8.0 Environmental Impacts of Alternatives to License Renewal

This chapter examines the potential environmental impacts associated with denying the renewal of an operating license (OL) (i.e., the no-action alternative); the potential environmental impacts from electric generating sources other than Turkey Point Units 3 and 4; the possibility of purchasing electric power from other sources to replace power generated by Units 3 and 4 and the associated environmental impacts; the potential environmental impacts from a combination of generating and conservation measures; and other generation alternatives that were deemed unsuitable for replacement of power generated by Units 3 and 4. The environmental impacts are evaluated using the U.S. Nuclear Regulatory Commission's (NRC's) three-level standard of significance—SMALL, MODERATE, or LARGE—developed using the Council on Environmental Quality guidelines and set forth in the footnotes to Table B-1 of 10 CFR 51, Subpart A, Appendix B:

> SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
>
> MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize important attributes of the resource.
>
> LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

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

8.1 No-Action Alternative

For license renewal, the no-action alternative refers to a scenario in which the NRC would not renew the Turkey Point Units 3 and 4 OLs, and the Florida Power & Light Company (FPL) would then decommission Turkey Point Units 3 and 4 when plant operations cease. Replacement of Turkey Point Units 3 and 4 electricity generation capacity would be met by

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

(1) demand-side management and energy conservation, (2) power purchased from other electricity providers, (3) generating alternatives other than Turkey Point Units 3 and 4, or (4) some combination of these options.

FPL will be required to comply with NRC decommissioning requirements whether or not the OLs are renewed. If the Turkey Point Units 3 and 4 OLs are renewed, decommissioning activities may be postponed for up to an additional 20 years. If the OLs are not renewed, FPL would conduct decommissioning activities according to the requirements in 10 CFR 50.82. The GEIS (NRC 1996; 1999) and the *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities* (NRC 1988) provide descriptions of decommissioning activities.

The environmental impacts associated with decommissioning under the no-action alternative would be bounded by the discussion of impacts in Chapter 7 of the GEIS, Chapter 7 of this Supplemental Environmental Impact Statement (SEIS), and the *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities* (NRC 1988). The impacts of decommissioning after 60 years of operation are not expected to be significantly different from those occurring after 40 years of operation.

The environmental impacts for the socioeconomic, historic and archaeological resources, and environmental justice impact categories are summarized in Table 8-1 and discussed in the ensuing paragraphs. Impacts for all other impact categories would be SMALL as shown in Table 9-1.

- Socioeconomic: When Turkey Point Units 3 and 4 cease operation, there will be a decrease in employment and tax revenues associated with the closure. These impacts would be concentrated in Miami-Dade County with lesser impacts in Broward and Monroe counties. Most secondary employment impacts and impacts on population would also be concentrated in Miami-Dade County and to a lesser extent in Broward and Monroe counties. Approximately 85 percent of employees who work at Turkey Point Units 3 and 4 live in Miami-Dade County, 7 percent live in Broward County, 7 percent live in Monroe County, and the remainder live in other locations (FPL 2000a). The extent of impacts on Miami-Dade County, particularly the southern portion of the county, will depend on the extent to which economic and population growth projected for South Miami-Dade County materializes (see Section 2.2.8.6).

  Most of the tax revenue losses resulting from closure of Turkey Point Units 3 and 4 would occur in Miami-Dade County. In 1998, FPL paid $10.14 million in property taxes to Miami-Dade County for Turkey Point Units 3 and 4, or about 1.6 percent of all property taxes collected by the county. The no-action alternative would result in the loss of these taxes as well as the loss of plant payrolls 20 years earlier than if the OLs were renewed.

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

Impact Category	Impact	Comment
Socioeconomic	SMALL to MODERATE	SMALL–if current growth projections for South Miami-Dade County materialize. MODERATE–decrease in employment, higher-paying jobs, and tax revenues assuming projected growth projections for South Miami-Dade County do not materialize.
Historic and Archaeological Resources	SMALL	Land occupied by Units 3 and 4 would likely be retained by FPL
Environmental Justice	SMALL to MODERATE	SMALL–if growth projections for South Miami-Dade County materialize. MODERATE–loss of employment opportunities if growth projections are not realized.

There would be some adverse impacts on housing values, the local economy in South Miami-Dade County, and employment if Turkey Point Units 3 and 4 were to cease operations. The local area is still in the process of recovering from the partial closure of the Homestead Air Force Base in 1994 and from the effects of Hurricane Andrew in 1992, both of which have had an adverse effect on employment opportunities and the local housing market.

FPL employees at Turkey Point Units 3 and 4 currently contribute time and money toward community involvement, including schools, churches, charities, and other civic activities. It is likely that with a reduced presence in the community following decommissioning, FPL's community involvement efforts in the region would be lessened.

If the growth forecasts for South Miami-Dade County materialize, the socioeconomic consequences of nonrenewal of the OLs could be partially or entirely offset by the new jobs created by such growth. What is not known are the types of jobs and pay scale of the projected employment increase. If some of the new jobs are skilled, higher-paying jobs, then the impacts of nonrenewal of the Turkey Point Units 3 and 4 OLs could be significantly mitigated and the socioeconomic consequence of closure would be SMALL. If the jobs are less skilled and lower-paying jobs, then the impact of plant closure could be only partially offset and the impacts would be MODERATE.

- Historic and Archaeological Resources: The potential for future adverse impacts to known or unrecorded cultural resources at Turkey Point Units 3 and 4 following decommissioning will depend on the future use of the site land. Following decommissioning, land occupied by Units 3 and 4 would likely be retained by FPL. The system of cooling canals would continue to be needed for operation of Turkey Point fossil-fuel Units 1 and 2. Eventual sale or transfer of the land occupied by Units 3 and 4 could result in adverse impacts on these resources if the land-use pattern changes dramatically. The impacts of this alternative on historic and archaeological resources are considered SMALL.

- Environmental Justice for No-Action: Current operations at Turkey Point Units 3 and 4 have no disproportionate impacts on the minority and low-income populations of the surrounding counties, and no environmental pathways have been identified that would cause disproportionate impacts. Closure of Units 3 and 4 would result in decreased employment opportunities and tax revenues in South Miami-Dade County with possible negative and disproportionate impacts on minority or low-income populations. The extent of the impacts would depend on the extent to which projected economic growth for South Miami-Dade County materializes and the extent to which those impacted are able to commute from the south part of the county to jobs elsewhere in the county. If projected growth is not fully realized, then employment opportunities for minority and low-income populations could be disproportionately impacted. Under this scenario, the environmental justice impacts are considered SMALL to MODERATE. Alternatively, if projected growth does materialize, the impacts of closure on minority and low-income populations would be mitigated, regardless of whether the created jobs are low- or high-paying jobs. The environmental justice impacts under this scenario are considered SMALL.

8.2 Alternative Energy Sources

This section discusses the environmental impacts associated with alternative sources of electric power to replace the power generated by Turkey Point Units 3 and 4, assuming that the OLs for Units 3 and 4 are not renewed. The following generation alternatives are considered in detail:

- coal-fired generation at the Turkey Point site and an alternate Florida site (Section 8.2.1)

- natural gas-fired generation at the Turkey Point site and an alternate Florida site (Section 8.2.2)

- nuclear generation at the Turkey Point site and an alternate Florida site (Section 8.2.3)

- oil-fired generation at the Turkey Point site (Section 8.2.4).

The alternative of purchasing power from other sources to replace power generated at Turkey Point Units 3 and 4 is discussed in Section 8.2.5. Other power generation alternatives and

conservation alternatives considered by the staff and found not to be reasonable replacements for Units 3 and 4 are discussed in Section 8.2.6. Section 8.2.7 discusses the environmental impacts of a combination of generation and conservation alternatives. The impacts associated with a combination of alternatives are estimated to be the same as or larger than the environmental consequences of renewal of the OLs for Turkey Point Units 3 and 4. The order of presentation of alternative energy sources in Section 8.2 does not imply which alternative would be most likely to occur or to have the least environmental impacts.

Each year the Energy Information Administration (EIA), a component of the U.S. Department of Energy (DOE), issues an Annual Energy Outlook. The *Annual Energy Outlook 2001*, was issued in December 2000 (DOE/EIA 2000a). In it, EIA projects that combined-cycle or combustion turbine technology fueled by natural gas is likely to account for approximately 92 percent of new electric generating capacity between the years 2000 and 2020 (DOE/EIA 2000a). Both technologies are designed primarily to supply peak and intermediate capacity, but combined-cycle technology can also be used to meet baseload[(a)] requirements. Coal-fired plants are projected by EIA to account for approximately 6 percent of new capacity during this period. Coal-fired plants are generally used to meet baseload requirements. Renewable energy sources, primarily wind, biomass gasification, and municipal solid waste units, are projected by EIA to account for the remaining 2 percent of capacity additions. EIA's projections are based on the assumption that providers of new generating capacity will seek to minimize cost while meeting applicable environmental requirements. Combined-cycle plants are projected by EIA to have the lowest generation cost in 2005 and 2020, followed by coal-fired plants and then wind generation (DOE/EIA 2000a).

EIA projects that oil-fired plants will account for very little of new generation capacity in the United States during the 2000 to 2020 time period because of higher fuel costs and lower efficiencies (DOE/EIA 2000a). Nevertheless, an oil-fired generating alternative at the Turkey Point site for replacement of power generated by Turkey Point Units 3 and 4 is considered in Section 8.2.4, principally because co-located Turkey Points Units 1 and 2 are oil-fired generation plants and infrastructure to support the oil-fired generation option is already in place at the Turkey Point site.

EIA also projects that new nuclear power plants will not account for any new generation capacity in the United States during the 2000 to 2020 time period because natural gas and coal-fired plants are projected to be more economical (DOE/EIA 2000a). In spite of this projection, a new nuclear plant alternative for replacement of power generated by Turkey Point Units 3 and 4 is considered in Section 8.2.3. Since 1997, the NRC has certified three new standard designs for nuclear power plants under the procedures in 10 CFR 52, Subpart B.

(a) A baseload plant normally operates to supply all or part of the minimum continuous load of a system and consequently produces electricity at an essentially constant rate. Nuclear power plants are commonly used for baseload generation; i.e., these units generally run near full load.

These designs are the U.S. Advanced Boiling Water Reactor (10 CFR 52, Appendix A), the System 80+ Design (40 CFR 52, Appendix B), and the AP600 Design (10 CFR 52, Appendix C). The submission to the NRC of these three applications for certification indicates continuing interest in the possibility of licensing new nuclear power plants. NRC has recently established a New Reactor Licensing Project Office to prepare for and manage future reactor and site licensing applications (NRC 2001).

Turkey Point Units 3 and 4 have a combined net summer rating of 1386 megawatts electric (MW[e]). For the coal, natural gas, and oil-fired alternatives, FPL's Environmental Report (ER; FPL 2000a) assumes three standard 400-MW(e) units[(a)] as potential replacements for Units 3 and 4. This approach is followed in this SEIS, although it results in some environmental impacts that are roughly 13 percent lower than if full replacement capacity were constructed. FPL's reasoning is that, although customized unit sizes can be built, use of standardized sizes is more economical. Moreover, using four 400-MW(e) units for the analysis would overestimate environmental impacts and tend to make the fossil alternatives less attractive.

FPL identified three preferred and three additional potential sites in Florida, all with existing FPL generating units, for possible future generation additions in its *Ten Year Power Plant Site Plan* prepared for the Florida Public Service Commission (FPL 2000b). The three preferred sites are: (1) a site 6 km (4 mi) east of Tice in Lee County, (2) property within the city limits of Debary in Volusia County, and (3) a site 11 km (7 mi) northwest of Indiantown in Martin County. The Martin County site is the closest preferred site to Turkey Point. The three additional potential sites are: (1) a site in Brevard County near the city of Port St. Johns, (2) a site in Palm Beach County within the city limits of Riviera Beach, and (3) a site in Broward County at Port Everglades within the city limits of Fort Lauderdale. The potential site in Broward County is the closest of the designated preferred and potential sites to the Turkey Point site. This SEIS has been prepared taking account of these preferred and potential sites, but not being limited to these particular sites.

8.2.1 Coal-Fired Generation

The coal-fired alternative is analyzed for both the Turkey Point site and an alternate site in Florida, such as one of the preferred or potential sites identified by FPL in its *Ten Year Power Plant Site Plan* (FPL 2000b). Construction of three 400-MW(e) units is assumed as discussed in Section 8.2. Construction at an alternate site would necessitate the construction of a new 500-kV transmission line to connect to existing lines to transmit power to FPL's customers in the Miami area. The FPL ER assumes that the new line would be approximately 96 km (60 mi) long (FPL 2000a).

(a) The gas-fired units would have a rating of 416 gross MW and 400 net MW. The coal-fired units would have a rating of 424 gross MW and 400 net MW. The difference between "gross" and "net" is the electricity consumed onsite.

The coal-fired plant would consume approximately 3.6 million metric tons (MT) (4.0 million tons) per year of pulverized bituminous coal with an ash content of approximately 8.2 percent (FPL 2000a). The ER assumes a heat rate[(a)] of 2.8 joules (J) of fuel /J of electricity (9600 Btu/kWh) and a capacity factor[(b)] of 0.9 (FPL 2000a). After combustion, 99.9 percent of the ash would be collected and disposed of at the plant site. In addition, approximately 300,000 MT (329,000 tons) of scrubber sludge would be disposed of at the plant site based on annual calcium hydroxide usage of approximately 169,000 MT (186,000 tons). Calcium hydroxide[(c)] is used in the scrubbing process for control of sulfur dioxide (SO_2) emissions.

