Oyster Creek Generating Station

Applicant's Environmental Report - Operating License Renewal Stage

AmerGen℠

An Exelon Company

Applicant's Environmental Report – Operating License Renewal Stage Oyster Creek Generating Station

AmerGen

Docket No. 50-219

License No. DPR-16

Table of Contents

Table of Contents (Continued)

Table of Contents (Continued)

Appendices

Table of Contents (Continued)

List of Tables

Table of Contents (Continued)

List of Figures

ACRONYMS AND ABBREVIATIONS

AADT	Annual Average Daily Traffic
BTU	British Thermal Unit
°C	degrees Celsius
CAFRA	Coastal Area Facility Review Act
CCMP	[Barnegat Bay] Comprehensive Conservation and Management Plan
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CMP	[Pinelands] Comprehensive Management Plan
CWA	Clean Water Act
DoD	[U.S.] Department of Defense
DSM	Demand-side management
ESA	Endangered Species Act
°F	degrees Fahrenheit
FES	Final Environmental Statement
fps	Feet per second
FRPP	Forked River Power Plant
FSAR	Final Safety Analysis Report
FWS	[U.S.] Fish and Wildlife Service
GE	General Electric
GEIS	Generic Environmental Impact Statement for License Renewal of Nuclear Plants
gpm	gallons per minute
GW	groundwater
HRSG	heat recovery steam generator
IPA	Integrated Plant Assessment
ISFSI	Independent Spent Fuel Storage Installation
Kwh	Kilowatt hours
LOS	Level of Service
MAFB	McGuire Air Force Base
MGD	Million gallons per day
MM	million
MSA	Metropolitan Statistical Area
MUA	Municipal Utilities Authority
MW	megawatt
MWe	megawatts-electric
NAAQS	National Ambient Air Quality Standards
NAES	Naval Air Engineering Station
NESC	National Electrical Safety Code
NJAC	New Jersey Administrative Code

NJBPU	New Jersey Board of Public Utilities
NJDEP	New Jersey Department of Environmental Protection
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
OCGS	Oyster Creek Generating Station
PJM	Pennsylvania, New Jersey, Maryland [power pool]
PM_{10}	particulates with diameters less than 10 microns
ppt	parts per thousand
SAMA	Severe Accident Mitigation Alternatives
SCR	Selective catalytic reduction
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SMITTR	surveillance, monitoring, inspections, testing, trending, and recordkeeping
SO_2	sulfur dioxide
SO_x	sulfur oxides
SW	surface water
TSP	total suspended particulates
USAEC	U.S. Atomic Energy Commission
USCB	U.S. Census Bureau
USEPA	U.S. Environmental Protection Agency
USNRC	U.S. Nuclear Regulatory Commission
WMA	Wildlife Management Area

Chapter 1

Introduction

1.1 Purpose of and Need for Action

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. AmerGen Energy Company LLC. (AmerGen) operates the Oyster Creek Generating Station (OCGS), pursuant to NRC Operating License DPR-16. The license will expire on April 9, 2009. AmerGen has prepared this environmental report in conjunction with its application to NRC to renew the OCGS operating license, as provided by the following NRC regulations:

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

NRC has defined the purpose and need for the proposed action, the renewal of the operating license for nuclear power plants such as OCGS, as follows:

> "...The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than NRC) decision makers." (USNRC 1996a)

The renewed operating license would allow an additional 20 years of plant operation beyond the current OCGS licensed operating period of 40 years.

1.2 Environmental Report Scope and Methodology

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

- NRC supplemental information in the Federal Register (USNRC 1996a, 1996b, 1996c, and 1999a)
- Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS) (USNRC 1996d and 1999b)
- Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses (USNRC 1996e)
- Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response (USNRC 1996f)

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

1.3 Oyster Creek Generating Station Licensee and Ownership

AmerGen is the NRC licensee for OCGS and will submit the OCGS license renewal application to the NRC. AmerGen is a wholly owned subsidiary of Exelon Corporation (Exelon 2002), a diversified energy services company representing more than 20 percent of the U.S. nuclear industry's power capacity (Exelon 2004). When AmerGen bought OCGS from GPU in August, 2000, Amergen was a joint venture between Exelon Corporation and British Energy. Exelon acquired British Energy's interest in 2002.

Table 1-1. Environmental Report Responses to License Renewal Environmental Regulatory Requirements.

