for No. 6 fuel oil (Ref. 7.2-8, Table 1.3-4)
Fuel sulfur content by weight = 1.54 percent	Typical for No. 6 fuel oil used in Florida (Ref. 7.2-7)
Fuel NO_x content = 26 lb/10^3 gal	Typical for No. 6 oil (Ref. 7.2-8)
Heat rate = 9,800 Btu/Kwh	Typical for fuel-oil steam turbines (FPL experience)
Capacity factor = 0.9	Typical for large oil-fired units (FPL experience)
NO_x control = low NO_x burners, overfire air (60 percent reduction)	Best available for minimizing NO_x emissions (Ref. 7.2-8). FPL experience is that selective catalytic reduction does not work for No. 6 fuel oil.
Particulate control = fabric filters (99 percent removal efficiency)	Best available for minimizing particulate emissions (Ref. 7.2-8)
SO_x control = Dry lime/limestone flue gas desulfurization (90 percent removal efficiency)	Best available for minimizing SO_x emissions in absence of freshwater source (Ref. 7.2-8)

Btu = British thermal unit
gal = gallon
ISO rating = International Standards Organization rating at standard atmospheric conditions of 59°F, 60 percent relative humidity, and 14.696 pounds of atmospheric pressure per square inch
Kwh = kilowatt hour
MW = megawatt
NO_x = nitrogen oxides
Ref. = Reference
SO_x = sulfur oxides

Notes: a. The difference between "net" and "gross" is electricity consumed on site.

TABLE 7.2-5
GAS-FIRED ALTERNATIVE

Characteristic	Basis
Unit size = 400 MW ISO rating net:[a] 150 MW-combustion turbines (2) 100 MW-heat recovery boiler	Standard size (FPL experience)
Unit size = 416 MW ISO rating gross:[a] 156 MW-combustion turbines (2) 104 MW-heat recovery boiler	Calculated based on 4 percent onsite power usage (FPL experience): 400 MW × 1.04
Number of units = 3	Calculated to be $\leq$ Turkey Point Units 3 & 4 capacity of 1,386 MW
Fuel type = natural gas	Assumed
Fuel heating value = 1,014 Btu/ft^3	Typical for natural gas used in Florida (Ref. 7.2-7)
Fuel sulfur content = 0.0006 lb/MMBtu	Typical for natural gas (Ref. 7.2-9)
Fuel NO_X content = 0.0088 lb/MMBtu	Typical for natural gas (Ref. 7.2-9)
Heat rate = 6,800 Btu/Kwh	Typical for gas-fired turbines (FPL experience)
Capacity factor = 0. 9	Typical for large gas-fired units (FPL experience)
NO_X control = low NO_X burners, water injection, selective catalytic reduction	Best available for minimizing NO_X emissions (Ref. 7.2-9)

Btu = British thermal unit
ft^3 = cubic foot
ISO rating = International Standards Organization rating at standard atmospheric conditions of 59°F, 60 percent relative humidity, and 14.696 pounds of atmospheric pressure per square inch
Kwh = kilowatt hour
MM = million
MW = megawatt
NO_X = nitrogen oxide
Ref. = Reference

Notes: a. The difference between "net" and "gross" is electricity consumed on site.

Table 7.2-5 presents the basic gas-fired alternative characteristics. FPL assumes that the capacity of the existing gas pipeline system would be insufficient to supply a large consumptive facility such as the Turkey Point Units 3 & 4 gas-fired alternative. This assumption is based in part on the fact that there currently are two new pipeline construction proposals for meeting existing demand in central Florida: Williams Gas "Buccaneer" and Coastal Gas "Gulfstream." Consistent with these proposals, FPL assumes that Mobile Bay, Alabama, would be the closest supply point for the pipeline construction analysis. The gas pipeline would be approximately 500 miles long, assuming a 150-foot pipeline corridor routed adjacent to major highways.

FPL would have to build new 500 kV transmission lines to connect to existing lines in order to transmit power to FPL's customers in the Miami area. FPL estimates that this construction would be for a distance of approximately 60 miles.

7.2.1.2 PURCHASE POWER

FPL currently has contracts (some extending through 2026) with a number of cogeneration small-power-production facilities and other utilities to purchase firm capacity and energy (Ref. 7.2-2, page 13). A cogeneration facility simultaneously produces electrical and thermal energy, with the thermal energy being used for industrial, commercial, or cooling and heating purposes. A small power-production facility does not (without exemption) exceed 80 MW capacity and uses renewable resources as its primary energy source. Because these contracts are part of FPL's current and future capacity and no substantial new capacity additions from cogeneration facilities are foreseen in the non-utility generation sector, FPL does not consider such power purchases a feasible option for the purchase power alternative.

Florida is a net importer of power (Ref. 7.2-1) and, as Figure 7.2-3 shows, power purchase is a substantial portion of the FPL energy mix. FPL has contracted the purchase of approximately 1,300 megawatts of coal-fired capacity annually to meet projected customer demand through the year 2010 (Ref. 7.2-2, page 16). FPL presumes that this capacity might be available for purchase after the year 2010, and could be imported to the region to meet current and future demand. Because FPL is currently using it to meet current demand, however, FPL could not rely on this power purchase as an alternative to Turkey Point Units 3 & 4 license renewal. Therefore, FPL assumes that the capacity for the purchased power alternative would come from other sources. FPL also assumes that the generating technology for the purchased power would be one of those that the NRC analyzed in the GEIS. For this reason, FPL is adopting by reference, as representative of the

purchased power alternative, the GEIS description of the alternative generating technologies.

Florida's peninsula limits interconnection alternatives for obtaining imported power, and the location of the Turkey Point Units 3 & 4 load center (i.e., Miami) at the end of the peninsula further constrains import possibilities. The existing power transmission infrastructure currently lacks capacity to import power in sufficient quantity to replace a major generation source, such as Turkey Point Units 3 & 4, located at the southern end of the FPL system. In order to replace Turkey Point Units 3 & 4 capacity with imported power, FPL would have to construct additional transmission facilities from the Florida state line to the Miami area, a distance of approximately 350 miles. In addition, depending on the source of the imported power, additional transmission facilities would have to be built in other states to the Florida state line.

7.2.1.3 REDUCE DEMAND

FPL has an aggressive demand-side management (DSM) program that reduces generation needs through a combination of energy conservation and load management programs. FPL's 1999 ten-year power plant site plan describes these programs (Ref. 7.2-2, page 15). In its plan, FPL proposed a DSM cumulative summer reduction goal of 697 megawatts between 2000 and 2008. DSM program reductions from 1981 through 1998 have totaled approximately 2,650 megawatts (refer to Figure 7.2-4). Historic and projected DSM reductions have been credited in the FPL plan, as necessary, to meet part of FPL's projected customer demand.

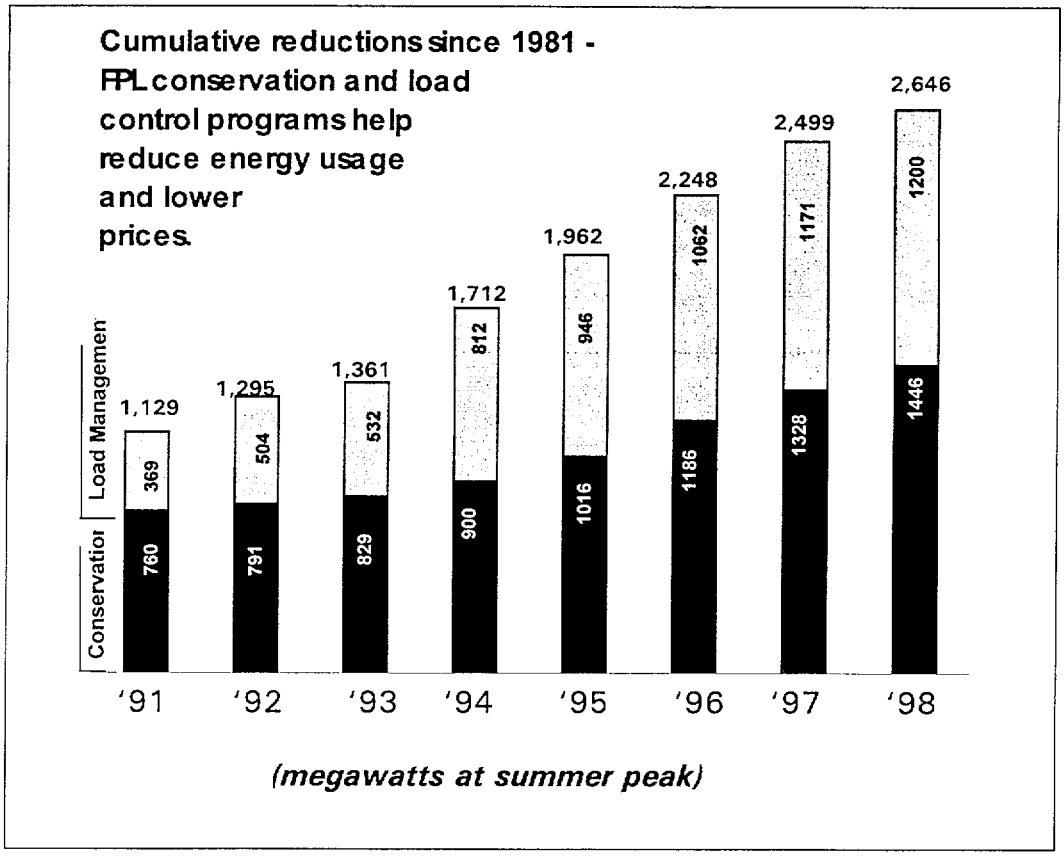

Figure 7.2-4. FPL Demand-Side Management (1991-1998) (Ref. 7.2-3)