The FPL ER assumes that coal and calcium hydroxide would be delivered by barge to the existing Turkey Point receiving dock. This dock is currently used for oil deliveries for Turkey Point Units 1 and 2. Any barge delivery would require the barges and accompanying vessels to pass through Biscayne National Park and the dredged channel that serves the dock. Such delivery would have an adverse aesthetic impact on park visitors. The park ecology would also be negatively impacted by routine transport and potentially impacted significantly if an accident occurred during transport.

An alternative means of delivery would be by rail. The Florida East Coast Railroad and CSX Transportation Inc. have tracks that serve the Miami area (Florida Department of Transportation 2001). Tracks of the Florida East Coast Railroad are approximately 14 km (9 mi) northwest of the Turkey Point site (NRC 1996). Construction of a rail spur to the Turkey Point site couldoccur in sensitive Everglades wetland areas and have negative ecological impacts both from construction and operation. Rail delivery would be the most likely option for delivering coal to an alternate inland Florida site for the coal plant. Barge delivery is potentially feasible for a coastal site.

For the rail delivery option, coal would likely be delivered by rail trains of approximately 115 cars each. Each open-top rail car holds about 90 MT (100 tons) of coal. Additional rail cars would be needed for lime delivery. In all, approximately 340 trains per year would deliver the coal and lime for the three units. An average of roughly 13 train trips per week on the rail spur would be needed, because for each full train delivery there would be an empty return train.

(a) Heat rate is a measure of generating plant thermal efficiency. The value given is in both metric and English units. It is more commonly expressed in British thermal units (Btu) per net kilowatt-hour (kWh). It is computed by dividing the total Btu content of fuel burned for electric generation by the resulting net kWh generation.

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

(c) Calcium hydroxide is prepared by reacting lime with water, a process called slaking. Calcium hydroxide is also known as hydrated lime or slaked lime. Calcium oxide (lime) is prepared by heating calcium carbonate (i.e., limestone) in a lime kiln to about 500°C to 600°C, which decomposes the limestone into the oxide and carbon dioxide.

A coal slurry pipeline is another potential alternative for delivering coal. However, such a pipeline would need to cover a great distance to reach a suitable coal-mining area or the coal would need to be transported by alternative means (e.g., rail) to a site closer to the Turkey Point site for introduction into the pipeline. The coal slurry pipeline alternative for delivering coal is not considered a feasible alternative because of the length of the pipeline that would be needed and is not further evaluated in this SEIS.

Unless otherwise indicated, the assumptions and numerical values used in Section 8.2.1 are from the FPL ER (FPL 2000a). The staff reviewed this information and compared it to environmental impact information in the GEIS. Although the OL renewal period is only 20 years, the impact of operating the coal-fired alternative for 40 years is considered (as a reasonable projection of the operating life of a coal-fired plant).

8.2.1.1 Closed-Cycle Cooling System

A coal-fired plant located at the Turkey Point site would use the existing canal system as a source of cooling. An alternate site could use either a closed-cycle or a once-through cooling system. FPL did not analyze an alternate site for a coal-fired plant in its ER, but assumed that an alternative natural gas-fired plant at a central Florida location would use a closed-cycle cooling system using mechanical draft cooling towers (FPL 2000a).

The overall impacts of the coal-fired generating system are discussed in the following sections and summarized in Table 8-2. The extent of impacts at an alternate Florida site will depend on the location of the particular site selected.

- **Land Use**

  The existing facilities and infrastructure at the Turkey Point site would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, it is assumed that the coal-fired replacement plant alternative would use the cooling canal system, switchyard, offices, and transmission line right-of-way. Much of the land that would be used has been previously disturbed.

  The coal-fired generation alternative would necessitate converting roughly an additional 360 ha (900 ac) of the Turkey Point site to industrial use for the plant, coal storage, and ash and scrubber sludge disposal. Additional land-use changes would occur offsite in an undetermined coal-mining area to supply coal for the plant. The GEIS estimated that approximately 8900 ha (22,000 ac) would be affected for mining the coal and disposing of the waste to support a coal plant during its operational life. Partially offsetting this offsite land use would be the elimination of the need for uranium mining to supply fuel for Units 3 and 4. The GEIS estimated that approximately 400 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a nuclear power plant.

Table 8-2. Summary of Environmental Impacts of Coal-Fired Generation at Turkey Point Site and an Alternate Florida Site Using Closed-Cycle Cooling

	Turkey Point Site		Alternate Florida Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	MODERATE	Uses approximately 570 ha (1400 ac) for plant, waste disposal, and rail spur; additional offsite land impacts for coal and limestone mining.	MODERATE to LARGE	Uses approximately 1770 ha (4300 ac), for plant, offices, parking, transmission line, and rail spur; additional land impacts for coal and limestone mining.
Ecology	MODERATE to LARGE	Uses undeveloped areas at current Turkey Point site, plus rail corridor or barge channel. Barge traffic in Biscayne Bay would adversely affect the marine ecosystem.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission line route; potential habitat loss and fragmentation; reduced productivity and biological diversity.
Water Use and Quality	SMALL	Uses existing cooling canal system	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body.
Air Quality	MODERATE	Sulfur oxides C 11,200 MT/yr (12,300 tons/yr) Nitrogen oxides C 7000 MT/yr (7800 tons/yr) Particulates C 150 MT/yr (165 tons/yr) of total suspended particulates, including 34 MT/yr (38 tons/yr) of PM_{10}	MODERATE	Potentially same impacts as the Turkey Point site, although pollution-control standards may vary.

Table 8-2. (contd)

	Turkey Point Site		Alternate Florida Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Air Quality (contd)		Carbon monoxide C 900 MT/yr (1000 tons/yr) Small amounts of mercury and other hazardous air pollutants and naturally occurring radioactive materials – mainly uranium and thorium		
Waste	MODERATE	Total waste volume would be approximately 600,000 MT/yr (660,000 tons/yr) of ash and scrubber sludge requiring approximately 138 ha (340 ac) for disposal during the 40-year life of the plant.	MODERATE	Same impacts as Turkey Point site; waste disposal constraints may vary.
Human Health	SMALL	Impacts are uncertain, but considered SMALL in the absence of more quantitative data.	SMALL	Same impact as the Turkey Point site.
Socioeconomics	SMALL to LARGE	During construction, impacts would be MODERATE. Up to 2500 workers during the peak period of the 5-year construction period, followed by reduction from current Turkey Point Units 3 and 4 work force of 960 to 250; tax base preserved. Impacts during operation would be SMALL. Transportation impacts associated with construction workers could be MODERATE to LARGE.	SMALL to LARGE	Construction impacts depend on location, but could be LARGE if plant is located in an area that is more rural than the Turkey Point site. Miami-Dade County would experience loss of tax base and employment, potentially offset by projected economic growth. Transportation impacts associated with construction workers could be MODERATE to LARGE.

Table 8-2. (contd)

	Turkey Point Site		Alternate Florida Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Socioeconomics (contd)		For rail transportation of coal and lime, the impact is considered MODERATE to LARGE. For barge transportation, the impact is considered SMALL.		For rail transportation of coal and lime, the impact is considered MODERATE to LARGE. For barge transportation, the impact is considered SMALL.
Aesthetics	LARGE	LARGE aesthetic impact due to impact of plant units and stacks on environmentally sensitive Biscayne National Park. Barge transportation of coal and lime would have a MODERATE aesthetic impact. Noise impact would be MODERATE given the environmental sensitivity of Biscayne National Park.	MODERATE to LARGE	Greatest impact is from the new transmission line that would be needed.
Historic and Archeological Resources	SMALL	Some construction would affect previously developed parts of Turkey Point site; cultural resource inventory should minimize any impacts on undeveloped lands.	SMALL	Alternate location would necessitate cultural resource studies
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction; loss of 710 operating jobs could reduce employment prospects for minority and low-income populations. Impacts could be offset by projected economic growth and the ability of affected workers to commute to other jobs.	SMALL to MODERATE	Impacts will vary depending on population distribution and makeup at the site.

If coal is delivered by rail, an additional approximately 70 ha (160 ac) would be needed for a rail spur.

The waste would be disposed of onsite, accounting for approximately 138 ha (340 ac) of land area over the 40-year plant life.

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

Construction of the coal-fired generation alternative at an alternate Florida site could impact up to 700 ha (1700 ac) (NRC 1996). An additional 1000 ha (2500 ac) would be needed for a transmission line to connect to existing lines to transmit power to FPL customers in the Miami area. Up to 70 ha (160 ac) could also be needed for a rail spur for coal and lime delivery, assuming that the alternate site location is within 16 km (10 mi) of the nearest railway connection. Depending particularly on transmission line and rail line routing, this alternative would result in MODERATE to LARGE land-use impacts.

- **Ecology**

Locating a coal-fired plant at the Turkey Point site would alter ecological resources because of the need to convert roughly 360 ha (900 ac) of land to industrial use (plant, coal storage, ash and scrubber sludge disposal). However, some of this land would have been previously disturbed.

Ecological impacts associated with transporting coal and lime to the Turkey Point site would be significant. The rail option would involve constructing a rail spur with a minimum length of 14 km (9 mi). Construction of at least a portion of the spur through ecologically sensitive wetlands would likely be needed. The barge delivery option would have negative ecological implications for waters included within Biscayne National Park. Written scoping comments submitted by the National Park Service (included in Appendix A) state that barges delivering oil for Turkey Point Units 1 and 2 have run aground within Biscayne National Park numerous times. The comments state that each trip adversely impacts water quality by churning up the bottom of Biscayne Bay and creating a turbidity plume that lasts long after the barge has passed. Turbidity limits the photosynthesis of the phytoplanktonic and seagrass communities that are essential for a healthy marine ecosystem. The comments also point out that the thrust from the tugboat may disrupt seagrass recovery by ripping it from the bottom along with other attached vegetation.

Siting a coal-fired plant at Turkey Point would have a MODERATE to LARGE ecological impact that would be greater than renewal of the Unit 3 and 4 OLs.

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

- **Water Use and Quality**

The coal-fired generation alternative at the Turkey Point site is assumed to use the existing cooling canal system, which would minimize incremental water-use and quality impacts. Surface-water impacts are expected to remain SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

It is assumed that a coal-fired plant located at Turkey Point would obtain potable, process, and fire-protection water from the Miami-Dade County public water system similar to the current practice for Turkey Point Units 3 and 4 (see Section 2.2.2).

Alternate sites would likely use a closed-cycle cooling system with cooling towers. For alternate sites, the impact on the surface water would depend on the volume of water needed for makeup water, the discharge volume, and the characteristics of the receiving body of water. Intake from and discharge to any surface body of water would be regulated by the State of Florida. The impacts would be SMALL to MODERATE.

No groundwater is currently used for operation of Turkey Point Units 3 and 4. It is unlikely that groundwater would be used for an alternative coal-fired plant sited at Turkey Point site. Use of groundwater for a coal-fired plant sited at an alternate site is a possibility. Any groundwater withdrawal would require a permit from the local permitting authority.

- **Air Quality**

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

A new coal-fired generating plant located in southern Florida would likely need a prevention of significant deterioration (PSD) permit and an operating permit under the Clean Air Act. The plant would need to comply with the new source performance standards for such plants

set forth in 40 CFR 60, Subpart Da. The standards establish limits for particulate matter and opacity (40 CFR 60.42a), SO_2 (40 CFR 60.43a), and NO_x (40 CFR 60.44a).

Section 169A of the Clean Air Act (42 USC 7491) establishes a national goal of preventing future and remedying existing impairment of visibility in mandatory Class I Federal areas when impairment results from man-made air pollution. Everglades National Park is a Class I area where visibility is an important value (40 CFR 81.407). Any new fossil power plant in southern Florida has the potential to affect visibility in the Everglades National Park. The U.S. Environmental Protection Agency (EPA) has various regulatory requirements for visibility protection in 40 CFR 51, Subpart P, including a specific requirement for review of any new major stationary source in an area designated as attainment or unclassified under the Clean Air Act. All of south-central Florida is classified as attainment or unclassified for criteria pollutants, except that Broward and Miami-Dade counties are maintenance areas for ozone (40 CFR 81.310). EPA issued a new regional haze rule in 1999 (64 FR 35714; July 1,1999 [EPA 1999]). The rule specifies that for each mandatory Class I Federal area located within a State, the State must establish goals that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most-impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period [40 CFR 51.308(d)(1)].

Impacts for particular pollutants are as follows:

Sulfur oxides emissions. FPL states in its ER that an alternative coal-fired plant located at the Turkey Point site would use spray-drying technology (dry scrubber) for flue gas desulfurization rather than a wet scrubber (FPL 2000a). Lime/limestone would be used for the flue gas desulfurization (FPL 2000a). FPL notes that the saline groundwater at the Turkey Point site 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.

A new coal-fired power plant would be subject to the requirements in Title IV of the Clean Air Act. Title IV was enacted to reduce emissions of SO_2 and NO_x, the two principal precursors of acid rain, by restricting emissions of these pollutants from power plants. Title IV caps aggregate annual power plant SO_2 emissions and imposes controls on SO_2 emissions through a system of marketable allowances. EPA issues one allowance for each ton of SO_2 that a unit is allowed to emit. New units do not receive allowances, but are required to have allowances to cover their SO_2 emissions. Owners of new units must therefore acquire allowances from owners of other power plants by purchase or reduce SO_2 emissions at other power plants they own. Allowances can be banked for use in future years. Thus, a new coal-fired power plant would not add to net regional SO_2 emissions, although it might do so locally. Regardless, SO_2 emissions would be greater for the coal alternative than the OL renewal alternative.

FPL estimates that by using the best available control technology for SO_x emissions, the total annual stack emissions would be approximately 11,200 MT (12,300 tons) of SO_x (FPL 2000a).

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

FPL estimates that using the best available control technology, the total annual NO_x emissions for a new coal-fired power plant would be approximately 7000 MT (7800 tons). This level of NO_x emissions would be greater than the OL renewal alternative.