Regulatory Requirement	Responsive Environmental Report Section(s)	
10 CFR 51.53(c)(1)		Entire Document
10 CFR 51.53(c)(2), Sentences 1 and 2	3.0	Proposed Action
10 CFR 51.53(c)(2), Sentence 3	7.2.2	Environmental Impacts of Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(1)	4.0	Environmental Consequences of the Proposed Action and Mitigating Actions
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(2)	6.3	Unavoidable Adverse Impacts
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(3)	7.0	Alternatives to the Proposed Action
	8.0	Comparison of Environmental Impacts of License Renewal with the Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(4)	6.5	Short-Term Use Versus Long-Term Productivity of the Environment
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(5)	6.4	Irreversible and Irretrievable Resource Commitments
10 CFR 51.53(c)(2) and 10 CFR 51.45(c)	4.0	Environmental Consequences of the Proposed Action and Mitigating Actions
	6.2	Mitigation
	7.2.2	Environmental Impacts of Alternatives
	8.0	Comparison of Environmental Impacts of License Renewal with the Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(d)	9.0	Status of Compliance
10 CFR 51.53(c)(2) and 10 CFR 51.45(e)	4.0	Environmental Consequences of the Proposed Action and Mitigating Actions
	6.3	Unavoidable Adverse Impacts
10 CFR 51.53(c)(3)(ii)(A)	4.1	Water Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a Small River with Low Flow)
	4.6	Groundwater Use Conflicts (Plants Using Cooling Towers or Cooling Ponds and Withdrawing Makeup Water from a Small River)
10 CFR 51.53(c)(3)(ii)(B)	4.2	Entrainment of Fish and Shellfish in Early Life Stages
	4.3	Impingement of Fish and Shellfish
	4.4	Heat Shock
10 CFR 51.53(c)(3)(ii)(C)	4.5	Groundwater Use Conflicts (Plants Using >100 gpm of Groundwater)
	4.7	Groundwater Use Conflicts (Plants Using Ranney Wells)
10 CFR 51.53(c)(3)(ii)(D)	4.8	Degradation of Groundwater Quality
10 CFR 51.53(c)(3)(ii)(E)	4.9	Impacts of Refurbishment on Terrestrial Resources
	4.10	Threatened or Endangered Species
10 CFR 51.53(c)(3)(ii)(F)	4.11	Air Quality During Refurbishment (Non-Attainment Areas)

Table 1-1. Environmental Report Responses to License Renewal Environmental Regulatory Requirements (Continued).

Regulatory Requirement	Responsive Environmental Report Section(s)	
10 CFR 51.53(c)(3)(ii)(G)	4.12	Microbiological Organisms
10 CFR 51.53(c)(3)(ii)(H)	4.13	Electric Shock from Transmission-Line-Induced Currents
10 CFR 51.53(c)(3)(ii)(I)	4.14	Housing Impacts
	4.15	Public Utilities: Public Water Supply Availability
	4.16	Education Impacts from Refurbishment
	4.17	Offsite Land Use
10 CFR 51.53(c)(3)(ii)(J)	4.18	Transportation
10 CFR 51.53(c)(3)(ii)(K)	4.19	Historic and Archaeological Resources
10 CFR 51.53(c)(3)(ii)(L)	4.20	Severe Accident Mitigation Alternatives
10 CFR 51.53(c)(3)(iii)	4.0	Environmental Consequences of the Proposed Action and Mitigating Actions
10 CFR 51.53(c)(3)(iv)	6.2	Mitigation
	5.0	Assessment of New and Significant Information
10 CFR 51, Appendix B, Table B-1, Footnote 6	2.6.2	Minority and Low-Income Populations

1.4 References

Note to reader: Hard copies of cited web pages are available in AmerGen files. Some sites, for example the census data, cannot be accessed through their given URLs. The only way to access these pages is to follow queries on previous web pages. The complete URLs used by AmerGen have been given for these pages, even though they may not be directly accessible.

Exelon. 2002. Oyster Creek Generating Station. Available at: http://www.exeloncorp.com/generation/nuclear/gn_oyster.shtml. Accessed June 30, 2004.

Exelon. 2004. Oyster Creek Generating Station. Available at: http://www.oystercreeklr.com/home.html. Accessed June 30, 2004.

USNRC (U.S. Nuclear Regulatory Commission). 1996a. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses." *Federal Register*. Vol. 61, No. 109. June 5.