In theory, additional DSM could be found in FPL's service territory, which would, in total or in part, replace the resources lost if the Turkey Point Units 3 & 4 licenses were not renewed. The actual feasibility of additional DSM could only be ascertained with a detailed economic-based study, which would determine how much money it would be cost-effective to spend on DSM versus other options such as license renewal or acquiring replacement generation capacity. Once this amount of money was established, the market potential of DSM that could reasonably be achieved with these expenditures could then be determined. Such an economic analysis of this specific issue has not been performed by FPL.

However, FPL has performed relevant environmental analyses of DSM versus new generating units that provide valuable insight into how DSM would compare with license renewal of a nuclear power unit from an environmental perspective. These analyses, which focused on total air emissions from the FPL system, looked at whether total system emissions would be greater with the addition of new units or with the addition of DSM to meet FPL's new resource needs. The results of these

analyses have consistently shown that FPL's total system emissions would be higher if DSM were chosen instead of new baseload units, particularly so if the new baseload units were gas-fired. This result is driven by two primary factors: the relatively low "capacity factor" of DSM compared to that of baseload units, and the significantly lower emission rates of new baseload units compared to those of FPL's existing units. Based on these results, it is expected that a similar analysis that focused on additional DSM versus the continued operation of a baseload nuclear unit (which has even lower emissions than a new gas-fired unit) would show that DSM as a replacement for this nuclear capacity would be an even worse choice from an air-emission perspective. Consequently, from an environmental perspective, additional DSM is not considered to be a viable alternative to the license renewal and continued operation of Turkey Point Units 3 & 4.

7.2.2 ENVIRONMENTAL IMPACTS OF ALTERNATIVES

This section evaluates the environmental impacts from what FPL has determined to be feasible alternatives to Turkey Point Units 3 & 4 license renewal: coal- and oil-fired generation at the Turkey Point site, gas-fired generation at another location, and purchased power.

7.2.2.1 COAL-FIRED GENERATION

The NRC evaluated environmental impacts from coal-fired generation alternatives in the GEIS. The NRC concluded that construction impacts could be substantial, due in part to the large land-area required, which can result in natural habitat loss, and the large construction workforce needed. The NRC pointed out that siting a new coal-fired plant where a nuclear power plant is located would reduce many construction impacts. The NRC identified major adverse impacts from operations as human health concerns associated with air emissions, waste generation, and losses of aquatic biota due to cooling water withdrawals and discharges.

The coal-fired alternative that FPL has defined in Section 7.2.1.1 would be located at the existing Turkey Point site near a large metropolitan area (Section 2.6), thereby reducing construction impacts. The alternative would also use the existing cooling canal system, thereby reducing aquatic impacts from operations. Therefore, FPL has limited its detailed evaluation to air emissions and associated waste generation in the form of ash and scrubber waste.

Air Quality

Air quality impacts of coal-fired generation vary considerably from those of nuclear power. A coal-fired plant would emit sulfur oxides, nitrogen oxides, particulate matter, and carbon monoxide, all regulated pollutants. As Section 7.2.1.1 indicates, FPL has assumed a plant design that would minimize air emissions through a combination of boiler technology and post-combustion pollutant removal. FPL estimates the coal-fired alternative emissions to be as follows:

Sulfur oxides = 12,295 tons per year

Nitrogen oxides = 7,798 tons per year

Carbon monoxide = 1,005 tons per year

Particulates:

Total suspended particulates = 165 tons per year

PM_{10} (particulates having a diameter of less than 10 microns) = 38 tons per year

Table 7.2-6 shows how FPL calculated these emissions.

The Turkey Point Units 3 & 4 site is located within an air quality region designated as an attainment area for all criteria air pollutants with the exception of ozone. Miami-Dade and Broward Counties within the region are maintenance areas for ozone. Due to the role nitrogen oxides and sulfur oxides play in the formation of ozone, operation of a coal-fired plant would be expected to raise ozone levels in the immediate area. However, FPL has not performed the modeling that would be necessary to meet regulatory requirements. Regulatory approval would be unlikely for a facility that affected the area attainment or maintenance status.

The Clean Air Act Amendments of 1990 specified a number of utility plants to begin compliance with stricter emissions standards for SO_x and NO_x in 1995. Emissions of SO_x from Florida electric power generation rose from 1986 to 1991, but declined from 1991 to 1996. Emissions of both CO and NO_x increased, however, over both periods. Florida's SO_x, NO_x, and CO emissions were all among the top seven nationally in 1996. Its concentration rankings were all also high, among the top eleven. Although Florida participated in the Ozone Transport

TABLE 7.2-6
AIR EMISSIONS FROM COAL-FIRED ALTERNATIVE

Parameter	Calculation	Result
Annual coal consumption	$3\text{units} \times \frac{424\ \text{MW}}{\text{unit}} \times \frac{9{,}600\ \text{Btu}}{\text{kW} \times \text{hr}} \times \frac{1{,}000\ \text{kW}}{\text{MW}} \times \frac{\text{lb}}{11{,}976\ \text{Btu}} \times \frac{\text{ton}}{2000\ \text{lb}} \times 0.9 \times \frac{24\ \text{hr}}{\text{day}} \times \frac{365\ \text{day}}{\text{yr}}$	4,019,418 tons per year
SO_x[a, b]	$\frac{38 \times 1.61\ \text{lb}}{\text{ton}} \times \frac{\text{ton}}{2000\ \text{lb}} \times (1 - 90/100) \times \frac{4{,}019{,}418\ \text{tons}}{\text{yr}}$	12,295 tons SO_x per year
NO_x[b, c]	$\frac{9.7\ \text{lb}}{\text{ton}} \times \frac{\text{ton}}{2000\ \text{lb}} \times (1 - 60/100) \times \frac{4{,}019{,}418\ \text{tons}}{\text{yr}}$	7,798 tons NO_x per year
CO[b]	$\frac{0.5\ \text{lb}}{\text{ton}} \times \frac{\text{ton}}{2000\ \text{lb}} \times \frac{4{,}019{,}418\ \text{tons}}{\text{yr}}$	1,005 tons CO per year
TSP[d]	$\frac{10 \times 8.2\ \text{lb}}{\text{ton}} \times \frac{\text{ton}}{2000\ \text{lb}} \times (1 - 99.9/100) \times \frac{4{,}019{,}418\ \text{tons}}{\text{yr}}$	165 tons TSP per year
PM_{10}[d]	$\frac{2.3 \times 8.2\ \text{lb}}{\text{ton}} \times \frac{\text{ton}}{2000\ \text{lb}} \times (1 - 99.9/100) \times \frac{4{,}019{,}418\ \text{tons}}{\text{yr}}$	38 tons PM_{10} per year

Btu = British thermal unit
CO = carbon monoxide
hr = hour
kW = kilowatt
lb = pound
MW = megawatt
NO_x = nitrogen oxide
PM_{10} = particulates having diameter less than 10 microns
SO_x = sulfur dioxide
TSP = total suspended particulates (filterable)

Notes: a. Ref. 7.2-6, Table 1.1-1
b. Ref. 7.2-6, Table 1.1-3
c. Ref. 7.2-6, Table 1.1-2
d. Ref. 7.2-6, Table 1.1-4

Assessment Group process, Florida generators are not subject to the recently announced proposal from the U.S. Environmental Protection Agency (EPA) requiring submission of state implementation plans to address the regional transport of ground-level ozone. However, Florida fossil-fuel fired units are subject to emissions reductions requirements of Phase II of EPA's Acid Rain Program, which took effect on January 1, 2000 (Ref. 7.2-1).