Particulate emissions. FPL estimates that the total annual stack emissions would include 150 MT (165 tons) of filterable total suspended particulates. The 150 MT would include 34 MT (38 tons) of particulate matter having an aerodynamic diameter less than or equal to 10 µm (PM_{10}) (40 CFR 50.6). Fabric filters or electrostatic precipitators would be used for control. In addition, coal-handling equipment would introduce fugitive particulate emissions. Particulate emissions would be greater under the coal alternative than the OL renewal alternative.

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

Carbon monoxide emissions. FPL estimates that the total carbon monoxide emissions would be approximately 900 MT (1000 tons) per year. This level of emissions is greater than the OL renewal alternative.

Hazardous air pollutants including mercury. In December 2000, EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam generating units (EPA 2000). EPA determined that coal- and oil-fired electric utility steam-generating units are significant emitters of hazardous air pollutants. Coal-fired power plants were found by EPA to emit arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, hydrogen fluoride, lead, manganese, and mercury (EPA 2000). EPA concluded that mercury is the hazardous air pollutant of greatest concern. EPA found that (1) there is a link between coal consumption and mercury emissions; (2) electric utility steam-generating units are the largest domestic source of mercury emissions; and (3) certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures resulting from

consumption of contaminated fish (EPA 2000). Accordingly, EPA added coal- and oil-fired electric utility steam-generating units to the list of source categories under Section 112(c) of the Clean Air Act for which emission standards for hazardous air pollutants will be issued (EPA 2000).

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

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

Siting a coal-fired generation plant at a site other than Turkey Point would not significantly change air-quality impacts, although it could result in installing more or less stringent pollution-control equipment to meet applicable local requirements. Therefore, the impacts would be MODERATE.

- **Waste**

Coal combustion generates waste in the form of ash, and equipment for controlling air pollution generates additional ash and scrubber sludge. Three 400-MW(e) coal-fired plants would generate approximately 600,000 MT (660,000 tons) of this waste annually for 40 years. The waste would be disposed of onsite, accounting for approximately 138 ha (340 ac) of land area over the 40-year plant life. Waste impacts to groundwater and surface water could extend beyond the operating life of the plant if leachate and runoff from the waste storage area occurs. Disposal of the waste could noticeably affect land use and groundwater quality, but with appropriate management and monitoring, it would not destabilize any resources. After closure of the waste site and revegetation, the land could be available for other uses. For these reasons, the appropriate characterization of impacts from waste generated from burning coal is MODERATE; the impacts would be clearly noticeable, but would not destabilize any important resource.

Construction-related debris would be generated during construction activities.

Siting the facility at a site other than Turkey Point would not alter waste generation, although other sites might have more constraints on disposal locations. Therefore, the impacts would be MODERATE.

- **Human Health**

Coal-fired power generation introduces worker risks from fuel and limestone mining, and worker and public risks from fuel and lime/limestone transportation and inhalation of stack-emissions. Emission impacts can be widespread and health risks difficult to quantify. The coal alternative also introduces the risk of coal-pile fires and attendant inhalation risks.

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

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

- **Socioeconomics**

Construction of the coal-fired alternative would take approximately 5 years. It is assumed that construction would take place while Turkey Point Units 3 and 4 continue operation and would be completed by the time Units 3 and 4 permanently cease operations. The work force would be expected to vary between 1200 and 2500 workers during the 5-year construction period (NRC 1996; 1999). These workers would be in addition to the approximately 960 workers employed at Units 3 and 4. During construction, the surrounding communities would experience demands on housing and public services that could have MODERATE impacts. These impacts would be tempered by construction workers commuting to the site from other parts of Miami-Dade County or from other counties. After construction, the communities would be impacted by the loss of the construction jobs, although this loss would be possibly offset by other growth currently being projected for South Miami-Dade County.

If the coal-fired replacement plant were constructed at the Turkey Point site and Units 3 and 4 were decommissioned, there would be a loss of approximately 710 permanent high-paying jobs (960 for two nuclear units down to 250 for the coal-fired plant), with a commensurate reduction in demand on socioeconomic resources and contribution to the regional economy. However, as discussed previously, projected economic growth in South Miami-Dade County could temper or offset the projected loss of jobs from the closure of Units 3 and 4. The coal-fired plants would provide a new tax base to offset the loss of tax base associated with the decommissioning of the nuclear units. For all of these reasons, the appropriate characterization of nontransportation socioeconomic impacts for a coal-fired plant constructed at the Turkey Point site would be SMALL to MODERATE; the socioeconomic impacts would be noticeable, but would be unlikely to destabilize the area.

During the 5-year construction period of replacement coal-fired units, up to 2500 construction workers would be working at the site in addition to the 960 workers at Units 3 and 4. The addition of these workers could place significant traffic loads on existing highways, particularly those leading to the Turkey Point site from Florida City. Such impacts would be MODERATE to LARGE.

For transportation related to commuting of plant operating personnel, the impacts are considered SMALL. The maximum number of plant operating personnel would be approximately 250. The current Turkey Point Units 3 and 4 work force is approximately 960. Therefore, traffic impacts associated with plant personnel commuting to a coal-fired plant would be expected to be SMALL compared to the current impacts from Turkey Point Units 3 and 4 operations.

For rail transportation related to coal and lime delivery to the Turkey Point site, the impacts are considered MODERATE to LARGE. Approximately 340 trains per year would be needed to deliver the coal and lime for the three coal-fired units. A total of 13 train trips is expected per week, or nearly 2 trips per day, because for each full train delivery there would be an empty train. On several days per week, there could be three trains per day using the rail spur to the Turkey Point site. Barge delivery of coal and lime would have SMALL socioeconomic impacts.

Construction of a replacement coal-fired power plant at an alternate Florida site would relocate some socioeconomic impacts, but would not eliminate them. The communities around Turkey Point would still experience the impact of Turkey Point Units 3 and 4 operational job loss (although potentially tempered by projected economic growth), and the communities around the new site would have to absorb the impacts of a large, temporary work force (up to 2500 workers at the peak of construction) and a permanent work force of approximately 250 workers. The GEIS indicated that socioeconomic impacts at a rural site would be larger than at an urban site, because more of the peak construction work force would need to move to the area to work. The Turkey Point site is within commuting distance of the Miami metropolitan area and is therefore not considered a rural site.

Alternate sites in Florida would need to be analyzed on a case-by-case basis. Socio-economic impacts at a rural site could be LARGE. Transportation-related impacts associated with commuting construction workers at an alternate Florida site are site dependent, but could be MODERATE to LARGE. Transportation impacts related to commuting of plant operating personnel would also be site dependent, but can be characterized as SMALL to MODERATE.

At an alternate Florida site, coal and lime would likely be delivered by rail, although barge delivery is feasible for a coastal location. Transportation impacts would depend upon the site location. Socioeconomic impacts associated with rail transportation would likely be MODERATE to LARGE. Barge delivery of coal and lime would likely have SMALL socioeconomic impacts.

- **Aesthetics**

If sited at Turkey Point, the three coal-fired power plant units could be as much as 60 m (200 ft) tall and be visible in daylight hours over many miles. The three exhaust stacks would be somewhere in the range of 120 to 185 m (400 to 600 ft) high. Given the low elevation at the site and of the surrounding land, the stacks would be highly visible in daylight hours for distances up to 16 km (10 mi). The units and associated stacks would also be visible at night because of outside lighting. The National Park Service states in its scoping comments (see Appendix E) that the Turkey Point Plant can be seen at night as far east as the park's barrier islands, which are 11 km (7 mi) offshore. The visual impact of a new coal-fired plant could be mitigated by landscaping and color selection for buildings that is consistent with the environment. The visual impact at night could be mitigated by reduced use of lighting and appropriate use of shielding.

The aesthetic impact of the replacement coal-fired units on visitors to Biscayne National Park would be significant. Given the environmental sensitivity of the park and the associated expectations of visitors to national parks, the addition of the coal-fired units and the associated exhaust stacks would likely have a LARGE aesthetic impact.

If coal and lime for a new coal-fired plant were delivered by barge to the Turkey Point site, the tugboat and barges would pass through Biscayne National Park. Given the environmental sensitivity of the park and the associated expectations of visitors to national parks, there would likely be a MODERATE aesthetic impact on visitors to the park associated with such traffic. During construction of the plant, it is also possible that equipment would be delivered by barge and thereby pass through the park.

Coal-fired generation would introduce mechanical sources of noise that would be audible offsite, especially within Biscayne National Park. Sources contributing to total noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations.

Intermittent sources include the equipment related to coal handling, solid-waste disposal, transportation related to coal and lime delivery, use of outside loudspeakers, and the commuting of plant employees. The incremental noise impacts of a coal-fired plant compared to existing Turkey Point Units 3 and 4 operations are considered to be MODERATE. Impacts would be most significant for visitors to Biscayne National Park.

Noise impacts associated with rail delivery of coal and lime to a plant at Turkey Point would be most significant for residents living in the vicinity of the facility and along the rail route. Although noise from passing trains significantly raises noise levels near the rail corridor, the short duration of the noise reduces the impact. Nevertheless, given the frequency of train transport and the many residents likely to be within hearing distance of the rail route, the impacts of noise on residents in the vicinity of the facility and the rail line is considered MODERATE.

Noise associated with barge transportation of coal and lime would be audible to visitors to Biscayne National Park. Given the environmental sensitivity of the park and the associated expectations of visitors to national parks, there would likely be a MODERATE noise impact on visitors to the park associated with such traffic.

At an alternate Florida site, there would be an aesthetic impact from the buildings, exhaust stacks, cooling towers, and the plume associated with the cooling towers. There would be a significant aesthetic impact associated with construction of a new 96-km (60-mi) transmission line to connect to other lines to enable delivery of electricity to the Miami area. Noise and light from the plant would be detectable offsite. Aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power plants. Overall the aesthetic impacts associated with locating at an alternate site can be categorized as MODERATE to LARGE. The greatest contributor to this categorization is the aesthetic impact of the new transmission line.

- **Historic and Archaeological Resources**

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

Prior to construction at the Turkey Point site or an alternate Florida site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-

way). Historic and archaeological resource impacts can generally be effectively managed and as such are considered SMALL.

- **Environmental Justice**

  No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement coal-fired plant were built at the Turkey Point site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect the minority and low-income populations. Closure of Turkey Point Units 3 and 4 would result in a decrease in employment of approximately 710 operating employees, possibly offset by projected growth in the South Miami-Dade County area. Following construction, it is possible that the ability of local government to maintain social services could be reduced at the same time as diminished economic conditions reduce employment prospects for minority or low-income populations. Overall, impacts would be SMALL to MODERATE, and would depend on the extent to which projected economic growth is realized and the ability of minority or low-income populations to commute to other jobs outside the South Miami-Dade County area.

  Impacts at other sites would depend upon the site chosen and the nearby population distribution, but are likely to also be SMALL to MODERATE.

8.2.1.2 Once-Through Cooling System

This section discusses the environmental impacts of constructing a coal-fired generation system at an alternate Florida site using once-through cooling. The impacts (SMALL, MODERATE, or LARGE) of this option are the same as the impacts for a coal-fired plant using the closed-cycle system. However, there are minor environmental differences between the closed-cycle and once-through cooling systems. Table 8.3 summarizes the incremental differences.

8.2.2 Natural Gas-Fired Generation

FPL concluded in its ER that the Turkey Point site would not be a reasonable site for location of a natural gas-fired generating unit. The basis for this determination was the consideration that such a plant would likely necessitate the construction of approximately 240 km (150 mi) of pipeline, a portion of which would pass through ecologically sensitive Everglades habitat. FPL suggested in its ER that a site near the center of the State would be a more suitable location (FPL 2000a). Nevertheless, the environmental impacts of the natural gas-fired alternative are examined in this section for both the Turkey Point site and an alternate Florida site. For the Turkey Point site, it is assumed that the plant would use the existing cooling canal system.

Table 8-3. Summary of Environmental Impacts of Coal-Fired Generation at an Alternate Florida Site with Once-Through Cooling System

Impact Category	Change in Impacts from Closed-Cycle Cooling System
Land Use	Impacts may be less (e.g., through elimination of cooling towers) or greater (e.g., if a reservoir is required).
Ecology	Impact would depend on ecology at the site. Possible impacts associated with entrainment of fish and shellfish in early life stages, impingement of fish and shellfish, and heat shock.
Surface Water Use and Quality	Increased water withdrawal leading to possible water-use conflicts; thermal load higher than with closed-cycle cooling
Groundwater Use and Quality	No change
Air Quality	No change
Waste	No change
Human Health	No change
Socioeconomics	No change
Aesthetics	Elimination of cooling towers
Historic and Archaeological Resources	No change
Environmental Justice	No change

The Turkey Point site is currently served by a 61-cm (24-in) diameter natural gas pipeline. However, gas availability has been a problem, and Turkey Point Units 1 and 2 are principally fired with oil, with natural gas as a backup when available.