USNRC (U.S. Nuclear Regulatory Commission). 1996b. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses; Correction." *Federal Register*. Vol. 61, No. 147. July 30.

USNRC (U.S. Nuclear Regulatory Commission). 1996c. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses." *Federal Register*. Vol. 61, No. 244. December 18.

USNRC (U.S. Nuclear Regulatory Commission). 1996d. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Volumes 1 and 2. NUREG-1437. Washington, DC. May.

USNRC (U.S. Nuclear Regulatory Commission). 1996e. *Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses*. NUREG-1440. Washington, DC. May.

USNRC (U.S. Nuclear Regulatory Commission). 1996f. *Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response*. Volumes 1 and 2. NUREG-1529. Washington, DC. May.

USNRC (U.S. Nuclear Regulatory Commission). 1999a. "Changes to Requirements for Environmental Review for Renewal of Nuclear Power Plant Operating Licenses; Final Rule." *Federal Register*. Vol. 64, No. 171. September 3.

USNRC (U.S. Nuclear Regulatory Commission). 1999b. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*. Section 6.3, "Transportation" and Table 9-1, "Summary of findings on NEPA issues for license renewal of nuclear power plants." NUREG-1437. Volume 1, Addendum 1. Washington, DC. August.

Chapter 2

Site and Environmental Interfaces

2.1 Location and Features

The information in this section comes from the Oyster Creek Nuclear Generating Station Final Safety Analysis Report (AmerGen 2003) and the 1972 Environmental Report (Jersey Central Power & Light Company 1972) unless noted otherwise.

Oyster Creek Generating Station (OCGS) is located in Lacey Township in Ocean County, New Jersey. The nearest major metropolitan areas to OCGS include Newark, New Jersey, approximately 60 miles to the north; Atlantic City, New Jersey, approximately 35 miles to the south; and Philadelphia, Pennsylvania, approximately 60 miles west of the OCGS site. Figures 2-1 and 2-2 are the 50-mile and 6-mile vicinity maps, respectively.

The Station is situated on approximately 800 acres of land (AmerGen 2003, Table 1.2-1) in the coastal pine barrens of New Jersey approximately 9 miles south of Toms River, New Jersey. The property is adjacent to Barnegat Bay and is bisected by U.S. Highway 9, and bounded by the South Branch of the Forked River and the manmade intake canal on the north, and Oyster Creek and the manmade discharge canal on the south.

Figure 2-3 shows the OCGS site boundary. The physical plant is located on approximately 150 acres west of U.S. Highway 9. OCGS is a single boiling water reactor with a maximum power level of 1930 MW (thermal) and an expected ultimate electrical capability of 640 MW net. The remaining approximately 650 acres is east of U.S. Highway 9 and is an old cattle farm (the former Finninger Farm). The old fields are undergoing succession and vegetation ranges from native grasses to pines and small oaks, typical of coastal New Jersey. A dredge spoil basin for sediment removed from Oyster Creek and Forked River is located in this portion of the site.

An emergency fire pond is located southwest of the Station, on the southern edge of the FirstEnergy property. The emergency fire pond is owned by FirstEnergy and maintained by AmerGen.

OCGS is within the Pinelands National Reserve. The surrounding terrain is naturally flat. The area immediately surrounding the plant is a mix of vacant lands, agricultural lands and woodlands. The region within 40 miles of the site has very little industry; in fact, only about 25 percent of the land in the surrounding area is developed. Development within the Pinelands National Reserve is strictly controlled.

The Barnegat Bay region is well known as a summer resort area thus the population of the area surrounding the site increases during the summer months.

Section 3.1 describes key features of OCGS, including reactor and containment systems, cooling water system, and transmission system.

2.2 Aquatic Ecological Communities

Oyster Creek Generating Station was built approximately two miles inland from Barnegat Bay, on high ground lying between two streams, the South Branch of the Forked River (to the north) and Oyster Creek (to the south). Jersey Central Power and Light Company dredged a semi-circular canal between the two streams (see Figure 2-3) to create a horseshoe-shaped cooling water system that consists of the lower reaches of the South Branch of the Forked River, the dredged canal, and the lower reaches of Oyster Creek. Figure 3-1 shows the cooling system configuration and the direction of cooling water flow. Water is withdrawn from Barnegat Bay via the intake canal (South Branch of Forked River and manmade intake canal), circulated through the plant's condensers, and returned to the Bay via the discharge canal (manmade discharge canal and Oyster Creek). A complete description of the circulating water (condenser cooling) system may be found in Section 3.1.2.