The Clean Air Act Amendments capped the nation's sulfur dioxide emissions from power plants, and each utility was allocated sulfur dioxide allowances. To be in compliance with the Act, FPL must hold enough allowances to cover its sulfur dioxide emissions annually. FPL would have to purchase additional allowances from the open market if it did not have enough surplus allowances to operate an additional fossil-burning plant at the Turkey Point Units 3 & 4 site. Nitrogen oxide emissions are also controlled under the Act, and utilities often have to purchase offsets to remain in compliance. Operation of a coal-fired plant may require that FPL purchase nitrogen oxide offsets.

The NRC did not quantify coal-fired emissions, but implied that air impacts would be substantial. The NRC noted that adverse human health effects from coal combustion have led to important federal legislation in recent years, and that public health risks, such as cancer and emphysema, have been associated with coal combustion. The NRC also mentioned global warming and acid rain as potential impacts. FPL concludes that federal legislation and large-scale issues, such as acid rain and global warming, are indications of concerns about destabilizing important attributes of air resources, and that sulfur oxide emission allowances, nitrogen oxide emission offsets, low nitrogen oxide burners, overfire air, selective catalytic reduction, fabric filters or electrostatic precipitators, and scrubbers are regulatorily imposed mitigation measures. As such, FPL concludes that the coal-fired alternative impacts on air quality would be MODERATE; the impacts would be clearly noticeable but would not destabilize air quality in the area.

FPL notes that locating another major air pollution source in the proximity of the Biscayne and Everglades National Parks would further add to the environmental pressures faced by the delicate ecological systems of the parks. Moreover, FPL (or any industrial entity) could experience difficulty in getting regulatory approvals to construct an additional air pollution source on the shore of Biscayne Bay, approximately 2 and 15 miles from the parks, respectively.

Waste Management

FPL concurs with the GEIS assessment that the coal-fired alternative would generate substantial solid waste. The coal-fired plant would annually consume approximately 4,019,418 tons of coal having an ash content of 8.2 percent (Tables 7.2-6 and 7.2-3). After combustion, most (99.9 percent) of this ash (approximately 329,000 tons per year), would be collected and disposed of on site. In addition, approximately 331,000 tons of scrubber sludge would be disposed of on site each year (based on annual calcium hydroxide usage of 186,000 tons). Based on a standard 30-foot-high waste pile, FPL estimates that ash and scrubber waste disposal over the 40-year plant life would impact approximately 340 acres (an area approximately 3,900 feet square). While only half of this waste volume and land use would be attributable to the 20-year license renewal period alternative, the total numbers are pertinent as a cumulative impact.

FPL believes that with proper siting and waste management and monitoring practices, waste disposal would not destabilize any resources. There is space on previously disturbed land within the Turkey Point cooling canal system footprint for this disposal. After closure of the waste site and revegetation, the land would be available for other uses. For these reasons, FPL believes that waste disposal impacts for the coal-fired alternative would be MODERATE; the impacts would be clearly noticeable but would not destabilize any important resource and further mitigation would be unwarranted.

Other Impacts

Construction of the powerblock and coal storage area would impact some land area and associated terrestrial habitat but, because this is a previously disturbed area at an existing industrial site making maximum use of existing facilities, impacts would be minimal. Visual impacts would be consistent with the industrial nature of the site. As with any large construction project, some erosion and sedimentation and fugitive dust emissions could be anticipated, but would be minimized using best management practices. Construction debris from clearing and grubbing could be disposed of on site and municipal waste disposal capacity is nearby. Socioeconomic impacts from the construction workforce would be minimized because worker relocation would not be expected due to the proximity to a large metropolitan area. Cultural resource impacts would be unlikely due to the lack of cultural resources at the site.

Operation using the existing cooling canal system would minimize impacts to aquatic resources and water quality. The additional stacks, boilers, and barge deliveries would be an incremental addition to the visual impact from existing Turkey Point structures and operations. Although a coal-fired plant would require fewer workers than Turkey Point Units 3 & 4, socioeconomic impacts from workforce reduction would be minimal due to the site's proximity to a large metropolitan area.

FPL believes that these other construction and operation impacts would be SMALL. In some cases the impacts would not be detectable, and in all cases they would be so minor that they would neither destabilize nor noticeably alter any important attribute of the resource involved. Due to the minor nature of these other impacts, mitigation would not be warranted beyond that mentioned.

7.2.2.2 OIL-FIRED GENERATION

The NRC concluded that constructing an oil-fired generation alternative would have the same environmental impacts as constructing other large central power-generating stations (e.g., coal-fired alternative). Reduced land requirements, if the new plant was constructed on the existing site, would reduce impacts to other resources that tend to follow land-use impacts: ecological, aesthetic, air quality, water quality, and cultural. A smaller workforce would reduce socioeconomic impacts. The NRC concluded that oil-fired operation impacts would also be similar to those from the coal-fired alternative. Human health concerns associated with air emissions, waste generation, and aquatic biota losses due to cooling water withdrawals and discharges would all be of concern.

FPL has defined, in Section 7.2.1.1, an oil-fired generation alternative located at the existing Turkey Point Units 3 & 4 site. This location, near a large metropolitan area, would mitigate construction and operation socioeconomic impacts, and use of existing facilities would reduce construction impacts to natural and cultural resources. As was the case for the coal-fired alternative, air emissions would be a major impact; waste generation less so but included here for comparison to the coal-fired alternative.

Air Quality

Air quality impacts of oil-fired generation are considerably different from those of nuclear power and similar to those of coal-fired generation. An oil-fired plant would emit sulfur oxides, nitrogen oxides, particulate matter, and carbon monoxide. The

plant design would minimize air emissions through a combination of boiler technology and post-combustion pollutant removal. FPL estimates the oil-fired alternative emissions to be as follows:

Sulfur oxides = 7,637 tons per year

Nitrogen oxides = 3,285 tons per year

Carbon monoxide = 1,579 tons per year

Particulates:

Filterable total suspended particulates = 55 tons per year

Filterable PM_{10} (particulates having a diameter of less than 10 microns) = 35 tons per year

Table 7.2-7 shows how FPL calculated these emissions.

The Section 7.2.2.1 discussion of regional air quality and Clean Air Act requirements is also applicable to the oil-fired generation alternative. Nitrogen oxides effects on ozone levels, sulfur dioxide allowances, nitrogen oxide emission offsets, and proximity to the national parks could all be issues of concern for oil-fired combustion at Turkey Point.

The NRC did not quantify oil-fired emissions but noted that they would be typical of coal plants. FPL concurs and believes that, for the same reasons as for coal-fired generation, impacts from oil-fired generation would be MODERATE with regulatorily imposed mitigation measures.

Waste Management

Oil consumption generates waste in the form of ash, and air pollution control equipment generates additional ash and scrubber sludge. The NRC characterized the amount of this waste as "moderate." FPL estimates that the oil-fired alternative would result in annual combustion of 631,715,837 gallons of fuel having an ash content of 2.08 percent (Tables 7.2-7 and 7.2-4). After combustion, most (99 percent) of this ash would be collected and disposed of on

TABLE 7.2-7
AIR EMISSIONS FROM OIL-FIRED ALTERNATIVE

Parameter	Calculation	Result
Annual oil consumption	$3\text{units} \times \frac{416\ \text{MW}}{\text{unit}} \times \frac{9{,}800\ \text{Btu}}{\text{kW} \times \text{hr}} \times \frac{1{,}000\ \text{kW}}{\text{MW}} \times 0.9 \times \frac{\text{gal}}{152{,}639\ \text{Btu}} \times \frac{24\ \text{hr}}{\text{day}} \times \frac{365\ \text{day}}{\text{yr}}$	631,715,837 gal per year
SO_x[a]	$157 \times \frac{1.54\ \text{lb}}{1{,}000\ \text{gal}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} \times (1-90/100) \times \frac{631{,}715{,}837\ \text{gal}}{\text{yr}}$	7,637 tons SO_x per year
NO_x[a]	$\frac{26\ \text{lb}}{1{,}000\ \text{gal}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} \times (1-60/100) \times \frac{631{,}715{,}837\ \text{gal}}{\text{yr}}$	3,285 tons NO_x per year
CO[a]	$\frac{5\ \text{lb}}{1{,}000\ \text{gal}} \times \frac{\text{ton}}{2000\ \text{lb}} \times \frac{631{,}715{,}837\ \text{gal}}{\text{yr}}$	1,579 tons CO per year
TSP[a]	$\frac{9.19 \times 1.54 + 3.22\ \text{lb}}{1{,}000\ \text{gal}} \times \frac{\text{ton}}{2000\ \text{lb}} \times (1-99/100) \times \frac{631{,}715{,}837\ \text{gal}}{\text{yr}}$	55 tons TSP per year
PM_{10}[b]	$\frac{0.63 \times 55\ \text{tons}}{\text{yr}}$	35 tons PM_{10} per year