If a new natural gas-fired plant were built in southern Florida to replace Turkey Point Units 3 and 4, a new 500-kV transmission line would need to be constructed to connect to existing lines to transmit power to FPL's customers in the Miami area. The FPL ER assumes that the new line would be approximately 96 km (60 mi) long (FPL 2000a). Location of a new gas-fired generating plant anywhere in southern Florida could also necessitate the construction or upgrade of a natural gas pipeline from the plant to a supply point where a firm supply of gas would be available. The FPL ER assumes that Mobile Bay, Alabama, would be the closest supply point. Additionally, the ER assumes that such a pipeline, to the center of the State,

would be approximately 800 km (500 mi) long and be located adjacent to existing highways. For delivery to the Turkey Point site, the pipeline originating in Mobile would either need to be extended to the Turkey Point site or be tied in to the existing gas pipeline serving the Turkey Point site. For the natural gas-fired alternative at the Turkey Point site, it is assumed that construction of a new pipeline to the Turkey Point site would be needed and that the distance would be approximately 20 percent longer than construction to the center of Florida. A second potential source of natural gas is liquefied natural gas (LNG) imported to the Elba Island facility in Georgia. The Elba Island facility is expected to be reactivated in 2003 (DOE/EIA 2000a). LNG imported to the Elba Island facility would need to be vaporized and transported to a Florida location via pipeline. A third potential source of natural gas is the proposed pipeline from Grand Bahama Island to Port Everglades. Port Everglades is a deepwater port principally located in Hollywood, Florida. Hollywood is approximately 72 km (45 mi) north of the Turkey Point site. The Federal Energy Regulatory Commission (FERC) has recently announced that it will prepare an EIS for the proposed pipeline (FERC 2001). A fourth potential source of natural gas is the Gulfstream Natural Gas System. This system, currently under construction, will deliver natural gas from Mobile, Alabama, across the Gulf of Mexico and terminate in Palm Beach County, Florida (Gulfstream Natural Gas System 2001). Delivery of natural gas is scheduled to commence in June 2002.

It is assumed that a replacement natural gas-fired plant would use combined-cycle technology (FPL 2000a). In the combined-cycle unit, hot combustion gases in a combustion turbine rotate the turbine to generate electricity. Waste combustion heat from the combustion turbine is routed through a heat-recovery boiler to make steam to generate additional electricity.

The following additional assumptions are made for the natural gas-fired plants (FPL 2000a):

- three 400-MW units, each consisting of two 150-MW combustion turbines and a 100-MW heat recovery boiler
- natural gas with an average heating value of 37 MJ/m^3 (1000 Btu/ft^3) as the primary fuel
- use of low-sulfur No. 2 fuel oil as backup fuel
- heat rate of 2 J fuel/J electricity (6,800 Btu/kWh)
- capacity factor of 0.9.

Unless otherwise indicated, the assumptions and numerical values used in Section 8.2.2 are from the FPL ER (FPL 2000a). The staff reviewed this information and compared it to environmental impact information in the GEIS. Although the OL renewal period is only 20 years, the impact of operating the natural gas-fired alternative for 40 years is considered (as a reasonable projection of the operating life of a natural gas-fired plant).

8.2.2.1 Closed-Cycle Cooling System

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

- **Land Use**

  For siting at Turkey Point, existing facilities and infrastructure would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, it is assumed that the natural gas-fired replacement plant alternative would use the cooling canal system, switchyard, offices, and transmission line right-of-way. Much of the land that would be used has been previously disturbed. At Turkey Point, it is assumed that approximately 14 ha (35 ac) would be needed for the plant and associated infrastructure. There would be an additional impact of up to approximately 4050 ha (10,000 ac) for construction and/or upgrade of a gas pipeline from Mobile Bay, Alabama. Significantly less land would be impacted if gas were to be available from the Gulfstream Natural Gas System or the proposed pipeline from Grand Bahama Island to Port Everglades.

  For construction at an alternate site, it is assumed that 20 ha (50 ac) would be needed for the plant and associated infrastructure (NRC 1996). In addition, approximately 1000 ha (2500 ac) would be impacted for construction of a transmission line, assuming a 96-km (60-mi) line. Approximately 3640 ha (9000 ac) could potentially be disturbed during construction and/or upgrade of an underground pipeline from Mobile Bay, Alabama. Significantly less land would be impacted if gas were to be available from the Gulfstream Natural Gas System or the proposed pipeline from Grand Bahama Island to Port Everglades. Additional land would be required for natural gas wells and collection stations. Partially offsetting these offsite land requirements would be the elimination of the need for uranium mining to supply fuel for Units 3 and 4. The GEIS (NRC 1996;1999) estimated that approximately 400 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a nuclear power plant. Overall, land-use impacts would be MODERATE to LARGE.

- **Ecology**

  At the Turkey Point site, there would be ecological impacts to land use for siting of the gas-fired plant. There would also be substantial ecological impacts associated with bringing a new underground gas pipeline to the Turkey Point site, especially because the pipeline would likely have to be routed through sensitive Everglades habitat. Ecological impacts at an alternate site would depend on the nature of the land converted for the plant and transmission line. If a natural gas-fired plant were located at an alternate Florida site, there is a reasonable likelihood that the plant would be located adjacent to an existing power plant on

Table 8-4. Summary of Environmental Impacts of Natural Gas-Fired Generation at Turkey Point Site and an Alternate Florida Site Using Closed-Cycle Cooling

	Turkey Point Site		Alternate Florida Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	MODERATE to LARGE	14 ha (35 ac) for powerblock, offices, roads, and parking areas. Additional impact of up to approximately 4050 ha (10,000 ac) for construction and/or upgrade of an underground gas pipeline.	MODERATE to LARGE	20 ha (50 ac) for powerblock, offices, roads, and parking areas. Approximately 1000 ha (2500 ac) for transmission line. Additional impact of up to 3600 ha (9000 ac) for construction and/or upgrade of an underground gas pipeline.
Ecology	MODERATE to LARGE	Uses undeveloped areas at current Turkey Point site, plus gas pipeline through sensitive Everglades habitat.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission and pipeline routes; potential habitat loss and fragmentation; reduced productivity and biological diversity. Likely plant sites already have power generation facilities.
Water Use and Quality	SMALL	Uses existing cooling canal system	SMALL to MODERATE	Impact depends on volume of water withdrawal and discharge and characteristics of surface water body.
Air Quality	MODERATE	Sulfur oxides C 13.6 MT/yr (15 tons/yr) Nitrogen oxides C 200 MT/yr (221 tons/yr) Carbon monoxide C 191 MT/yr (211 tons/yr) PM_{10} particulates C 439 MT/yr (484 tons/yr) Some hazardous air pollutants	MODERATE	Same emissions as Turkey Point site
Waste	SMALL	Small amount of ash produced	SMALL	Same waste produced as if produced at the Turkey Point site

Table 8-4. (contd)

	Turkey Point Site		Alternate Florida Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Human Health	SMALL	Impacts considered to be minor.	SMALL	Impacts considered to be minor
Socioeconomics	SMALL to MODERATE	During construction, impacts would be MODERATE. Up to 1200 additional workers during the peak of the 3-year construction period, followed by reduction from current Turkey Point Units 3 and 4 work force of 960 to 150; tax base preserved. Impacts during operation would be SMALL. Transportation impacts associated with construction workers would be MODERATE.	SMALL to MODERATE	During construction, impacts would be MODERATE. Up to 1200 additional workers during the peak of the 3-year construction period. Miami-Dade County would experience loss of tax base and employment, potentially offset by projected economic growth. Transportation impacts associated with construction workers would be MODERATE.
Aesthetics	MODERATE	MODERATE aesthetic impact due to impact of plant units and stacks on environmentally sensitive Biscayne National Park.	MODERATE to LARGE	Greatest impact would be from the new transmission line that would be needed.
Historic and Archeological Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Same as Turkey Point; any potential impacts can likely be effectively managed.
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction; loss of 810 operating jobs at Turkey Point Plant could reduce employment prospects for minority and low-income populations. Impacts could be offset by projected economic growth and the ability of affected workers to commute to other jobs.	SMALL to MODERATE	Impacts vary depending on population distribution and makeup at site.

previously disturbed land, which would tend to mitigate impacts. Construction of the transmission line and construction and/or upgrading of the gas pipeline to serve the plant would be expected to have temporary ecological impacts. Ecological impacts to the plant site and utility easements could include impacts on threatened or endangered species, wildlife habitat loss and reduced productivity, habitat fragmentation, and a local reduction in biological diversity. At an alternate site, the cooling makeup water intake and discharge could have aquatic resource impacts. Overall, the ecological impacts are considered MODERATE to LARGE.

- **Water Use and Quality**

Each of the gas-fired 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. A natural gas-fired plant sited at Turkey Point is assumed to use the existing cooling canal system. No groundwater is currently used for operation of Turkey Point Units 3 and 4. It is unlikely that groundwater would be used for an alternative natural gas-fired plant sited at Turkey Point. Water-use and quality impacts at Turkey Point would be SMALL.

A natural gas-fired plant at an alternate Florida site is assumed to use a closed-cycle cooling system with mechanical draft cooling towers. It is assumed that surface water would be used for cooling makeup water and discharge. Intake and discharge would involve relatively small quantities of water compared to the coal alternative. Intake from and discharge to any surface body of water would be regulated by the State of Florida.

Water-quality impacts from sedimentation during construction were characterized in the GEIS as SMALL. The GEIS also noted that operational water-quality impacts would be similar to, or less than, those from other generating technologies.

Use of groundwater for a natural gas-fired plant sited at an alternate site is a possibility. Any groundwater withdrawal would require a permit from the local permitting authority. Impacts on surface water would depend on the volume and other characteristics of the source water budget. Overall, water-use and -quality impacts at an alternate Florida site are considered SMALL to MODERATE.

- **Air Quality**

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

A new gas-fired generating plant located in south-central Florida would likely need a PSD permit and an operating permit under the Clean Air Act. A new combined-cycle natural gas power plant would also be subject to the new source performance standards for such units

at 40 CFR 60, Subparts Da and GG. These regulations establish emission limits for particulates, opacity, SO_2, and NO_x.

Section 169A of the Clean Air Act (42 USC 7491) establishes a national goal of preventing future and remedying existing impairment of visibility in mandatory Class I Federal areas when impairment results from man-made air pollution. Everglades National Park is a Class I area where visibility is an important value (40 CFR 81.407). Any new fossil power plant in southern Florida has the potential to affect visibility in Everglades National Park. EPA has various regulatory requirements for visibility protection in 40 CFR 51, Subpart P, including a specific requirement for review of any new major stationary source in an area designated attainment or unclassified under the Clean Air Act. EPA issued a new regional haze rule in 1999 (64 FR 35714; July 1,1999 [EPA 1999]). The rule specifies that for each mandatory Class I Federal area located within a State, the State must establish goals that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period [40 CFR 51.308(d)(1)].

FPL projects the following emissions for the natural gas-fired alternative (FPL 2000a):

Sulfur oxides - 13.6 MT/yr (15 tons/yr)
Nitrogen oxides - 200 MT/yr (221 tons/yr)
Carbon monoxide - 191 MT/yr (211 tons/yr)
PM_{10} particulates - 439 MT/yr (484 tons/yr)

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

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

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

The preceding emissions would likely be the same at Turkey Point or at an alternate Florida site. Impacts from the above emissions would be clearly noticeable, but would not be sufficient to destabilize air resources as a whole. The overall air-quality impact for a new natural gas-generating plant sited at Turkey Point or at an alternate Florida site is considered MODERATE.

- **Waste**

  There will be small amounts of solid-waste products (i.e., ash) from burning natural gas fuel. The GEIS concluded that waste generation from gas-fired technology would be minimal. Gas firing results in very few combustion by-products because of the clean nature of the fuel. Waste generation at a gas-fired plant would be largely limited to typical office wastes. Waste-generation impacts would be so minor that they would not noticeably alter any important resource attribute. Construction-related debris would be generated during construction activities. Overall, the waste impacts would be SMALL for a natural gas-fired plant sited at Turkey Point or at an alternate Florida site.

- **Human Health**

  Table 8-2 of the GEIS identifies cancer and emphysema as potential health risks from gas-fired plants. The risk may be attributable to NO_x emissions that contribute to ozone formation, which in turn contribute to health risks. NO_x emissions from the plant would be regulated by the Florida Department of Environmental Protection (FDEP). Human health effects would not be detectable or would be sufficiently minor that they would neither destabilize nor noticeably alter any important attribute of the resource. Overall, the impacts on human health of the natural gas-fired alternative sited at Turkey Point or at an alternate Florida site are considered SMALL.

- **Socioeconomics**

  A 3-year construction period is assumed. Peak employment would be approximately 1200 workers (NRC 1996; 1999). It is assumed that construction would take place while Units 3 and 4 continue operation and would be completed by the time they permanently cease operations. During construction, the communities surrounding the Turkey Point site would experience demands on housing and public services that could have MODERATE impacts. These impacts would be tempered by construction workers commuting to the site from other parts of Miami-Dade County or from other counties. After construction, the communities would be impacted by the loss of jobs. The current Turkey Point Units 3 and 4 work force (960 workers) would decline through a decommissioning period to a minimal maintenance size. The gas-fired plant would introduce a replacement tax base at Turkey Point or an alternate Florida site and approximately 150 new permanent jobs. For siting at an alternate Florida site, impacts in South Miami-Dade County resulting from decommissioning of Units 3 and 4 may be offset by economic growth projected to occur in the county.

  The GEIS (NRC 1996; 1999) concluded that socioeconomic impacts from constructing a natural gas-fired plant would not be very noticeable and that the small operational work force would have the lowest socioeconomic impacts of any nonrenewable technology. Compared to the coal-fired and nuclear alternatives, the smaller size of the construction

work force, the shorter construction time frame, and the smaller size of the operations work force would mitigate socioeconomic impacts. For these reasons, the socioeconomic impacts associated with construction and operation of a natural gas-fired power plant would be SMALL to MODERATE for siting at Turkey Point or at an alternate Florida site. Depending on other growth in the area, socioeconomic effects could be noticed, but they would not destabilize any important socioeconomic attribute.

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

Overall, socioeconomic impacts resulting from construction of a natural gas-fired plant at Turkey Point or an alternate Florida site and from decommissioning of Turkey Point Units 3 and 4 would be SMALL to MODERATE.

- **Aesthetics**

The turbine buildings (approximately 30 m [100 ft] tall) and exhaust stacks (approximately 38 m [125 ft] tall) would be visible during daylight hours from offsite. The gas pipeline compressors would also be visible. Noise and light from the plant would be detectable offsite. No travel through Biscayne National Park would be needed to support plant operations. During construction, some plant equipment might be delivered by barge and thereby pass through the park. At the Turkey Point site, these impacts would result in a MODERATE aesthetic impact given the environmental sensitivity of Biscayne National Park and the expectations of visitors to national parks.