Barnegat Bay Physical-Chemical Characteristics

Barnegat Bay is a shallow, lagoon-type estuary located along the central New Jersey coast (Figure 2-2). The Bay extends from Point Pleasant in the north to Manahawkin Causeway in the south, a distance of about 30 miles (USAEC 1974). The Bay has an average depth of 5 feet and a maximum depth of 20 feet. The deepest areas are found along the Intracoastal Waterway, a narrow navigation channel that loosely follows the western shoreline of the Bay. The Bay has a surface area of approximately 65 square miles and a volume of 9.5 billion cubic feet (USAEC 1974).

A pair of barrier islands, Island Beach and Long Beach Island, with north-south orientations separate Barnegat Bay from the Atlantic Ocean (Figure 2-2). Water moves between Barnegat Bay and the Atlantic Ocean via Barnegat Inlet, which separates Island Beach and Long Beach Island. The northern part of the Bay also receives brackish water from the lower Manasquan River via the Bay Head-Manasquan Canal (also known as the Point Pleasant Canal) while the southern part of the Bay communicates freely with Manahawkin Bay.

The U.S. Army Corps of Engineers made a number of modifications to Barnegat Inlet between 1987 and 1991 in an attempt to stabilize the Inlet's navigation channel (Seabergh et al. 1998). A new 4,270-foot-long south jetty was built parallel to the existing north jetty. The existing navigation channel was straightened and deepened to allow water to move more freely in and out of the Bay. After the Inlet was modified, spring tidal prisms (volume of water moving through the inlet in a tidal cycle) increased substantially, returning values to approximating those seen in the 1930s and early 1940s (Seabergh et al. 1998).

Barnegat Bay has a small bay tide range (0.3 to 0.7 foot) compared to the mean ocean tide (4.25 feet) (Seabergh et al. 1998). This is due to the large size of the Bay relative to the inlet's cross-sectional area at its narrowest point, a circumstance that creates asymmetries in flood and ebb tide flows. Flood flow predominates during spring tides accompanied by inability to fully drain during ebb flow (due to the limited discharge capacity of the channel). This creates a net storage in the Bay until the transition from spring to neap tide occurs, when there is a net outflow.

Salinities range from 12 parts per thousand (ppt) in the northern end of Barnegat Bay to 32 ppt at its southern end (USAEC 1974). Salinities in the area of Oyster Creek range from 19 to 30 parts ppt and average around 25 ppt (Chizmadia et al. 1984). Freshwater enters the estuary primarily along the western (mainland) shore from surface runoff and groundwater seepage. A number

of streams that drain the New Jersey Pine Barrens flow into the Bay along its western margin. Of these streams, Toms River and Cedar Creek have the greatest freshwater flow. Smaller streams flowing into the Bay include (from north to south) the Metedeconk River, Forked River, Oyster Creek, and Manahawkin Creek.

Ambient water temperatures in Barnegat Bay range from 29.5°F (-1.4°C) in winter to 82.5°F (28°C) in summer (Chizmadia et al. 1984). Because the Bay is shallow, it is subject to rapid temperature change; temperatures may change as much as 4°F over a 24-hour period. Deeper portions of the Bay may show thermal stratification, but coastal winds and wave action tend to keep the system well mixed. Temperature inversions occasionally occur at the mouths of streams draining the mainland, as cool, freshwater from these streams flows over warmer, saline Bay water (USAEC 1974; Chizmadia et al. 1984).

Because of the shallowness of the Bay, wind action strongly affects its circulation. The predominant wind direction during the summer is from the south (south-southwest), with wind stress producing a general flow of water to the north (Chizmadia et al. 1984). Winds are mainly from the west (west-northwest) in winter, and water flows generally eastward and southward during this season. A tendency toward two-layered circulation exists in areas deeper than 5 feet, although complete vertical mixing occurs periodically. Local water movements in the estuary are complex because of the interaction of wind, tides, hydraulic head produced by runoff and groundwater seepage, density differences due to salinity and temperature gradients, and the bathymetry of the bay.