Btu = British thermal unit
CO = carbon monoxide
hr = hour
kW = kilowatt
lb = pound
MW = megawatt
NO_x = nitrogen oxide
PM_{10} = particulates having diameter less than 10 microns
SO_x = sulfur dioxide
TSP = total suspended particulates (filterable)

Notes: a. Ref. 7.2-8, Table 1.3-1
b. Ref. 7.2-8, Table 1.3-4

site. In addition, approximately 207,000 tons of scrubber sludge would be disposed of on site each year. This waste total is less than that for the coal-fired alternative and could be disposed of on previously disturbed land at Turkey Point. For the same reasons as for the coal-fired alternative, FPL concludes that the oil-fired alternative impacts would be MODERATE, though smaller than the coal-fired impacts.

Other Impacts

As for the coal-fired alternative, constructing the oil-fired alternative on an existing site such as Turkey Point would reduce construction-related impacts. The NRC estimated in the GEIS that 120 acres would be needed for a plant site; this much previously disturbed acreage is available at the Turkey Point site, reducing loss of terrestrial habitat. Aesthetic impacts, erosion and sedimentation, fugitive dust, and construction debris impacts would be similar to the coal-fired alternative, but smaller due to the reduced site size. Socioeconomic impacts would be minimal due to the location, and cultural resource impacts unlikely.

Operational impacts would be similar, but reduced from coal-fired alternative impacts. Aquatic and water resource impacts would be minimized through use of the existing cooling canal system. Although an oil-fired plant would require fewer workers than Turkey Point Units 3 & 4, socioeconomic impacts from workforce reduction would be minimal due to the site's proximity to a large metropolitan area. Visual impacts from a coal pile would be replaced by visual impacts of large oil storage tanks. Oil fuel transport by barge would not increase the risk of transportation accidents above that for the coal-fired alternative, but might increase ecological risks that could result from a release of oil to the water.

FPL concludes that these other construction and operation impacts would be SMALL and minimally detectable, and would not destabilize or noticeably alter any important attributes of resources involved. FPL also believes that additional mitigation would not be warranted due to the minor nature of these impacts.

7.2.2.3 GAS-FIRED GENERATION

The NRC evaluated environmental impacts from gas-fired generation alternatives in the GEIS, focusing on combined cycle plants. Section 7.2.1.1 presents FPL's reasons for defining the gas-fired generation alternative as a combined cycle plant located at a hypothetical greenfield site in Central Florida rather than at the Turkey Point site. Construction at such a greenfield site would increase impacts above

those from siting the coal- and oil-fired alternatives at Turkey Point because it would necessitate clearing natural habitat, constructing transmission lines and a gas pipeline, and introducing impacts to aquatic resources from operation of a cooling system.

The NRC has evaluated the environmental impacts of constructing and operating four 440-MW combined cycle gas-fired units as an alternative to a nuclear power plant license renewal (Ref. 7.2-4). This analysis would bound the gas-fired alternatives analysis for the Turkey Point Units 3 & 4 alternative because FPL would install fewer and smaller units (three 400-MW units). FPL has independently calculated the emissions from the gas-fired alternative to be consistent with the coal- and oil-fired analyses, but has adopted the rest of the NRC analysis with necessary Florida- and FPL-specific modifications noted.

Land Use

The NRC estimated that 10 acres would be required for offices, roads, parking areas, and a switchyard, and 60 acres for the powerblock. The Turkey Point Units 3 & 4 gas-fired alternative also would involve constructing approximately 60 miles of 350-foot wide transmission line corridor, a total of approximately 2,500 acres, and constructing or upgrading approximately 500 miles of pipeline affecting a 150-foot wide easement, a total of 9,000 acres.

FPL assumes that the pipeline construction would be mostly on previously disturbed land along existing pipeline or highway rights-of-way. FPL concludes that the land use impact would be small to moderate. Generally, land use changes would be so minor that they would neither destabilize nor noticeably alter any important land use resources. Given the length of the pipeline, however, it is reasonable to assume that, in some cases, land use changes would be clearly noticeable, a characteristic of moderate impact.

FPL assumes that the siting analysis would ensure that the gas-fired plant would be located on previously disturbed land, perhaps on land that had previously been under cultivation, resulting in a noticeable (moderate) change in land use on 70 acres. FPL also assumes that transmission line routing would minimize construction over incompatible land uses or sensitive habitats and would result in small impact on land use.

Overall, FPL concludes that land use impacts would be SMALL to MODERATE, depending primarily on gas pipeline routing.

Ecological Resources

Construction at a greenfield site, assumed to be on previously disturbed land, would disturb marginal terrestrial habitat that would have to be investigated for the presence of threatened or endangered species. Assuming appropriate siting analysis, impacts should be small and, in the long run, might result in improved terrestrial habitat on site areas that would not be physically occupied by plant facilities. Plant operation could have moderate effects on aquatic resources affected by cooling water intake and discharge, which are necessary for plant operations. Pipeline and transmission line rights-of-way maintenance practices, as for the preferred alternative of license renewal, should have small impacts on ecological resources. FPL concludes that the gas-fired alternative could have noticeable impacts on ecological resources, resulting in SMALL to MODERATE impacts.

Aesthetics

The combustion turbines and heat recovery steam generators would be relatively low structures that could be visible at a moderate offsite distance depending on the area chosen. Additionally, the taller (about 100 feet) turbine building, up to 125-foot exhaust stacks, cooling tower vapor plumes, and pipeline compressors would be visible from off site. As discussed in the GEIS, aesthetic resource impacts would be noticeable, but would not exert a destabilizing effect. FPL concludes that the gas-fired generation aesthetic impacts would be SMALL to MODERATE.

Water Quality

Each of the gas-fired alternative units would include a heat recovery boiler from which steam would turn an electric generator. Steam would be condensed and circulated back to the boiler for reuse. FPL assumes that the source of water for cooling the circulating water would be a closed cycle system utilizing cooling towers. The gas-fired alternative would affect surface water quality through makeup for and blowdown from the closed cycle cooling system. Intake and discharge would be regulated by the State and would involve relatively small quantities of water compared to the coal- and oil-fired alternatives. FPL concludes that the water quality impacts would be minor and would not noticeably alter any important water resource. These impacts would be SMALL.

Air Quality

Natural gas is a relatively clean-burning fuel, and the gas-fired alternative would release similar types of emissions but in lesser quantities than the coal- and oil-fired alternatives, except for particulates. Control technology for gas-fired turbines focuses on nitrogen oxide emissions. FPL estimates the gas-fired alternative emissions to be as follows:

Sulfur oxides = 15 tons per year

Nitrogen oxides = 221 tons per year

Carbon monoxide = 211 tons per year

Particulates (filterable) = 484 tons per year (all particulates are PM_{10})

Table 7.2-8 shows how FPL calculated these emissions.

The discussion in Section 7.2.2.1 of regional air quality and Clean Air Act requirements is also applicable to the gas-fired generation alternative. Nitrogen oxide effects on ozone levels, sulfur dioxide allowances, and nitrogen oxide emission offsets could all be issues of concern for gas-fired combustion. While gas-fired turbine emissions are less than coal- and oil-fired boiler emissions, and regulatory requirements are less stringent, the emissions are still substantial. However, site-specific modeling would be necessary to determine whether the emissions would noticeably alter local air quality. In the absence of modeling, and in order to avoid overstating the impacts, FPL concludes that the impacts would be SMALL.

Waste Management

Gas-fired generation would result in almost no waste generation, producing minor, if any, impacts. FPL concludes that gas-fired generation waste management impacts would be SMALL.