At an alternate Florida site, the buildings, cooling towers, cooling tower plumes, and the associated transmission line and gas pipeline compressors would be visible offsite. The visual impact of a new 96-km (60-mi) transmission line would be especially significant. Aesthetic impacts would be mitigated if the plant were located in an industrial area adjacent to other power plants. Overall, the aesthetic impacts associated with an alternate Florida site are categorized as MODERATE to LARGE. The greatest contributor to this categorization is the aesthetic impact of the new transmission line.

- **Historic and Archaeological**

At both Turkey Point and an alternate Florida site, a cultural resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of extant historic and archaeological

resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

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

- **Environmental Justice**

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement natural gas-fired plant were built at the Turkey Point site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. Closure of Turkey Point Units 3 and 4 would result in a decrease in employment of approximately 810 operating employees, possibly offset by general growth in the South Miami-Dade County area. Following construction, it is possible that the ability of local government to maintain social services could be reduced at the same time as diminished economic conditions reduce employment prospects for minority or low-income populations. Overall, impacts are expected to be SMALL to MODERATE. Projected economic growth in South Miami-Dade County and the ability of minority and low-income populations to commute to other jobs outside the South Miami-Dade County area could mitigate any adverse effects.

Impacts at an alternate Florida site would depend upon the site chosen and the nearby population distribution, but are likely to also be SMALL to MODERATE.

8.2.2.2 Once-Through Cooling System

This section discusses the environmental impacts of constructing a natural gas-fired generation system at an alternate Florida location using once-through cooling. The impacts (SMALL, MODERATE, or LARGE) of this option are the same as the impacts for a natural gas-fired plant using the closed-cycle system. However, there are minor environmental differences between the closed-cycle and once-through cooling systems. Table 8.5 summarizes the incremental differences.

Table 8-5. Summary of Environmental Impacts of Natural Gas-Fired Generation at an Alternate Florida Site with Once-Through Cooling

Impact Category	Change in Impacts from Closed-Cycle Cooling System
Land Use	Impacts may be less (e.g., through elimination of cooling towers) or greater (e.g., if a reservoir is required).
Ecology	Impact would depend on ecology at the site. Potential impacts associated with entrainment of fish and shellfish in early life stages, impingement of fish and shellfish, and heat shock.
Surface Water Use and Quality	Increased water withdrawal leading to possible water-use conflicts, thermal load higher than with closed-cycle cooling
Groundwater Use and Quality	No change
Air Quality	No change
Waste	No change
Human Health	No change
Socioeconomics	No change
Aesthetics	Elimination of cooling towers
Historic and Archaeological Resources	No change
Environmental Justice	No change

8.2.3 Nuclear Power Generation

Since 1997 the NRC has certified three new standard designs for nuclear power plants under the procedures at 10 CFR 52, Subpart B. These designs are the 1300-MW U.S. Advanced Boiling Water Reactor (10 CFR 52, Appendix A), the 1300-MW System 80+ Design (10 CFR 52, Appendix B), and the 600-MW AP600 Design (10 CFR 52, Appendix C). All of these plants are light-water reactors. Although no applications for a construction permit or a combined license based on these certified designs have been submitted to NRC, the submission of the design certification applications indicates continuing interest in the possibility of licensing new nuclear power plants. In addition, recent volatility in prices of natural gas and electricity have made new nuclear power plant construction more attractive from a cost standpoint. Consequently, construction of a new nuclear power plant at the Turkey Point site

using the existing cooling canal system and at an alternate Florida site using both closed- and open-cycle cooling are considered in this section. It is assumed that the new nuclear plant would have a 40-year lifetime. Consideration of a new nuclear generating plant to replace Units 3 and 4 was not included in the FPL ER.

The NRC has summarized environmental data associated with the uranium fuel cycle in Table S-3 of 10 CFR 51.51. The impacts shown in Table S-3 are representative of the impacts that would be associated with a replacement nuclear power plant built to one of the certified designs, sited at Turkey Point or an alternate Florida site. The impacts shown in Table S-3 are for a 1000-MW(e) reactor and would need to be adjusted to reflect replacement of Units 3 and 4, which have a capacity of 1386 MW(e). The environmental impacts associated with transporting fuel and waste to and from a light-water-cooled nuclear power reactor are summarized in Table S-4 of 10 CFR 51.52. The summary of NRC's findings on National Environmental Policy Act (NEPA) issues for license renewal of nuclear power plants in Table B-1 of 10 CFR 51 Subpart A, Appendix B, is also relevant for consideration of environmental impacts associated with the operation of a replacement nuclear power plant. Additional environmental impact information for a replacement nuclear power plant using closed-cycle cooling is presented in Section 8.2.3.1 and using open-cycle cooling in Section 8.2.3.2.

8.2.3.1 Closed-Cycle Cooling System

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

- **Land Use**

  The existing facilities and infrastructure at the Turkey Point site would be used to the extent practicable, limiting the amount of new construction that would be required. A replacement nuclear power plant at the Turkey Point site would alter approximately 200 ha (500 ac) of land to industrial use (NRC 1996). It is assumed that a replacement nuclear power plant would use the existing cooling canal system, switchyard, offices, and transmission line right-of-way. Much of the land that would be used has been previously disturbed. There would be no net change in land needed for uranium mining because land needed for the new nuclear plant would offset land needed to supply uranium for fuel for Units 3 and 4.

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

  Land-use requirements at an alternate Florida site would be approximately 200 to 400 ha (500 to 1000 ac) plus the possible need for a transmission line to connect to existing lines to

Table 8-6. Summary of Environmental Impacts of New Nuclear Power Generation at the Turkey Point Site and an Alternate Florida Site Using Closed-Cycle Cooling

	Turkey Point Site		Alternate Florida Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	MODERATE	Requires approximately 200 ha (500 ac) for the plant	MODERATE to LARGE	Requires approximately 200 to 400 ha (500 to 1000 ac) plus land for transmission line (1000 ha [2500 ac] assuming a 96 km [60 mi] line)
Ecology	MODERATE	Uses undeveloped areas at current Turkey Point site	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission line route; potential habitat loss and fragmentation; reduced productivity and biological diversity.
Water Use and Quality	SMALL	Uses existing cooling canal system	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body.
Air Quality	SMALL	Fugitive emissions and emissions from vehicles and equipment during construction. Small amount of emissions from diesel generators and possibly other sources during operation.	SMALL	Same impacts as Turkey Point site
Waste	SMALL	Waste impacts for an operating nuclear power plant are set out in 10 CFR 51, Appendix B, Table B-1. Debris would be generated and removed during construction.	SMALL	Same impacts as Turkey Point site
Human Health	SMALL	Human health impacts for an operating nuclear power plant are set out in 10 CFR 51, Appendix B, Table B-1.	SMALL	Same impacts as Turkey Point site

Table 8-6. (contd)

	Turkey Point Site		Alternate Florida Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Socioeconomics	SMALL to LARGE	During construction, impacts would be MODERATE. Up to 2500 workers during peak period of the 6-year construction period. Operating work force assumed to be similar to Units 3 and 4; tax base preserved. Impacts during operation would be SMALL. Transportation impacts associated with construction workers could be MODERATE to LARGE. Transportation impacts of commuting plant personnel would be SMALL.	SMALL to LARGE	Construction impacts depend on location. Impacts at a rural location could be LARGE. Miami-Dade County would experience loss of tax base and employment, possibly offset by economic growth. Transportation impacts of construction workers could be MODERATE to LARGE. Transportation impacts of commuting plant personnel could be SMALL to MODERATE.
Aesthetics	SMALL	No exhaust stacks or cooling towers would be needed. Daytime visual impact could be mitigated by landscaping and appropriate color selection for buildings. Visual impact at night could be mitigated by reduced use of lighting and appropriate shielding. Noise impacts would be relatively small and could be mitigated. There would be no travel through Biscayne National Park.	MODERATE to LARGE	Greatest impact is from the new transmission line that would be needed.
Historic and Archeological Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Any potential impacts can likely be effectively managed.
Environmental Justice	SMALL	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction.	SMALL to MODERATE	Impacts will vary depending on population distribution and makeup at the site. Impacts to minority and low-income residents of South Miami-Dade County associated with closure of Turkey Point Units 3 and 4 could be significant, but could also be mitigated by projected economic growth for the area.

transmit power to FPL's customers in the Miami area. Assuming a 96-km (60-mi) transmission line, an additional 1000 ha (2500 ac) would be needed. In addition, it may be necessary to construct a rail spur to an alternate site to bring in equipment during construction. Depending particularly on transmission line routing, siting a new nuclear plant at an alternate Florida site would result in MODERATE to LARGE land-use impacts.

- **Ecology**

Locating a replacement nuclear power plant at the Turkey Point site would alter ecological resources because of the need to convert roughly 200 to 400 ha (500 to 1000 ac) of land to industrial use. Some of this land, however, would have been previously disturbed.

Siting at Turkey Point would have a MODERATE ecological impact that would be greater than renewal of the Unit 3 and 4 OLs.

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

- **Water Use and Quality**

The replacement nuclear plant alternative at the Turkey Point site is assumed to use the existing cooling canal system, which would minimize incremental water-use and -quality impacts. Surface-water impacts are expected to remain SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

It is assumed that a new nuclear power plant located at Turkey Point would obtain potable, process, and fire-protection water from the Miami-Dade County public water system similar to the current practice for Turkey Point Units 3 and 4 (see Section 2.2.2).

Cooling towers would likely be used at alternate sites. For alternate sites, the impact on the surface water would depend on the volume of water needed for makeup water, the discharge volume, and the characteristics of the receiving body of water. Intake from and discharge to any surface body of water would be regulated by the State of Florida. The impacts would be SMALL to MODERATE.

No groundwater is currently used for operation of Turkey Point Units 3 and 4. It is unlikely that groundwater would be used for an alternative nuclear power plant sited at Turkey Point.

Use of groundwater for a nuclear power plant sited at an alternate site is a possibility. Any groundwater withdrawal would require a permit from the local permitting authority.

- **Air Quality**

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

- **Waste**

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

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

- **Human Health**

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

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

- **Socioeconomics**

The construction period and the peak work force associated with new nuclear power plant construction are currently unquantified (NRC 1996). In the absence of quantified data, a construction period of 6 years and a peak work force of 2500 is assumed. It is assumed that construction would take place while the existing nuclear units continue operation and would be completed by the time Turkey Point Units 3 and 4 permanently cease operations. During construction, the communities surrounding the Turkey Point site would experience demands on housing and public services that could have MODERATE impacts. These impacts would be tempered by construction workers commuting to the site from other parts of Miami-Dade County or from other counties. After construction, the communities would be

impacted by the loss of the construction jobs, although this loss would be possibly offset by other growth currently being projected for South Miami-Dade County.

The replacement nuclear unit(s) are assumed to have an operating work force comparable to the 960 workers currently working at Turkey Point Units 3 and 4. The replacement nuclear unit(s) would provide a new tax base to offset the loss of tax base associated with decommissioning of Turkey Point Units 3 and 4. For all of these reasons, the appropriate characterization of nontransportation socioeconomic impacts for replacement nuclear units constructed at Turkey Point would be SMALL to MODERATE; the socioeconomic impacts would be noticeable, but would be unlikely to destabilize the area.

During the 6-year construction period, up to 2500 construction workers would be working at the Turkey Point site in addition to the 960 workers at Units 3 and 4. The addition of the construction workers could place significant traffic loads on existing highways, particularly those leading to the Turkey Point site from Florida City. Such impacts would be MODERATE to LARGE. Transportation impacts related to commuting of plant operating personnel would be similar to current impacts associated with operation of Units 3 and 4 and are considered SMALL.

Construction of a replacement nuclear power plant at an alternate Florida site would relocate some socioeconomic impacts, but would not eliminate them. The communities around the Turkey Point site would still experience the impact of Turkey Point Units 3 and 4 operational job loss (although potentially tempered by projected economic growth), and the communities around the new site would have to absorb the impacts of a large, temporary work force (up to 2500 workers at the peak of construction) and a permanent work force of approximately 960 workers. The GEIS (NRC 1996; 1999) indicated that socioeconomic impacts at a rural site would be larger than at an urban site because more of the peak construction work force would need to move to the area to work. The Turkey Point site is within commuting distance of the Miami metropolitan area and is therefore not considered a rural site. Alternate sites in Florida would need to be analyzed on a case-by-case basis. Socioeconomic impacts at a rural site could be LARGE. Transportation-related impacts associated with commuting workers at an alternate Florida site are site dependent, but could be MODERATE to LARGE. Transportation impacts related to commuting of plant operating personnel would also be site dependent, but can be characterized as SMALL to MODERATE.

- **Aesthetics**

The containment buildings for a replacement nuclear power plant sited at Turkey Point and other associated buildings would likely be visible in daylight hours over many miles. The replacement nuclear units would also likely be visible at night because of outside lighting.

The National Park Service states in its scoping comments (see Appendix E) that the Turkey Point Plant can be seen at night as far east as the park's barrier islands, which are 11 km (7 mi) offshore. Visual impacts could be mitigated by landscaping and selecting a color for buildings that is consistent with the environment. Visual impact at night could be mitigated by reduced use of lighting and appropriate use of shielding. No exhaust stacks would be needed. No cooling towers would be needed assuming use of the existing cooling canal system.

A replacement nuclear plant sited at Turkey Point would be visible from Biscayne National Park. However, the visual impact can be kept SMALL. No travel through the park would be needed to support plant operations. During construction, some plant equipment might be delivered by barge and thereby pass through the park.

Noise from operation of a replacement nuclear power plant would potentially be audible by visitors to Biscayne National Park in calm wind conditions or when the wind is blowing in the direction of the park. Mitigation measures, such as reduced or no use of outside loud-speakers, can be employed to reduce noise level and keep the impact SMALL.