The barrier islands restrict water circulation, thereby affecting tides, salinities, and sediment deposition in the Bay. Because of restricted circulation, nutrient inputs from urban stormwater and sewage treatment plants tend to remain in the Bay. This has, in the past, produced elevated levels of nitrogen compounds and other nutrients that can stimulate growth of algae. In the last several decades, as development has intensified along the western shore of Barnegat Bay, heavy algae blooms have become more common in summer, while submerged aquatic vegetation has become less abundant. Temporal and spatial shifts in submerged aquatic vegetation in Barnegat Bay are likely the result of naturally-occurring cycles (e.g., periodic disease outbreaks), but anthropogenic activities such as dredging and nutrient loading may also have an effect (BBNEP 2001).

Barnegat Bay Aquatic Communities

The most comprehensive source of information on the aquatic communities of Barnegat Bay is a monograph entitled *Ecology of Barnegat Bay* (Kennish and Lutz, eds.), published in 1984. A collaborative effort, it contains the results of research and monitoring studies carried out by Jersey Central Power and Light Company and GPU Nuclear Corporation (previous owners of OCGS) biologists, university researchers, New Jersey state resource agency biologists, national laboratory (Battelle Columbus) scientists, and consultants. Although some of this information must be viewed in light of physical (modification of Barnegat Inlet) and biological (increasing eutrophication) changes in Barnegat Bay since 1984, it remains an invaluable document and is the basis for the description of aquatic biota that follows.

Algae and macrophytes

The bottom vegetation of Barnegat Bay varies throughout the estuary because of differences in substrate, depth, salinity, water quality, and local currents. In general, the benthic macroflora is dominated by the vascular plant *Zostera marina* (eelgrass) and several species of macroalgae (*Ulva lactuca*, *Codium fragile*, *Gracilaria tikvahiae*, and *Ceramium fastigiatum*) (Loveland et al.

1984). Beds of eelgrass are most common along the mainland shore and shallows east of the Intracoastal Waterway. Most macroalgae are unattached forms, drifting throughout the shallow portions of the Bay.

Phytoplankton

Barnegat Bay contains more than 180 species of phytoplankton, with diatoms and dinoflagellates the numerically dominant groups (Mountford 1984). Phytoplankton biomass peaks during the late winter-early spring diatom bloom or later, in summer, depending on weather and nutrient availability. Zooplankton grazing terminates the diatom bloom in the spring. *Skeletonema costatum*, a relatively unimportant species during the bloom, becomes the dominant phytoplankton as temperatures rise in the spring. Phytoplankton numbers peak in the summer, and are lower in fall and winter. Smaller forms (ultraplankton and nanoplankton) are especially numerous in summer.

Brown tide blooms, caused by the rapid growth of the micro-alga *Aureococcus anophagefferens*, were first observed along the coast of the northeastern U.S. in 1985 in Narragansett Bay (Rhode Island) and Peconic Bay (New York) (Gastrich et al. 2003). Brown tide blooms were first documented in Barnegat Bay in 1995.

The New Jersey Department of Environmental Protection (NJDEP) monitoring over the 2000-2002 period showed brown tide species were present at all sampling stations and that Category 3 blooms (the most severe) covered significant portions of the lower Barnegat Bay-Little Egg Harbor area (Gastrich et al. 2003). Extended drought conditions with correspondingly low freshwater inputs occurred over this period, and likely contributed to the blooms. In 2003, a year with lower average temperatures and salinities, the number of brown tide blooms was substantially reduced: only one station (in Tuckerton Bay) had "elevated" brown tide blooms (NJDEP 2004a).

Zooplankton

Copepods are the most important microzooplankton (< 500 micrometers long) in Barnegat Bay (Kennish 1984). Common species include *Acartia hudsonica*, *Acartia tonsa*, and *Oithona colcarva*. Important macrozooplankton (> 500 micrometers long) in the estuary include *Rathkea octopunctata*, *Neomysis americana*, *Crangon septemspinosa*, *Neopanope texana*, *Jassa falcata*, *Sagitta* spp., and *Sarsia* spp. (Kennish 1984).

In general, abundance of zooplankton of Barnegat Bay tracks abundance of phytoplankton. Greatest zooplankton densities occur in the spring, after the winter-spring diatom blooms, and in summer. Similarly, shorter-term fluctuations in zooplankton numbers appear to be correlated with increases and decreases in phytoplankton numbers.