TABLE 7.2-8
AIR EMISSIONS FROM GAS-FIRED ALTERNATIVE

Parameter	Calculation	Result
Annual gas consumption	$3\ \text{units} \times \frac{312\ \text{MW}}{\text{unit}} \times \frac{6{,}800\ \text{Btu}}{\text{kW} \times \text{hr}} \times \frac{1{,}000\ \text{kW}}{\text{MW}} \times 0.9 \times \frac{\text{ft}^3}{1{,}014\ \text{Btu}} \times \frac{24\ \text{hr}}{\text{day}} \times \frac{365\ \text{day}}{\text{yr}}$	49,487,261,538 ft^3 per year
Annual Btu input	$3\ \text{units} \times \frac{312\ \text{MW}}{\text{unit}} \times \frac{6{,}800\ \text{Btu}}{\text{kW} \times \text{hr}} \times \frac{1{,}000\ \text{kW}}{\text{MW}} \times 0.9 \times \frac{24\ \text{hr}}{\text{day}} \times \frac{365\ \text{day}}{\text{yr}} \times \frac{\text{MMBTU}}{10^6 \times \text{BTU}}$	50,180,083 MMBtu per year
SO_x[a]	$\frac{0.0006\ \text{lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2000\ \text{lb}} \times \frac{50{,}180{,}083\ \text{MMBtu}}{\text{yr}}$	15 tons SO_x per year
NO_x[b]	$\frac{0.0088\ \text{lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2000\ \text{lb}} \times \frac{50{,}180{,}083\ \text{MMBtu}}{\text{yr}}$	221 tons NO_x per year
CO[b]	$\frac{0.0084\ \text{lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2000\ \text{lb}} \times \frac{50{,}180{,}083\ \text{MMBtu}}{\text{yr}}$	211 tons CO per year
TSP[a]	$\frac{0.0193\ \text{lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2000\ \text{lb}} \times \frac{50{,}180{,}083\ \text{MMBtu}}{\text{yr}}$	484 tons filterable TSP per year
PM_{10}[a]	$\frac{484\ \text{tons TSP}}{\text{yr}}$	484 tons filterable PM_{10} per year

Btu = British thermal unit
CO = carbon monoxide
hr = hour
kW = kilowatt
lb = pound
MW = megawatt
NO_x = nitrogen oxides
PM_{10} = particulates having diameter less than 10 microns
SO_x = sulfur oxides
TSP = total suspended particulates (filterable)

Notes: a. Ref. 7.2-9, Table 3.1-1

B. REF. 7.2-9, TABLE 3.1-2

Human Health

The GEIS mentions potential gas-fired alternative risks that are associated with air emissions. FPL assumes that regulatory requirements imposed on air emissions are designed to protect human health and that compliance with those requirements would result in SMALL, if any, impacts on human health.

Socioeconomics

The GEIS anticipated a work force of approximately 150, which would have moderate long-term economic benefits, presumably to the local economy. Given the hypothetical plant's proximity to the Miami area, FPL believes that the adverse socioeconomic impact of a reduction in the Turkey Point workforce would be small, and given the small size of the gas-fired alternative workforce, impacts in the vicinity of that plant also would be SMALL. As for the coal- and oil-fired alternatives, the gas-fired alternative would mean a substantial reduction in the size of the Turkey Point Units 3 & 4 workforce.

Cultural Resources

Gas-fired generation plant and pipeline construction could require cultural resource studies and preservation measures. FPL anticipates that these measures would result in no detectable change in cultural resources or that the effects would be minor and not exert a destabilizing influence on this resource. FPL concludes that impacts to cultural resources would be SMALL, if any.

7.2.2.4 PURCHASE POWER

As discussed in Section 7.1.2.2, FPL assumes that the generating technology employed under the purchased power alternative would be one of those that the NRC analyzed in the GEIS. FPL is also adopting by reference, the NRC analysis of the environmental impacts from those technologies. Under the purchased power alternative, therefore, environmental impacts would still occur, but would be located elsewhere within the region, nation, or Canada.

The purchased power alternative would include adding 350 miles of transmission lines to get power from the Florida state line to the load center in Miami. This could result in up to 15,000 acres of land use change with associated terrestrial ecology impacts. FPL assumes that the transmission line construction mostly

would be on previously disturbed land along existing transmission line rights-of-way. FPL concludes that the land use impact would be small to moderate. Generally, land use changes would be so minor that they would neither destabilize nor noticeably alter any important land use resources. Given the length of the transmission lines, however, it is reasonable to assume that in some cases land use changes would be clearly noticeable, a characteristic of an impact that is MODERATE.

7.3 REFERENCES

Ref. 7.0-1 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437. Washington, D.C. May 1996.

Ref. 7.0-2 U.S. Nuclear Regulatory Commission. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses." *Federal Register*. Vol. 61, No. 244 (December 18, 1996): 66537-54.

Ref. 7.1-1 U.S. Nuclear Regulatory Commission. *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities.* NUREG-0586. Washington, D.C. August 1988.

Ref. 7.2-1 Energy Information Administration. *State Energy Profiles*. Table 1, Figures 1 and 2. 1999. www.eia.doe.gov/cneaf/st_profiles/florida/ft.html. Accessed December 3, 1999.

Ref. 7.2-2 Florida Power & Light Company. *FPL Ten Year Power Plant Site Plan; 1999-2008*. Miami, Fla. April 1999.

Ref. 7.2-3 Florida Power & Light Company. *Florida Power and Light Energy Mix*. http//www.fpl.com/html/fplfactsheet.pdf. Accessed October 7, 1999.

Ref. 7.2-4 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Calvert Cliffs Nuclear Power Plant*. NUREG-1437, Supplement 1. Office of Nuclear Reactor Regulations, Washington, D.C. October 1999.

Ref. 7.2-5 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Oconee Nuclear Station*. NUREG-1437, Supplement 2. Office of Nuclear Reactor Regulations, Washington, D.C. December 1999.

Ref. 7.2-6 U.S. Environmental Protection Agency. *Air Pollutant Emission Factors.* Vol. I, *Stationary Point Sources and Area Sources.* Chapter 1, *External Combustion Sources*, Section 1.1, "Bituminous and Subbituminous Coal Combustion." AP-42. September 1998. http://www.epa.gov/ttn/chief/ap42c1.html. Accessed February 4, 2000.

Ref. 7.2-7 Energy Information Administration. Form EIA-767, "Steam Electric Plant Operation and Design Report." Table 28, "Average Quality of Fossil Fuels Burned at U.S. Electric Utilities by Census Division and State, 1996 and 1997." 1999. http://www.eia.doe.gov/cneaf/electricity/epav2/epav2t28.txt. Accessed February 4, 2000.

Ref. 7.2-8 U.S. Environmental Protection Agency. *Air Pollutant Emission Factors.* Vol. 1, *Stationary Point Sources and Area Sources.* Chapter 1, *External Combustion Sources,* Section 1.3, "Fuel Oil Combustion." AP-42. September 1998, and Errata to Section 1.3. http://www.epa.gov/ttn/chief/ap42c1.html. Accessed February 4, 2000.

Ref. 7.2-9 U.S. Environmental Protection Agency. *Air Pollutant Emission Factors*. Vol. 1, *Stationary Point Sources and Area Sources.* Chapter 3, *Stationary Internal Combustion Sources,* Section 3.1, "Stationary Gas Turbines for Electricity Generation." AP-42. October 1996. http://www.epa.gov/ttn/chief/ap42c3.html. Accessed February 4, 2000.

Ref. 7.2-10 South Carolina Electric and Gas Company. *Environmental Assessment for Cope Power Plant; 1200 MW Pulverized Coal Project Located Near Cope, South Carolina*. Vol. 1 & 2, Columbia, S.C., October 1991.

8.0 COMPARISON OF ENVIRONMENTAL IMPACTS OF LICENSE RENEWAL WITH THE ALTERNATIVES

8.1 DISCUSSION

NRC

"To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form..." 10 CFR 51.45(b)(3) as adopted by 51.53(c)(2)

Chapter 4 analyzes environmental impacts for Turkey Point Units 3 & 4 and Chapter 7 analyzes impacts from renewal alternatives. Table 8.1-1 summarizes environmental impacts of the proposed action (license renewal) and the alternatives so that the reader can compare them. The environmental impacts compared in Table 8.1-1 are those that either are a Category 2 issue for the proposed action, license renewal, or are issues that the GEIS (Ref 8.1-1) identified as major considerations in an alternatives analysis. For example, although the NRC concluded that air quality impacts from the proposed action would be small (Category 1), the GEIS identified major human health concerns associated with air emissions from alternatives (Section 7.2.2.1). Therefore, Table 8.1-1 compares air quality impacts among the proposed action and alternatives. Table 8.1-2 is a more detailed comparison of the alternatives.