At an alternate Florida site, there would be an aesthetic impact from the buildings, cooling towers, and the plume associated with the cooling towers. There would also be a significant aesthetic impact associated with construction of a new 96-km (60-mi) transmission line to connect to other lines to enable delivery of electricity to the Miami area. Noise and light from the plant would be detectable offsite. The impact of noise and light would be mitigated if the plant is located in an industrial area adjacent to other power plants. Overall, the aesthetic impacts associated with locating at an alternative site can be categorized as MODERATE to LARGE. The greatest contributor to this categorization is the aesthetic impact of the new transmission line.

- **Historic and Archaeological Resources**

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

Prior to construction at Turkey Point or another site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-

way). Historic and archaeological resource impacts can generally be effectively managed and as such are considered SMALL.

- **Environmental Justice**

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

  Impacts at other sites would depend on the site chosen and the nearby population distribution, but are likely to be SMALL to MODERATE. Impacts to minority and low-income residents of South Miami-Dade County associated with closure of Turkey Point Units 3 and 4 could be significant, but could also be mitigated by projected economic growth for the area.

8.2.3.2 Once-Through Cooling System

This section discusses the environmental impacts of constructing a nuclear power plant at an alternate Florida site using once-through cooling. The impacts (SMALL, MODERATE, or LARGE) of this option are the same as the impacts for a nuclear power plant using the closed-cycle system. However, there are minor environmental differences between the closed-cycle and once-through cooling systems. Table 8.7 summarizes the incremental differences.

8.2.4 Oil-Fired Generation

EIA projects that oil-fired plants will account for very little of the new generation capacity in the United States during the 2000 to 2020 time period because of higher fuel costs and lower efficiencies (DOE/EIA 2000a). Nevertheless, an oil-fired generating alternative at the Turkey Point site for replacement of power generated by Turkey Point Units 3 and 4 is considered in this section principally because co-located Turkey Point Units 1 and 2 are oil-fired generation plants and the infrastructure to support the oil-fired generation option is already in place at the Turkey Point site. It is assumed that an oil-fired plant sited at Turkey Point would use the existing cooling canal system. Oil-fired generation at an alternate Florida site is not considered

Table 8-7. Summary of Environmental Impacts of a New Nuclear Power Plant Sited at an Alternate Florida Site with Once-Through Cooling

Impact Category	Change in Impacts from Closed-Cycle Cooling System
Land Use	Impacts may be less (e.g., through elimination of cooling towers) or greater (e.g., if a reservoir is required).
Ecology	Impacts would depend on ecology at the site. Possible impacts associated with entrainment of fish and shellfish in early life stages, impingement of fish and shellfish, and heat shock.
Surface Water Use and Quality	Increased water withdrawal leading to possible water-use conflicts, thermal load higher than with closed-cycle cooling
Groundwater Use and Quality	No change
Air Quality	No change
Groundwater Use and Quality	No change
Air Quality	No change
Waste	No change
Human Health	No change
Socioeconomics	No change
Aesthetics	Elimination of cooling towers
Historic and Archaeological Resources	No change
Environmental Justice	No change

in this SEIS because of the EIA projection that little, if any, new oil-fired generation capacity will be constructed in the 2000 to 2020 time period.

Unit 1 at Turkey Point began commercial operation in 1967 and has a net summer capability of 410 MW. Unit 2 began commercial operation in 1968 and has a net summer capability of 400 MW (DOE/EIA 2000d, Table 20). Both units are fueled by Number 6 fuel oil as the primary fuel with natural gas as the alternate fuel.

The following additional assumptions are made for the replacement oil-fired plants (FPL 2000a):

- three 400-MW tangentially fired units
- use of Number 6 fuel oil
- heat rate of 2.9 J fuel/J electricity (9800 Btu/kWh)
- capacity factor of 0.9.

Unless otherwise indicated, the assumptions and numerical values used in Section 8.2.4 are from the FPL ER (FPL 2000a). The staff reviewed this information and compared it to environmental impact information in the GEIS. Although the OL renewal period is only 20 years, the impact of operating the oil-fired alternative for 40 years is considered (as a reasonable projection of the operating life of a oil-fired plant).

The overall environmental impacts of the oil-fired generating system are discussed in the following sections and summarized in Table 8-8.

8.2.4.1 Land Use

The existing facilities and infrastructure at the Turkey Point site would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, it is assumed that the oil-fired alternatives would use the cooling canal system, switchyard, offices, and transmission line right-of-way. Much of the land that would be used has been previously disturbed.

The oil-fired generation alternative would necessitate converting roughly an additional 50 ha (120 ac) of the Turkey Point site to industrial use for the plant and associated facilities including oil storage tanks. Additional land-use changes would occur offsite in an undetermined area to supply oil for the plant. The GEIS estimated that approximately 650 ha (1600 ac) would be affected for oil wells and support facilities to support an oil-fired plant during its operational life (NRC 1996). Partially offsetting this offsite land use would be the elimination of the need for uranium mining to supply fuel for Units 3 and 4. The GEIS (NRC 1996; 1999) estimated that

Table 8-8. Summary of Environmental Impacts Associated with New Oil-Fired Generation Plants at Turkey Point Site Assuming Use of Existing Cooling Canal System

Impact Category	Impact	Comments
Land Use	SMALL to MODERATE	102 ha (250 ac) for powerblock, oil storage, waste storage, offices, roads, and parking areas. Additional land impacts for oil wells and support facilities.
Ecology	MODERATE to LARGE	Uses undeveloped areas at current Turkey Point site plus barge channel. Impacts to Biscayne National Park from barge transport of oil could be significant.
Water Use and Quality	SMALL	Uses existing cooling canal system
Air Quality	MODERATE	Sulfur oxides - 6930 MT/yr (7640 tons/yr) Nitrogen oxides - 2980 MT/yr (3290 tons/yr) Total suspended particulates - 50 MT/yr (55 tons/yr), including 32 MT/yr (35 tons/yr) of PM_{10} particulates Carbon monoxide - 1430 MT/yr (1580 tons/yr) Some hazardous air pollutants including mercury
Waste	MODERATE	Approximately 225,000 MT/yr (250,000 tons/yr) of ash and scrubber sludge requiring approximately 52 ha (130 ac) for disposal
Human Health	SMALL	Impacts are uncertain, but considered SMALL in the absence of more quantitative data.
Socioeconomics	MODERATE	During construction, impacts would be MODERATE. Up to 1700 additional workers during the peak of the 3- to 4-year construction period, followed by reduction from current Turkey Point Units 3 and 4 work force of 960 to approximately 200. Tax base preserved. Impacts during operation would be SMALL. Transportation impacts associated with construction workers would be MODERATE.
Aesthetics	MODERATE to LARGE	MODERATE to LARGE impact from the plant and stacks to Biscayne National Park visitors. Barge transportation of oil and lime would have a MODERATE impact. Noise impact of the plant and related transportation would be MODERATE given the environmental sensitivity of Biscayne National Park.
Historic and Archaeological Resources	SMALL	Any potential impacts can likely be effectively managed.
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction; loss of 760 operating jobs could reduce employment prospects for minority and low-income populations. Impacts could be offset by projected economic growth and the ability of affected workers to commute to other jobs.

approximately 400 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a nuclear power plant.

Approximately 225,000 MT (250,000 tons) of oil-combustion by-products per year (ash and scrubber sludge) would be disposed of onsite, requiring approximately 52 ha (130 ac) for a by-product disposal area for the 40-year expected life of the plant.[a] Facilities would be constructed to control and treat leachate from ash and scrubber sludge disposal areas. It is assumed that oil-fired generation structures and facilities, including oil storage and ash and scrubber sludge disposal areas, would all be located within the current Turkey Point site boundary.

The impact of an oil-fired generating unit on land use at the Turkey Point site is best characterized as SMALL to MODERATE. The impact would be greater than the OL renewal alternative.

8.2.4.2 Ecology

Locating an oil-fired alternative energy source at the existing Turkey Point site would alter ecological resources because of the need to convert roughly 102 ha (250 ac) of land to industrial use (plant, oil storage, waste storage, ash and scrubber sludge disposal). Some of this land, however, would have been previously disturbed.

Ecological impacts associated with transporting oil and lime to the Turkey Point site would be significant. If rail is used, a rail spur with a minimum length of 14 km (9 mi) would need to be constructed. Construction of at least a portion of the spur through ecologically sensitive wetlands would likely be needed. The barge delivery option would have negative ecological implications for waters included within Biscayne National Park. Written scoping comments submitted by the National Park Service (included in Appendix E) state that barges currently bringing oil for Turkey Point Units 1 and 2 have run aground within Biscayne National Park numerous times. The comments state that each trip adversely impacts water quality by churning up the bottom of Biscayne Bay and creating a turbidity plume that lasts long after the barge has passed. Turbidity limits the photosynthesis of the phytoplanktonic and seagrass communities that are essential for a healthy marine ecosystem. The comments also point out that the thrust from the tugboat may disrupt seagrass recovery by ripping it from the bottom, along with other attached vegetation.

Siting at the existing Turkey Point site would have a MODERATE to LARGE ecological impact that would be greater than renewal of the Unit 3 and 4 OLs.

(a) Only half of the land area needed for by-product disposal is directly attributable to the alternative of renewing the Turkey Point Units 3 and 4 OLs for 20 years.

8.2.4.3 Water Use and Quality

The oil-fired generation alternative at the Turkey Point site is assumed to use the existing cooling canal system, which would minimize incremental water-use and -quality impacts. Surface-water impacts are expected to remain SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

It is assumed that an oil-fired plant located at Turkey Point would obtain potable, process, and fire protection water from the Miami-Dade County public water system similar to the current practice for Turkey Point Units 3 and 4 (see Section 2.2.2).

No groundwater is currently used for operation of Turkey Point Units 3 and 4. It is unlikely that groundwater would be used for an alternative oil-fired plant sited at Turkey Point.

8.2.4.4 Air Quality

The air-quality impacts of oil-fired generation vary considerably from those of nuclear power due to emissions of SO_x, NO_x, particulates, carbon monoxide, and hazardous air pollutants such as mercury.

A new oil-fired generating plant located in south Florida would likely need a PSD permit and an operating permit under the Clean Air Act. The plant would need to comply with the new source performance standards for such plants set forth in 40 CFR Part 60, Subpart Da. The standards establish limits for particulate matter and opacity (40 CFR 60.42a), SO_2 (40 CFR 60.43a), and NO_x (40 CFR 60.44a).

Section 169A of the Clean Air Act (42 USC 7491) establishes a national goal of preventing future and remedying existing impairment of visibility in mandatory Class I Federal areas when impairment results from man-made air pollution. Everglades National Park is a Class I area where visibility is an important value (40 CFR 81.407). Any new fossil power plant in southern Florida has the potential to affect visibility in Everglades National Park. EPA has various regulatory requirements for visibility protection in 40 CFR Part 51, Subpart P, including a specific requirement for review of any new major stationary source in an area designated as attainment or unclassified under the Clean Air Act. EPA issued a new regional haze rule in 1999 (64 FR 35714; July 1,1999 [EPA 1999]). The rule specifies that for each mandatory Class I Federal area located within a State, the State must establish goals that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most- impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period [40 CFR 51.308(d)(1)].

Impacts for particular pollutants are as follows:

- Sulfur oxides emissions. FPL states in its ER that an alternative coal-fired plant located at the Turkey Point site would use spray-drying technology (dry scrubber) for flue-gas desulfurization rather than a wet scrubber (FPL 2000a). The dry scrubber technology is also assumed for a new oil-fired plant. Lime/limestone would be used for the flue-gas desulfurization (FPL 2000a). FPL notes that the saline groundwater at the Turkey Point site 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.

  A new oil-fired power plant would be subject to the requirements in Title IV of the Clean Air Act. Title IV was enacted to reduce emissions of SO_2 and NO_x, the two principal precursors of acid rain, by restricting emissions of these pollutants from power plants. Title IV caps aggregate annual power plant SO_2 emissions and imposes controls on SO_2 emissions through a system of marketable allowances. EPA issues one allowance for each ton of SO_2 that a unit is allowed to emit. New units do not receive allowances, but are required to have allowances to cover their SO_2 emissions. Owners of new units must therefore acquire allowances from owners of other power plants by purchase or reduce SO_2 emissions at other power plants they own. Allowances can be banked for use in future years. Thus, a new oil-fired power plant would not add to net regional SO_2 emissions, although it might do so locally. Regardless, SO_2 emissions would be greater for the oil alternative than the OL renewal alternative.

  FPL estimates that by using the best available control technology for SO_x emissions, the total annual stack emissions from an alternative oil-fired replacement plant would be approximately 6930 MT (7640 tons) of SO_x (FPL 2000a).

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

  FPL estimates that using the best available control technology, the total annual NO_x emissions for a new oil-fired power plant would be approximately 2980 MT (3290 tons). This level of NO_x emissions would be greater than the OL renewal alternative.

- Particulate emissions. FPL estimates that the total annual stack emissions would include 50 MT (55 tons) of filterable total suspended particulates. The 50 MT would include 32 MT (35 tons) of PM_{10} particulate matter. Fabric filters would be used for control (FPL 2000a). Particulate emissions would be greater under the oil alternative than the OL renewal alternative.

- Carbon monoxide emissions. FPL estimates that the total carbon monoxide emissions would be approximately 1430 MT (1580 tons) per year. This level of emissions is greater than the OL renewal alternative.