TABLE 8.1-1
IMPACTS COMPARISON SUMMARY

Impact	Proposed Action (License Renewal)	No-Action Alternative				
		Base (Decommissioning)	With Coal-Fired Generation	With Oil-Fired Generation	With Gas-Fired Generation	With Purchased Power
Land Use	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE	MODERATE
Water Quality	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE
Air Quality	SMALL	SMALL	MODERATE	MODERATE	SMALL	SMALL to MODERATE
Ecological Resources	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE
Human Health	SMALL	SMALL	MODERATE	SMALL	SMALL	SMALL to MODERATE
Socioeconomics	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Waste Management	SMALL	SMALL	MODERATE	MODERATE	SMALL	SMALL to MODERATE
Aesthetics	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE
Cultural Resources	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL

SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. MODERATE - Environmental effects are sufficient to alter noticeably but not to destabilize any important attribute of the resource. 10 CFR 51, Subpart A, Appendix B, Table B-1, footnote 3.

TABLE 8.1-2
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	No-Action Alternative				
	Base (Decommissioning)	With Coal-Fired Generation	With Oil-Fired Generation	With Gas-Fired Generation	With Purchased Power
	Description				
Turkey Point Units 3 & 4 license renewals for 20 years each, followed by decommissioning (Chapter 3)	Decommissioning following expiration of current Turkey Point Units 3 & 4 licenses. Adopting by reference, as bounding Turkey Point Units 3 & 4 decommissioning, GEIS description (Section 7.1)	New construction at the Turkey Point site	New construction at the Turkey Point site	New construction at a greenfield site in Central Florida Construct 500 miles of gas pipeline in a 150-foot wide corridor Construct 60 miles of 500kV transmission lines in 350-foot wide corridor	Construct 350 miles or more of transmission lines Could involve construction of new generation capacity out of state. Adopting by reference GEIS description of alternate technologies (Section 7.2.1.2)
		Three 400-MW tangentially-fired, dry bottom units; capacity factor 0.9	Three 400-MW tangentially-fired units; capacity factor 0.9	Three 400-MW units: each consisting of two 150-MW combustion turbines and a 100-MW heat recovery boiler; capacity factor 0.9	
		Existing cooling canal system	Existing cooling canal system	Mechanical draft cooling towers	

TABLE 8.1-2 (Cont'd)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternative			
		With Coal-Fired Generation	With Oil-Fired Generation	With Gas-Fired Generation	With Purchased Power
		Description (Cont'd)			
		Pulverized bituminous coal, 11,976 Btu/pound; 9,600 Btu/kWh; 8.2% ash; 1.61% sulfur; 9.7 lb/ton nitrogen oxides; 4,019,418 tons coal/yr	No. 6 fuel oil; 152,639 Btu/gallon; 9,800 Btu/kWh; 2.08% ash; 1.54% sulfur; 26 lb NO_x/1000 gallons; 631,715,837 gallons oil/yr	Natural gas, 1,014 Btu/ft^3; 6,800 Btu/kWh; 0.0006 lb sulfur/MMBtu; 0.0088 lb NO_x/MMBtu; 49,487,261,538 ft^3 gas/yr	
		Low NO_x burners, overfire air (60% NO_x reduction efficiency)	Low NO_x burners, overfire air (60% NO_x reduction efficiency)	Dry, low NO_x burners, water injection, selective catalytic reduction	
		Dry lime/limestone flue gas desulfurization (90% SO_x removal efficiency); 217,000 tons limestone/yr	Dry lime/limestone flue gas desulfurization (90% SO_x removal efficiency); 217,000 tons limestone/yr		
		Fabric filters or electrostatic precipitators (99.9% particulate removal efficiency)	Fabric filters (99% particulate removal efficiency)		
		250 workers (Section 7.2.1.1)	200 workers (Section 7.2.1.1)	150 workers (Section 7.2.1.1)	

TABLE 8.1-2 (Cont'd)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	No-Action Alternative				
	Base (Decommissioning)	With Coal-Fired Generation	With Oil-Fired Generation	With Gas-Fired Generation	With Purchased Power
			Land Use Impacts		
SMALL – Adopting by reference Category 1 issue findings (Table 4.0-2, Issues 52, 53)	SMALL – Not an impact evaluated by GEIS (Ref. 8.1-1, Section 7.3)	SMALL – 340 acres on existing site for ash and scrubber sludge disposal (Section 7.2.2.1)	SMALL -120 acres (Section 7.2.2.2)	SMALL to MODERATE - 70 acres at greenfield site; 9,000 acres for pipeline; 2,500 acres for transmission lines (Section 7.2.2.3)	MODERATE - 15,000 acres for transmission facilities (Section 7.2.2.4) Adopting by reference GEIS description of land use impacts from alternate technologies (Ref. 8.1-1, Section 8.2)
			Water Quality Impacts		
SMALL – Adopting by reference Category 1 issue findings (Table 4.0-2, Issues 7-11, 37-38). Category 2 water-use-conflicts and groundwater issues not applicable (Section 4.1, Issue 13, Section 4.5, Issue 33, Section 4.6, Issue 34, Section 4.7, Issue 35, and Section 4.8, Issue 39).	SMALL – Adopting by reference Category 1 issue finding (Table 4.0-2, Issue 89).	SMALL – Construction impacts minimized by use of best management practices. Operation impacts minimized by use of existing cooling canal system (Section 7.2.2.1)	SMALL – Same as for coal-fired generation (Section 7.2.2.2)	SMALL – Reduced cooling water demands, inherent in combined cycle design, and use of closed cycle cooling minimize impacts (Section 7.2.2.3)	SMALL to MODERATE - Adopting by reference GEIS description of water quality impacts from alternate technologies (Ref. 8.1-1, Section 8.2)

TABLE 8.1-2 (Cont'd)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	No-Action Alternative				
	Base (Decommissioning)	With Coal-Fired Generation	With Oil-Fired Generation	With Gas-Fired Generation	With Purchased Power
Air Quality Impacts					
SMALL – Adopting by reference Category 1 issue finding (Table 4.0-2, Issue 51). Category 2 issue not applicable (Section 4.11, Issue 50).	SMALL – Adopting by reference Category 1 issue findings (Table 4.0-2, Issue 88)	MODERATE – • 12,295 tons SO_x/yr • 7,798 tons NO_x/yr • 1,005 tons CO/yr • 165 tons TSP/yr • 38 tons PM_{10}/yr (Section 7.2.2.1)	MODERATE – • 7,637 tons SO_x/yr • 3,285 tons NO_x/yr • 1,579 tons CO/yr • 55 tons TSP/yr • 35 tons PM_{10}/yr (Section 7.2.2.2)	SMALL – • 15 tons SO_x/yr • 221 tons NO_x/yr • 211 tons CO/yr • 484 tons PM_{10}/yr[a] (Section 7.2.2.3)	SMALL to MODERATE – Adopting by reference GEIS description of air quality impacts from alternate technologies (Ref. 8.1-1, Section 8.2)
Ecological Resource Impacts					
SMALL – Adopting by reference Category 1 issue findings (Table 4.0-2, Issues 15-17, 20-24, 44-48). Four Category 2 issues not applicable (Section 4.2, Issue 25, Section 4.3, Issue 26, Section 4.4, Issue 27, and Section 4.9, Issue 40).	SMALL – Adopting by reference Category 1 issue finding (Table 4.0-2, Issue 90)	SMALL – Use of previously disturbed land minimizes impact to quality habitats. Continued protection of endangered crocodile habitat (Section 7.2.2.1)	SMALL – Same as for coal-fired generation but smaller acreage (Section 7.2.2.2)	SMALL to MODERATE – Cooling water intake and discharge could have aquatic resource impacts (Section 7.2.2.3)	SMALL to MODERATE – Adopting by reference GEIS description of ecological resource impacts from alternate technologies (Ref. 8.1-1, Section 8.2)

TABLE 8.1-2 (Cont'd)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	No-Action Alternative				
	Base (Decommissioning)	With Coal-Fired Generation	With Oil-Fired Generation	With Gas-Fired Generation	With Purchased Power
		Ecological Resource Impacts (Cont'd)			
Impacts to threatened and endangered species expected to be positive due to extensive crocodile management program (Section 4.10, Issue 49)					
		Human Health Impacts			
SMALL – Category 1 issues (Table 4.0-2, Issues 56, 58, 61, 62). Risk from microbiological organisms minimal due to harsh environment in cooling canals (Section 4.12, Issue 57). Risk due to transmission-line-induced currents minimal due to conformance with consensus code (Section 4.13, Issue 59)	SMALL – Adopting by reference Category 1 issue finding (Table 4.0-2, Issue 86)	MODERATE – Adopting by reference GEIS conclusion that risks such as cancer and emphysema is likely from emissions are likely (Ref. 8.1-1, Section 8.3.9)	SMALL - Adopting by reference GEIS conclusion that some risk of cancer and emphysema is likely from emissions (Ref. 8.1-1, Section 8.3.9)	SMALL - Adopting by reference GEIS conclusion that some risk of cancer and emphysema is likely from emissions (Ref. 8.1-1, Table 8.2)	SMALL to MODERATE – Adopting by reference GEIS description of human health impacts from alternate technologies (Ref. 8.1-1, Section 8.2)

TABLE 8.1-2 (Cont'd)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	No-Action Alternative				
	Base (Decommissioning)	With Coal-Fired Generation	With Oil-Fired Generation	With Gas-Fired Generation	With Purchased Power
	Socioeconomic Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4.0-2, Issues 64, 67). Two Category 2 issues not applicable (Section 4.16, Issue 66 and Section 4.17.1, Issue 68). Proximity to large metropolitan area minimizes potential for housing impact (Section 4.14, Issue 63). Plant contribution is small proportion of county tax base, minimizing potential for land use impacts (Section 4.17.2, Issue 69). Capacity of public water supply and transportation services minimizes potential for related impacts	SMALL – Adopting by reference Category 1 issue finding (Table 4.0-2, Issue 91)	SMALL – As for proposed action, proximity to large metropolitan area minimizes potential for socioeconomic impact (Section 7.2.2.1)	SMALL – As for proposed action, proximity to large metropolitan area minimizes potential for socioeconomic impact (Section 7.2.2.2)	SMALL – Reduced size of workforce would minimize socioeconomic impacts (Section 7.2.2.3)	SMALL – Adopting by reference GEIS description of socioeconomic impacts from alternate technologies (Ref. 8.1-1, Section 8.2)

TABLE 8.1-2 (Cont'd)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	No-Action Alternative				
	Base (Decommissioning)	With Coal-Fired Generation	With Oil-Fired Generation	With Gas-Fired Generation	With Purchased Power
			Socioeconomic Impacts (Cont'd)		
(Section 4.15, Issue 65, and Section 4.18, Issue 70)					
			Waste Management Impacts		
SMALL – Adopting by reference Category 1 issue findings (Table 4.0-2, Issues 77-85)	SMALL – Adopting by reference Category 1 issue finding (Table 4.0-2, Issue 87)	MODERATE - 329,000 tons ash and 331,000 tons scrubber sludge generated annually (Section 7.2.2.1)	MODERATE – 207,000 tons of scrubber sludge generated annually (Section 7.2.2.2)	SMALL – Almost no waste generation (Section 7.2.2.3)	SMALL to MODERATE – Adopting by reference GEIS description of waste management impacts from alternate technologies (Ref. 8.1-1, Section 8.2)
			Aesthetic Impacts		
SMALL – Adopting by reference Category 1 issue findings (Table 4.0-2, Issues 73, 74)	SMALL – Not an impact evaluated by GEIS (Ref. 8.1-1, Section 7.3)	SMALL – Incremental addition to existing structures and barge traffic (Section 7.2.2.1)	SMALL – Incremental addition to existing structures and barge traffic (Section 7.2.2.2)	SMALL to MODERATE – Site structures, cooling tower plumes, and transmission lines visible off site (Section 7.2.2.3)	SMALL to MODERATE – Adopting by reference GEIS description of aesthetic impacts from alternate technologies (Ref. 8.1-1, Section 8.2)

TABLE 8.1-2 (Cont'd)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	No-Action Alternative				
	Base (Decommissioning)	With Coal-Fired Generation	With Oil-Fired Generation	With Gas-Fired Generation	With Purchased Power
Cultural Resource Impacts					
SMALL – Lack of resources and SHPO consultation minimizes potential for impact (Section 4.19, Issue 71)	SMALL – Not an impact evaluated by GEIS (Ref. 8.1-1, Section 7.3)	SMALL – Impacts unlikely due to lack of resources on site (Section 7.2.2.1)	SMALL – Impacts unlikely due to lack of resources on site. (Section 7.2.2.2)	SMALL – Preservation measures, if necessary, would minimize impact (Section 7.2.2.3)	SMALL – Adopting by reference GEIS description of cultural resource impacts from alternate technologies (Ref. 8.1-1, Section 8.2)

SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. MODERATE - Environmental effects are sufficient to alter noticeably but not to destabilize any important attribute of the resource.
10 CFR 51, Subpart A, Appendix B, Table B-1, footnote 3.

Btu = British thermal unit
ft^3 = cubic foot
gal = gallon
GEIS = Generic Environmental Impact Statement (Ref. 8.1-1)
kWh = kilowatt hour
lb = pound
MM = million
MW = megawatt
NO_x = nitrogen oxide
PM_{10} = particulates having diameter less than 10 microns
SHPO = State Historic Preservation Officer
SO_x = sulfur dioxide
TSP = total suspended particulates
yr = year

Notes: a. All TSP for gas fired alternative is PM_{10}.

8.2 REFERENCES

Ref. 8.1-1 U.S. Nuclear Regulatory Commission. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437. Washington, D.C. May 1996.

9.0 STATUS OF COMPLIANCE

9.1 PROPOSED ACTION

NRC

"The environmental report shall list all Federal permits, licenses, approvals and other entitlements which must be obtained in connection with the proposed action and shall describe the status of compliance with these requirements. The environmental report shall also include a discussion of the status of compliance with applicable environmental quality standards and requirements including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements which have been imposed by Federal, State, regional, and local agencies having responsibility for environmental protection." 10 CFR 51.45(d), as required by 10 CFR 51.53(c)(2)

9.1.1 GENERAL

Table 9.1-1 lists environmental authorizations that FPL has obtained for current Turkey Point Units 3 & 4 operations. In this context, FPL uses "authorizations" to include any permits, licenses, approvals, or other entitlements. FPL expects to continue renewing these authorizations during the current license period and through the NRC license renewal period. Based on the new and significant information identification process that Chapter 5 describes, Turkey Point Units 3 & 4 are in compliance with applicable environmental standards and requirements.

Table 9.1-2 lists additional environmental authorizations and consultations that would be conditions precedent to NRC renewal of the Turkey Point Units 3 & 4 licenses to operate. As indicated, FPL anticipates needing relatively few such authorizations and consultations. Sections 9.1.2 through 9.1.5 discuss some of these items in more detail.

TABLE 9.1-1
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT TURKEY POINT UNITS 3 & 4 OPERATIONS

Agency	Authority	Requirement	Number	Expiration or Consultation Date	Activity Covered
Federal Prerequisites to License Renewal					
U.S. Nuclear Regulatory Commission	Atomic Energy Act [42 USC 2011, et seq.], 10 CFR 50.10	License to operate	DPR-31 (Unit 3); DPR-41 (Unit 4)	7/19/12 (Unit 3); 4/10/13 (Unit 4)	Operation of Units 3 & 4
DEP	Clean Water Act Section 401 [33 USC 1341]	Certification of compliance with State water quality standards	FL0001562 (Section I.E.15)	4/30/98	Discharges during license renewal term (Appendix E)
U.S. District Court	Clean Water Act	Consent Decree	70-328-CA	None	Recirculating condenser cooling water system (canals)
U.S. Fish and Wildlife Service	Migratory Bird Treaty Act [16 USC 703 – 712]	Permit	PRT-697722	12/31/00	Carcass salvage and injured bird transport
State and Local Authorizations					
South Florida Water Management District	Florida Statutes § 120.54(5)	Agreement	4-FPL-22 8046/306	None	Interceptor ditch operation, groundwater monitoring
DEP	Florida Statutes Clean Water Act Section 402 (33 USC 1342); § 403	Discharge permit	FL0001562	1/6/05	Closed-loop cooling canal and 2 solids settling basins (fossil). State implementation of National Pollutant Discharge Elimination System (Appendix E)

TABLE 9.1-1 (Cont'd)
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT TURKEY POINT UNITS 3 & 4 OPERATIONS

Agency	Authority	Requirement	Number	Expiration or Consultation Date	Activity Covered
DEP	Florida Statutes § 403.087	Wastewater treatment permit	FLA013612-002	1/25/01	Sewage treatment facility
DEP	Florida Statutes Chapter 376	Annual storage tank registration	Facility ID 8622249, Placard No. 110600	06/30/00	Operation of above-ground storage tanks. Seven for petroleum products and one for sulfuric acid
DEP	Florida Statutes Chapter 376	Annual storage tank registration	Facility ID 8622251, Placard No. 110599	06/30/00	Operation of three above-ground and two underground petroleum storage tanks
DEP	Florida Statutes Chapter 403	Air permit	0250003-002-AV	12/31/03	Emissions from nine diesel emergency generators, miscellaneous diesel engines, and miscellaneous unregulated and insignificant emissions units and/or activities
DEP	Florida Statutes Chapter 403	Underground injection control permit	U013-277655	11/5/00	Sanitary wastewater disposal to well
FWCC	Florida Administrative Code Chapter 39	Scientific collecting permit	WS97115	5/26/00	Salvaging carcasses of protected wildlife