- Hazardous air pollutants, including mercury. In December 2000, EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (EPA 2000). EPA determined that coal- and oil-fired electric utility steam-generating units are significant emitters of hazardous air pollutants. Oil-fired power plants were found by EPA to emit arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, lead, manganese, mercury, and nickel (EPA 2000). EPA concluded that mercury is the hazardous air pollutant of greatest concern. EPA found that (1) electric utility steam-generating units are the largest domestic source of mercury emissions; and (2) certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures resulting from consumption of contaminated fish (EPA 2000). Accordingly, EPA added coal- and oil-fired electric utility steam-generating units to the list of source categories under Section 112(c) of the Clean Air Act for which emission standards for hazardous air pollutants will be issued (EPA 2000).

  Fugitive dust would be generated during construction activities. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process.

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

8.2.4.5 Waste

Oil combustion generates waste in the form of ash, and equipment for controlling air pollution generates additional ash and scrubber sludge. Three 400-MW(e) oil-fired plants would generate approximately 225,000 MT (250,000 tons) of this waste annually for 40 years. The waste would be disposed of onsite, accounting for approximately 52 ha (130 ac) of land area

during the 40-year life of the plant. Waste impacts to groundwater and surface water could extend beyond the operating life of the plant if leachate and runoff from the waste storage area occurs. Disposal of the waste could noticeably affect land use and groundwater quality, but with appropriate management and monitoring, it would not destabilize any resources. After closure of the waste site and revegetation, the land could be available for other uses.

Construction of the plant would result in construction-related debris.

The appropriate characterization of impacts from waste generated from the oil-fired generation alternative is MODERATE; the impacts would be clearly noticeable, but would not destabilize any important resource.

8.2.4.6 Human Health

Oil-fired power generation introduces worker risks from oil-drilling activities and limestone mining, and worker and public risks from oil and lime/limestone transportation and inhalation of stack emissions. Emission impacts can be widespread and health risks difficult to quantify. The GEIS analysis noted that there could be human health impacts (cancer and emphysema) from inhalation of toxins and particulates, but did not identify the significance of these impacts.

Regulatory agencies, including EPA and State agencies, focus on air emissions and have revised regulatory requirements based on human health impacts. Such agencies also impose site-specific emission limits as needed to protect human health. As discussed in the air-quality section above, EPA has recently concluded that certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures from coal- and oil-fired power plants. However, in the absence of more quantitative data, human health impacts from radiological doses and inhaling toxins and particulates generated by an oil-fired power plant are characterized as SMALL.

8.2.4.7 Socioeconomics

Construction of the oil-fired alternative plant would take approximately 3 to 4 years. It is assumed that construction would take place while Units 3 and 4 continue operation and would be completed by the time Units 3 and 4 permanently cease operations. There would be a peak construction work force of approximately 1700 workers (NRC 1996). These workers would be in addition to the approximately 960 workers employed at Units 3 and 4. During construction, the communities surrounding the Turkey Point site would experience demands on housing and public services that could have MODERATE impacts. These impacts would be tempered by construction workers commuting to the site from other parts of Miami-Dade County or from other counties. After construction, the communities would be impacted by the loss of the

construction jobs, although this loss would be possibly offset by other growth currently being projected for South Miami-Dade County.

The GEIS (NRC 1996; 1999) indicated that socioeconomic impacts at a rural site would be larger than at an urban site because more of the peak construction work force would need to move to the area to work. The Turkey Point site is within commuting distance of the Miami metropolitan area and is therefore not considered a rural site.

When the oil-fired replacement plant is constructed and Units 3 and 4 are decommissioned, there will be a loss of approximately 760 permanent high-paying jobs (960 for the two nuclear units down to 200 for the oil-fired plant), with a commensurate reduction in demand on socioeconomic resources and contribution to the regional economy. However, as discussed previously, projected economic growth in South Miami-Dade County could temper or offset the projected loss of jobs from the closure of Units 3 and 4. The oil-fired plant would provide a new tax base to offset the loss of tax base associated with decommissioning of the nuclear units. For all of these reasons, the appropriate characterization of socioeconomic impacts for an oil-fired plant would be SMALL to MODERATE; the socioeconomic impacts would be noticeable, but would be unlikely to destabilize the area.

Rail delivery of lime and possibly of oil could have MODERATE socioeconomic impacts. Barge delivery of oil and lime would have SMALL socioeconomic impacts.

For transportation related to commuting of plant operating personnel, the impacts are considered SMALL. The maximum number of plant operating personnel for the oil-fired plant would be approximately 200. The current Turkey Point Units 3 and 4 work force is approximately 960. Therefore, traffic impacts associated with commuting plant personnel would be expected to be SMALL compared to the current impacts from Turkey Point Units 3 and 4 operations.

During the 3- to 4-year construction period of replacement oil-fired units, up to an additional 1700 construction workers would be working at the site in addition to the 960 workers at Units 3 and 4. The addition of these workers could place significant traffic loads on existing highways, particularly those leading to the Turkey Point site from Florida City. Such impacts would be MODERATE.

8.2.4.8 Aesthetics

Given the low elevation at the Turkey Point site and of the surrounding land and the relatively low ground cover, the oil-fired power plant units and the associated exhaust stacks would be highly visible for distances up to 16 km (10 mi). The aesthetic impact on visitors to Biscayne National Park would be particularly significant, although mitigated somewhat by the existing aesthetic impact associated with Turkey Point Units 1 and 2. Given the environmental

sensitivity of the park and the associated expectations of visitors to national parks, the addition of the oil-fired units and the associated exhaust stacks would likely have a MODERATE to LARGE aesthetic impact.

If oil and lime are delivered by barge to the Turkey Point site, the tugboat and barges would pass through Biscayne National Park. Given the environmental sensitivity of the park and the associated expectations of visitors to national parks, there would likely be a MODERATE aesthetic impact on visitors to the park associated with such traffic. During construction of the plant, it is also possible that equipment would be delivered by barge and thereby pass through the park.

Oil-fired generation would introduce mechanical sources of noise that would be audible offsite, especially within Biscayne National Park. Sources contributing to total noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the equipment related to solid-waste disposal, transportation (rail or barge) related to oil and lime delivery, use of loudspeakers, and the commuting of plant employees. Given the environmental sensitivity of the park and the associated expectations of visitors to national parks, the incremental noise impacts of an oil-fired plant compared to existing Turkey Point Units 3 and 4 operations are considered to be MODERATE. Impacts would be most significant for visitors to Biscayne National Park.

Noise impacts associated with rail delivery of lime and possibly oil would be most significant for residents living in the vicinity of the facility and along the rail route. Although noise from passing trains significantly raises noise levels near the rail corridor, the short duration of the noise reduces the impact. Nevertheless, the impacts of noise on residents in the vicinity of the facility and the rail line is considered MODERATE.

8.2.4.9 Historic and Archaeological Resources

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

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

8.2.4.10 Environmental Justice

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement oil-fired plant were built at the Turkey Point site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect the minority and low-income populations. Closure of Turkey Point Units 3 and 4 would result in a decrease in employment of approximately 760 operating employees, possibly offset by projected economic growth in the South Miami-Dade County area. Following construction, it is possible that the ability of the local government to maintain social services could be reduced at the same time as diminished economic conditions reduce employment prospects for the minority or low-income populations. Overall, impacts are likely to be SMALL to MODERATE, and would depend on the extent to which projected economic growth is realized and the ability of minority and low-income populations to commute to other jobs outside the South Miami-Dade County area.

8.2.5 Purchased Electrical Power

If available, purchased power from other sources could potentially obviate the need to renew the Turkey Point Units 3 and 4 OLs. It is unlikely, however, that sufficient baseload, firm power supply would be available to replace the Units 3 and 4 capacity.

Purchased power accounted for approximately 14 percent of FPL power sales in 1998 (FPL 2000a). FPL has a contract to purchase up to 931 MW, with a minimum of 380 MW, of coal-fired generation from the Southern Company. In addition, FPL has contracts with the Jacksonville Electric Authority for the purchase of 388 MW of coal-fired generation from the St. John's Power Park Units 1 and 2 (FPL 2000b). FPL also has contracts with 10 cogeneration/small power production facilities to purchase firm capacity and energy (FPL 2000b). FPL purchases as-available (nonfirm) energy from other cogeneration and small power-production facilities. FPL does not foresee any substantial new capacity additions from co-generation facilities in the nonutility generation sector (FPL 2000a). All of the preceding power sources are being used to meet current and projected customer demand and are not available to replace power generated by Turkey Point Units 3 and 4.

Florida's peninsula limits interconnection alternatives for obtaining power purchased from out-of-State sources. The location of the Turkey Point Units 3 and 4 load center (Miami) at the southern end of the peninsula further constrains import possibilities. The existing power transmission infrastructure currently lacks the capacity to import power in sufficient quantity to replace a major generation source such as Turkey Point Units 3 and 4 located at the southern end of the FPL system. To replace Turkey Point Units 3 and 4 capacity with imported power, FPL would need to construct additional transmission facilities from the Florida State line to the

Miami area, a distance of approximately 560 km (350 mi). Additional transmission facilities may need to be constructed in other states to transmit the power to Florida (FPL 2000a).

Imported power from Canada or Mexico is unlikely to be available for replacement of Turkey Point Units 3 and 4 capacity. In Canada, 56 percent of the country's electricity capacity is derived from hydropower. However, there are few plans to expand large-scale hydroelectric facilities, although several small- to mid-sized hydroelectric projects are still being pursued (DOE/EIA 2000b). Canada is reevaluating the safety of its nuclear power industry. In late 1997 and early 1998, Canada shut down seven of its older nuclear power plants, or 17 percent (4,300 MW) of its operating capacity. It is uncertain whether the plants will be brought back on line sometime after 2000 as was intended. If the plants are prematurely retired, Canada's future dependence on nuclear power would be reduced. In addition, the loss of capacity could lead to a temporary reversal of electricity trade flows between the United States and Canada (DOE/EIA 2000b). EIA projects that total gross U.S. imports of electricity from Canada and Mexico will gradually increase from 46.5 billion kWh in year 2000 to 68.7 billion kWh in year 2005 and then gradually decrease to 28.6 billion kWh in year 2020 (DOE/EIA 2000a). Consequently, it is unlikely that electricity imported from Canada or Mexico would be able to replace the Turkey Point Units 3 and 4 capacity.

If power to replace Turkey Point Units 3 and 4 capacity were to be purchased from sources within the United States or a foreign country, the generating technology would be one of those described in this SEIS and in the GEIS (probably coal, natural gas, or nuclear). The description of the environmental impacts of other technologies in Chapter 8 of the GEIS is representative of the purchased electrical power alternative to renewal of the Turkey Point Units 3 and 4 OLs. Thus, the environmental impacts of imported power would still occur but would be located elsewhere within the region, nation, or another country.

8.2.6 Other Alternatives

Other generation technologies considered by NRC are discussed in the following sections.

8.2.6.1 Wind Power

The State of Florida is in a wind power Class 1 region (average wind speeds at 10-m (30 ft) elevation of 0 to 4.4 m/s [9.8 mph]). Class 1 has the lowest potential for wind energy generation (DOE 2001a). Wind turbines are economical in wind power Classes 4 through 7 (average wind speeds of 5.6 to 9.4 m/s [12.5 to 21.1 mph] [DOE 2001a]). Consequently, the staff concludes that locating a wind-energy facility on or near the Turkey Point site would not be economically feasible given the current state of wind energy generation technology.

8.2.6.2 Solar Power

Solar power technologies, photovoltaic and thermal, cannot currently compete with conventional fossil-fueled technologies in grid-connected applications due to higher capital costs per kilowatt of capacity. The average capacity factor of photovoltaic cells is about 25 percent, and the capacity factor for solar thermal systems is about 25 percent to 40 percent (NRC 1996). Energy storage requirements limit the use of solar-energy systems as baseload electricity supply.

There are substantial impacts to natural resources (wildlife habitat, land-use, and aesthetic impacts) from construction of solar-generating facilities. According to the GEIS, land requirements are high—14,000 ha (35,000 ac) per 1000 MW(e) for photovoltaic and approximately 5700 ha (14,000 ac) per 1000 MW(e) for solar thermal systems. Neither type of solar electric system would fit at the Turkey Point site, and both would have large environmental impacts at a greenfield site.

The Turkey Point site receives approximately 4 to 5 kWh of solar radiation per square meter per day, compared to 6 to 8 kWh of solar radiation per square meter per day in areas of the western United States, such as California, which are most promising for solar technologies (DOE/EIA 2000c). Because of the natural resource impacts (land and ecological), the area's relatively low rate of solar radiation, and high cost, solar power is not deemed a feasible baseload alternative to renewal of the Turkey Point Units 3 and 4 OLs. Some onsite-generated solar power (e.g., from rooftop photovoltaic applications) may substitute for electric power from the grid. Implementation of solar generation on a scale large enough to replace Turkey Point Units 3 and 4 would likely result in LARGE environmental impacts.

8.2.6.3 Hydropower

Florida has an estimated 43 MW of undeveloped hydroelectric resources (INEEL 1998). This amount is far less than what is needed to replace the 1386 MW(e) capacity of Turkey Point Units 3 and 4. As Section 8.3.4 of the GEIS points out, hydropower's percentage of U.S. generating capacity is expected to decline because hydroelectric facilities have become difficult to site as a result of public concern about flooding, destruction of natural habitat, and alteration of natural river courses. Based on estimates in the GEIS, land requirements for hydroelectric power are approximately 400,000 ha (1 million ac) per 1000 MW(e). Replacement of Turkey Point Units 3 and 4 generating capacity would require flooding more than this amount of land. Due to the relatively low amount of undeveloped hydropower resource in Florida and the large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to replace Turkey Point Units 3 and 4, the staff concludes that local hydropower is not a feasible alternative to Turkey Point Units 3 and 4 OL renewal on its own. Any attempts to site hydroelectric facilities large enough to replace Turkey Point Units 3 and 4 would result in LARGE environmental impacts.