TABLE 9.1-1 (Cont'd)
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT TURKEY POINT UNITS 3 & 4 OPERATIONS

Agency	Authority	Requirement	Number	Expiration or Consultation Date	Activity Covered
FWCC	Florida Administrative Code Chapter 39	Special purpose permit	WX98470	3/2/01	Live-capturing crocodiles, alligators, and Eastern indigo snakes
DERM	Code of Miami-Dade County Chapter 24	Multiple source annual operating permit	MSP-70010-99	9/30/00	Boiler makeup water treatment system, fleet operations, two underground storage tanks, barge slip operations, and refrigerant use and recovery
DERM	Code of Miami-Dade County Chapter 24	Domestic wastewater annual operating permit	DWO-00010-99	4/14/00	Sewage treatment facility
Miami-Dade County, Florida Fire Rescue Department		Burning permit	7575	2/2/00	

CFR = Code of Federal Regulations
DEP = (Florida) Department of Environmental Protection
DERM = (Miami-Dade County, Florida) Department of Environmental Resources Management
FWCC = (Florida) Fish and Wildlife Conservation Commission

TABLE 9.1-2
ENVIRONMENTAL AUTHORIZATIONS FOR TURKEY POINT UNITS 3 & 4 LICENSE RENEWAL[a]

Agency	Authority	Requirement	Remarks
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011 et seq.)	License renewal	Environmental Report submitted in support of license renewal application
FWS and NMFS	Endangered Species Act Section 7 (16 USC 1536)	Consultation	Requires Federal agency issuing a license to consult with FWS and NMFS. NMFS has concurred that license renewal is unlikely to affect species under its purview (Appendix B)
Florida Department of Environmental Protection	Clean Water Act Section 401 (33 USC 1341)	Certification	Turkey Point NPDES permit constitutes State Certification (Appendix E)
Florida Division of Historic Resources	National Historic Preservation Act Section 106 (16 USC 470f)	Consultation	Requires Federal agency issuing a license to consider cultural impacts and consult with State Historic Preservation Officer (SHPO). SHPO has concurred that license renewal will not affect any sites listed or eligible for listing (Appendix D)
Florida Department of Community Affairs	Federal Coastal Zone Management Act (16 USC 1451 et seq.)	Certification	Requires an applicant to provide certification to the Federal agency issuing the license that license renewal would be consistent with the federally approved state coastal zone management program. Based on its review of the proposed activity, the State must concur with or object to the applicant's certification (Appendix G)

FPL = Florida Power & Light Company
FWS = U.S. Fish and Wildlife Service
NMFS = National Marine Fisheries Service
NPDES = National Pollutant Discharge Elimination System

Notes: a. No renewal-related requirements identified for local or other agencies.

9.1.2 THREATENED AND ENDANGERED SPECIES CONSULTATION

Section 7 of the Endangered Species Act (16 USC 1531 et seq.) requires federal agencies to ensure that agency action is not likely to jeopardize any species that is listed or threatened. Depending on the action involved, the Act requires consultation with the U.S. Fish and Wildlife Service (FWS) regarding effects on non-marine species, the National Marine Fisheries Service (NMFS), for marine species, or both. FWS and NMFS have issued joint procedural regulations at 50 CFR 402, Subpart B, which address consultation, and FWS maintains the joint list of threatened and endangered species at 50 CFR 17.

As discussed in Section 4.10, several federal threatened and endangered species and state species of concern are found on the Turkey Point Units 3 & 4 site, the Turkey Point Units 3 & 4 transmission line corridors, and in the Turkey Point Units 3 & 4 vicinity. These include marine and non-marine species. Although not required by federal law or NRC regulation, FPL has chosen to invite comment from federal and state agencies regarding potential effects that Turkey Point Units 3 & 4 license renewal might have. Appendix B includes copies of FPL correspondence with FWS and NMFS. In addition, FPL has corresponded with the Florida Fish and Wildlife Conservation Commission regarding potential effects on state-listed species; Appendix B also includes copies of this correspondence. Based on the FPL submittals and meeting discussions, as discussed in detail in Section 4.10, the agencies concur with the FPL conclusion that Turkey Point Units 3 & 4 license renewal would not adversely affect threatened or endangered species or critical habitat. To the contrary, license renewal effects on threatened and endangered species could be beneficial due to continued stewardship of species habitat.

9.1.3 COASTAL ZONE MANAGEMENT PROGRAM COMPLIANCE

The Federal Coastal Zone Management Act (16 USC 1451 et seq.) imposes requirements on applicants for a federal license to conduct an activity that could affect a state's coastal zone. The Act requires the applicant to certify to the licensing agency that the proposed activity would be consistent with the state's federally approved coastal zone management program [16 USC 1456(c)(3)(A)]. The National Oceanic and Atmospheric Administration (NOAA) has promulgated implementing regulations that indicate that the requirement is applicable to renewal of federal licenses for activities not previously reviewed by the state [15 CFR 930.51(b)(1)]. The regulation requires that the license applicant provide its

certification to the federal licensing agency and a copy to the applicable state agency (15 CFR 930.57[a]).

The NRC Office of Nuclear Reactor Regulation has issued guidance to its staff regarding compliance with the Act. This guidance acknowledges that Florida has an approved coastal zone management program (Ref. 9.1-1, Attachment 5). Turkey Point Units 3 & 4 are located within the Florida coastal zone and Appendix G of the Turkey Point Units 3 & 4 Environmental Report contains a copy of the FPL coastal zone management program certification for Turkey Point Units 3 & 4 license renewal. FPL submitted project descriptive material and a certification to the State (Appendix G).

9.1.4 HISTORIC PRESERVATION CONSULTATION

Section 106 of the National Historic Preservation Act (16 USC 470 et seq.) requires Federal agencies having the authority to license any undertaking to, prior to issuing the license, take into account the effect of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. Council regulations provide for establishing an agreement with the State Historic Preservation Officer (SHPO) to substitute state review for Council review (35 CFR 800.7). Although not required by federal law or NRC regulation, FPL has chosen to invite comment by the Florida SHPO. Appendix D of the Turkey Point Units 3 & 4 Environmental Report includes copies of FPL correspondence with the SHPO. Based on the FPL submittal and meeting discussions, the SHPO concurred with the FPL conclusion that Turkey Point Units 3 & 4 license renewal would not affect known historic or archaeological properties.

9.1.5 WATER QUALITY CERTIFICATION

Federal Clean Water Act Section 401 requires that applicants for a Federal license to conduct an activity that might result in a discharge into navigable water provide the licensing agency a certification from the state that the discharge will comply with applicable Clean Water Act requirements (33 USC 1341). FPL is applying to the NRC for a license (i.e., license renewal) to continue Turkey Point Units 3 & 4 operations.

The State of Florida has U.S. Environmental Protection Agency (EPA) authorization to implement the National Pollutant Discharge Elimination System (NPDES) within the state for facilities such as Turkey Point. Pursuant to State authority and the

EPA authorization, the Florida Department of Environmental Protection has issued an Industrial Wastewater Facility permit for the Turkey Point plant. Appendix E of the Turkey Point Units 3 & 4 Environmental Report contains a copy of the permit. Permit Section I.E.15 (page E-24) indicates that the permit constitutes Section 401 certification.

9.2 ALTERNATIVES

NRC

"The discussion of alternatives in the report shall include a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements." 10 CFR 51.53(c)(2)

The coal-, gas-, oil-fired and purchase power alternatives that Section 7.2.1 discusses probably could be constructed and operated so as to comply with all applicable environmental quality standards and requirements. FPL notes that increasingly stringent air quality protection requirements could make construction of a large new fossil-fuel-fired power plant infeasible in many locations. FPL recognizes, for example, that it could be difficult to obtain regulatory approvals to construct a major new air emission source in close proximity to Biscayne National Park and Everglades National Park.

9.3 REFERENCES

Ref. 9.1-1 U.S. Nuclear Regulatory Commission Office of Nuclear Reactor Regulation. *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues*. Revision 2 Washington, D.C. 1999.