8.2.6.4 Geothermal Energy

Geothermal energy has an average capacity factor of 90 percent and can be used for baseload power where available. However, geothermal technology is not widely used as baseload generation due to the limited geographical availability of the resource and immature status of the technology (NRC 1996). As illustrated by Figure 8.4 in the GEIS, geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii where hydrothermal reservoirs are prevalent. There is no feasible eastern location for geothermal capacity to serve as an alternative to Turkey Point Units 3 and 4. The staff concludes that geothermal energy is not a feasible alternative to renewal of the Turkey Point Units 3 and 4 OLs.

8.2.6.5 Wood Waste

A wood-burning facility can provide baseload power and operate with an average annual capacity factor of around 70 to 80 percent and with 20 to 25 percent efficiency (NRC 1996, Section 8.3.6). The fuels required are variable and site-specific. A significant barrier to the use of wood waste to generate electricity is the high delivered-fuel cost and high construction cost per MW of generating capacity. The larger wood-waste power plants are only 40 to 50 MW(e) in size. Estimates in the GEIS suggest that the overall level of construction impact per MW of installed capacity should be approximately the same as that for a coal-fired plant, although facilities using wood waste for fuel would be built at smaller scales. Like coal-fired plants, wood-waste plants require large areas for fuel storage and processing and involve the same type of combustion equipment.

Due to uncertainties associated with obtaining sufficient wood and wood waste to fuel a base-load generating facility, ecological impacts of large-scale timber cutting (e.g., soil erosion and loss of wildlife habitat), and high inefficiency, the staff has determined that wood waste is not a feasible alternative to renewing the Turkey Point Units 3 and 4 OLs.

8.2.6.6 Municipal Solid Waste

The initial capital costs for municipal solid-waste plants are greater than for comparable steam-turbine technology at wood-waste facilities (Section 8.2.6.5). This is due to the need for specialized waste-separation and -handling equipment for municipal solid waste. The decision to burn municipal waste to generate energy is usually driven by the need for an alternative to landfills rather than by energy considerations. The use of landfills as a waste disposal option is likely to increase in the near term; however, it is unlikely that many landfills will begin converting waste to energy because of unfavorable economics, particularly with electricity prices declining in real terms. EIA projects that between 1999 and 2020, the average price of electricity in real 1999 dollars will decline by an average of 0.5 percent per year as result of competition among

electricity suppliers (DOE/EIA 2000a). Therefore, municipal solid waste would not be a feasible alternative to renewal of the Turkey Point Units 3 and 4 OLs, particularly at the scale required.

8.2.6.7 Other Biomass-Derived Fuels

In addition to wood and municipal solid-waste fuels, there are several other concepts for fueling electric generators, including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste). The GEIS points out that none of these technologies has progressed to the point of being competitive on a large scale or of being reliable enough to replace a baseload plant such as Turkey Point Units 3 and 4. For these reasons, such fuels do not offer a feasible alternative to renewal of the Turkey Point Units 3 and 4 OLs.

8.2.6.8 Fuel Cells

Fuel cells work without combustion and its environmental side effects. Power is produced electrochemically by passing a hydrogen-rich fuel over an anode and air over a cathode and separating the two by an electrolyte. The only by-products are heat, water, and carbon dioxide. Hydrogen fuel can come from a variety of hydrocarbon resources by subjecting them to steam under pressure. Phosphoric acid fuel cells are generally considered first-generation technology. Higher-temperature second-generation fuel cells achieve higher fuel-to-electricity and thermal efficiencies. The higher temperatures contribute to improved efficiencies and give the second-generation fuel cells the capability to generate steam for cogeneration and combined-cycle operations. DOE projects that by 2003, two second-generation fuel cell technologies using molten carbonate and solid oxide technology, respectively, will be commercially available in sizes up to 2 MW at a cost of $1000 to $1500 per kW of installed capacity (DOE 2001b). For comparison, the installed capacity cost for a natural gas-fired combined-cycle plant is on the order of $500 to $600 per kW (NWPPC 2000). As market acceptance and manufacturing capacity increase, natural-gas-fueled fuel cell plants in the 50- to 100-MW range are projected to become available (DOE 2001b). At the present time, fuel cells are not economically or technologically competitive with other alternatives for baseload electricity generation. Fuel cells are, consequently, not a feasible alternative to renewal of the Turkey Point Units 3 and 4 OLs.

8.2.6.9 Delayed Retirement

FPL has no current plans to retire any existing generating units. For this reason, delayed retirement of other FPL generating units would not be a feasible alternative to renewal of the Turkey Point Units 3 and 4 OLs.

8.2.6.10 Utility-Sponsored Conservation

FPL has developed residential, commercial, and industrial programs to reduce both peak demands and daily energy consumption. These programs are commonly referred to as

demand-side management (DSM). FPL's DSM programs through 1999 have resulted in a cumulative summer peak reduction of approximately 2800 MW at the generator (FPL 2000b). FPL's additional incremental summer peak reduction goals attributable to DSM programs are 200 MW for 2001 increasing to 765 MW by 2009 (FPL 2000b). These goals have been approved by the Florida Public Service Commission (FPL 2000b).

FPL's current DSM program includes the following components (FPL 2000b):

- Residential Conservation Service – This is an energy audit program designed to assist residential customers in understanding how to make their homes more energy-efficient through the installation of conservation measures and practices.

- Residential Building Envelope – This program encourages the installation of energy-efficient ceiling insulation in residential dwellings that use whole-house electric air conditioning.

- Duct System Testing and Repair – This program encourages demand and energy conservation through the identification of air leaks in whole-house air conditioning duct systems and the repair of those leaks by qualified contractors.

- Residential Air Conditioning – This program is designed to encourage customers to purchase higher-efficiency central cooling and heating equipment.

- Residential Load Management (On Call) – This program offers load control of major appliances and household equipment to residential customers.

- BuildSmart – This program is designed to encourage the design and construction of energy-efficient homes that cost-effectively reduce FPL's coincident peak load and energy consumption.

- Business Energy Evaluation – This program is designed to encourage energy efficiency in both new and existing commercial and industrial facilities by identifying DSM opportunities and providing recommendations to the customer.

- Commercial/Industrial Heating, Ventilating, and Air Conditioning – This program is designed to encourage the use of high-efficiency heating, ventilating, and air conditioning systems in commercial and industrial facilities. These systems include air- and water-cooled chillers, thermal energy storage, window and wall units, and duct repair measures.

- Commercial/Industrial Lighting – This program is designed to encourage the installation of energy-efficient lighting measures in commercial and industrial facilities.

- Off-Peak Battery Charging – This program is designed to shift the demand of commercial and industrial customers' battery-charging applications from on-peak to off-peak time periods.

- Business Custom Incentive – This program is designed to encourage commercial and industrial customers to implement unique energy conservation measures or projects not covered by other FPL programs.

- Commercial/Industrial Load Control – This program is designed to reduce peak demand by controlling customer loads of 200 kW or greater during periods of extreme demand or capacity shortages.

- Commercial/Industrial Building Envelope – This program is designed to encourage the installation of energy-efficient building envelope measures such as window treatments and roof/ceiling insulation.

- Business on Call – This program is designed to offer load control of central air conditioning units to small nondemand billed commercial and industrial customers.

FPL's DSM program also includes a variety of research and development activities (FPL 2000b).

Historic and projected reduction in generation needs as a result of DSM programs has been credited in the FPL *Ten Year Power Plant Site Plan 2000-2009* (FPL 2000b) to meet part of FPL's projected customer demand. Because these DSM savings are part of the long-range plan for meeting projected demand, they are not available offsets for Turkey Point Units 3 and 4. Therefore, the conservation option is not considered a reasonable replacement for the OL renewal alternative.

8.2.7 Combination of Alternatives

Even though individual alternatives to Turkey Point Units 3 and 4 might not be sufficient on their own to replace Turkey Point Units 3 and 4 capacity due to the small size of the resource or lack of cost-effective opportunities, it is conceivable that a combination of alternatives might be cost-effective.

As discussed in Section 8.2, Turkey Point Units 3 and 4 have a combined net summer rating of 1386 MW(e). For the coal-, natural gas-, and oil-fired alternatives, the FPL ER assumes three standard 400-MW(e) units as potential replacements for Units 3 and 4. This approach is followed in this SEIS, although it results in some environmental impacts that are somewhat lower than if full replacement capacity were constructed.

One possible combination of alternatives is to combine limited small-scale solar power with a smaller central power station to replace the Turkey Point Units 3 and 4 capacity. Such an alternative could potentially have fewer environmental impacts than the central plant by itself. The environmental impacts associated with the additional generating option(s), such as solar power, would need to be added to the impacts associated with the central plant technology. For example, solar thermal systems potentially have significant wildlife habitat, land-use, and aesthetic impacts.

Table 8-9 contains a summary of the environmental impacts of another assumed combination of alternatives consisting of 800 MW(e) of combined cycle natural gas-fired generation using closed-cycle cooling, an additional 186 MW(e) purchased from other sources, and 400 MW(e) gained from additional DSM measures. The impacts are based on the gas-fired generation impact assumptions discussed in Section 8.2.2, adjusted for the reduced generating capacity. As discussed in Section 8.2.5, the environmental impacts associated with purchased power would depend on the generation technology and would occur at the generation site. These impacts are not shown in Table 8.9. While the DSM measures would have few environmental impacts, operation of the new gas-fired plant would result in increased emissions and other environmental impacts. The staff concludes that it is very unlikely that the environmental impacts of any reasonable combination of generating and conservation options could be reduced to the level of impacts associated with renewal of the Turkey Point Units 3 and 4 OLs.

8.3 Summary of Alternatives Considered

The environmental impacts of the proposed action, license renewal, are SMALL for all impact categories (except collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, for which a single significance level was not assigned). The alternative actions, i.e., no-action alternative (discussed in Section 8.1), new generation alternatives (from coal, natural gas, nuclear, and oil discussed in Sections 8.2.1 through 8.2.4, respectively), purchased electrical power (discussed in Section 8.2.5), alternative technologies (discussed in Section 8.2.6), and the combination of alternatives (discussed in Section 8.2.7) were considered.

The no-action alternative would require the replacement of electrical generating capacity by (1) DSM and energy conservation, (2) power purchased from other electricity providers, (3) generating alternatives other than Turkey Point Units 3 and 4, or (4) some combination of these options and would result in the decommissioning of Turkey Point Units 3 and 4. For each of the new generation alternatives (coal, natural gas, nuclear, and oil), the environmental impacts would not be less than the impacts of license renewal. For example, the land-disturbance impacts resulting from construction of any new facility would be greater than the impacts of continued operation of Turkey Point Units 3 and 4. The impacts of purchased electrical power (imported power) would still occur, but would occur elsewhere. Alternative

Table 8-9. Summary of Environmental Impacts of 800 MW(e) of Natural Gas-Fired Generation, 186 MW(e) of Purchased Power, and 400 MW(e) from Demand-Side Management Measures

	Turkey Point Site		Alternate Florida Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	MODERATE to LARGE	9 ha (23 ac) for powerblock, offices, roads, and parking areas. Additional impact of up to approximately 4050 ha (10,000 ac) for construction and/or upgrade of an underground gas pipeline.	MODERATE to LARGE	23 ha (34 ac) for powerblock, offices, roads, and parking areas. Approximately 1000 ha (2500 ac) for transmission line. Additional impact of up to 3600 ha (9000 ac) for construction and/or upgrade of an underground gas pipeline.
Ecology	MODERATE to LARGE	Uses undeveloped areas at current Turkey Point site, plus gas pipeline through sensitive Everglades habitat.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission and pipeline routes; potential habitat loss and fragmentation; reduced productivity and biological diversity. Likely plant sites already have power generation facilities.
Water Use and Quality	SMALL	Uses existing cooling canal system	SMALL to MODERATE	Impact depends on volume of water withdrawal and discharge and characteristics of surface water body.
Air Quality	MODERATE	Sulfur oxides C 9 MT/yr (10 tons/yr) Nitrogen oxides C 134 MT/yr (148 tons/yr) Carbon monoxide C 128 MT/yr (141 tons/yr) PM_{10} particulates C 294 MT/yr (324 tons/yr) Some hazardous air pollutants	MODERATE	Same as siting at Turkey Point
Waste	SMALL to MODERATE	Small amount of ash produced from gas-fired plant.	SMALL	Small amount of ash produced from gas-fired plant.
Human Health	SMALL	Impacts considered to be minor.	SMALL	Impacts considered to be minor.

Table 8-9. (contd)

	Turkey Point Site		Alternate Florida Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Socioeconomics	SMALL to MODERATE	During construction, impacts would be MODERATE. Up to 1000 additional workers during the peak of the 3-year construction period, followed by reduction from current Turkey Point Units 3 and 4 work force of 960 to 100; tax base preserved. Impacts during operation would be SMALL. Transportation impacts associated with construction workers would be MODERATE.	SMALL to MODERATE	Construction impacts depend on location, but could be significant if location is in a more rural area than Turkey Point. Miami-Dade County would experience loss of tax base and employment, potentially offset by projected economic growth. Transportation impacts associated with construction workers would be MODERATE.
Aesthetics	MODERATE	MODERATE aesthetic impacts due to impacts of plant units and stacks on environmentally sensitive Biscayne National Park.	MODERATE to LARGE	Greatest impact is from the new transmission line that would be needed.
Historic and Archeological Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Any potential impacts can likely be effectively managed.
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction; loss of 860 operating jobs at Turkey Point could reduce employment prospects for minority and low-income populations. Impacts could be offset by projected economic growth and the ability of affected workers to commute to other jobs.	SMALL to MODERATE	Impacts vary depending on population distribution and makeup at site.

technologies are not considered feasible at this time and it is very unlikely that the environmental impacts of any reasonable combination of generation and conservation options could be reduced to the level of impacts associated with renewal of Turkey Point Units 3 and 4.

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

8.4 References

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

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

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

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

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

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

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

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