Benthic Fauna

A total of 216 species of benthic macroinvertebrates were found at three study sites during early years (1969-1973) of OCGS operation (Loveland and Vouglitois 1984). Over this period, there was a general trend of decreasing density and increasing diversity (species richness). Patterns of dominance changed very little, with numerically dominant species in 1969 ranking among dominant species in 1973. Suspension and filter feeders numerically dominated collections in 1969, while deposit feeders dominated in subsequent years of study.

Shellfish

Barnegat Bay historically supported two recreationally and commercially important shellfish species, the hard clam (*Mercenaria mercenaria*) and the blue crab (*Callinectes sapidus*). Abundance and biomass of

Mercenaria in the Bay decreased steadily in the 1960s and 1970s. The decline in standing stocks was attributed to lower recruitment (Kennish et al. 1984). The decline in recruitment, coupled with closure of some shellfish beds due to high levels of bacteria and reduced fishing effort, combined to reduce commercial harvest of this species.

Blue crabs are concentrated along the eastern shore of the Bay, where they are typically found in areas with dense aquatic vegetation. The blue crab population of Barnegat Bay is dominated by recruitment-size (less than 59 mm) and growth-size (60 to 119 mm) crabs, suggesting that the estuary is an important nursery area for this species (Kennish et al. 1984).

The blue crab occurs in Barnegat Bay year-round, but is most active in the summer months. It is an important component of the recreational fishery, making up more than 50 percent of the annual catch (Kennish et al. 1984).

Finfish

Barnegat Bay supports a diverse assemblage of fishes typical of mid-Atlantic estuaries. Biologists collected 107 fish species representing 57 families in Barnegat Bay over a three-year period in the 1970s (Tatham et al. 1984). Resident fishes (20 species), those found year-round within the estuary, made up 31 percent (by number) of all fish collected in the study. Common, recreationally-important, and commercially-important resident species included inland silversides (*Menidia beryllina*), Atlantic silversides (*M. menidia*), mummichog (*Fundulus heteroclitus*), and winter flounder (*Pseudopleuronectes americanus*). Warm-water migrants, those present from April through November, were a diverse (34 species) and abundant (65 percent of all fish collected) group. They included bay anchovy (*Anchoa mitchilli*), Atlantic menhaden (*Brevoortia tyrannus*), spot (*Leiostomus xanthurus*), and weakfish (*Cynoscion regalis*). Most warm-water migrants collected were young of the year or juveniles using the Bay as a nursery area. Individuals of some species, such as bay anchovy and Atlantic menhaden, were also collected in winter months. Cool-water migrants (12 species, 3 percent of all fish collected) were present from November through April and were usually absent in other months. Most were young herring (Clupeidae; 4 species) and cods (Gadidae; 3 species). Some adult alewife (*Alosa pseudoharengus*) and blueback herring (*A. aestivalis*) were also collected, and made spawning runs into some tributary streams.

Strays from the open ocean and freshwater streams flowing into Barnegat Bay were the most diverse group (42 species), but made up a relatively small percentage of all fish collected (1 percent). Most marine strays were immature fish and were collected in summer. Most freshwater strays were collected after periods of heavy rainfall.

The Barnegat Bay fish community tends to be dominated numerically by small, schooling species such as the bay anchovy and Atlantic silversides. (Tatham et al. 1984) sampled an array of stations in western Barnegat Bay over a three-year period using a variety of gear (seines, gill nets, trawls) in an attempt to characterize the fish community potentially affected by OCGS operations. In this study, more than 90 percent of the catch comprised 10 species: bay anchovy, Atlantic silverside, fourspine stickleback (*Apeltes quadracus*), spot, winter flounder, inland silverside, northern pipefish (*Sygnathus fuscus*), mummichog, bluefish (*Pomatomus saltatrix*), and oyster toadfish (*Opsanus tau*). Although there may be large fluctuations in absolute abundance (i.e., measures of density or catch per unit effort) of these common species, patterns of species composition and relative abundance tend to be stable (Kennish 1984).

Commercial and Recreational Fisheries

At the time *Ecology of Barnegat Bay* (Kennish and Lutz, eds.) was published, three finfish (American eel [*Anguilla rostrata*], white perch [*Morone americana*], and winter flounder) and two shellfish (blue crab and hard clam) were sought by commercial fishermen. Annual landings of commercially-important species were variable, reflecting normal year-to-year fluctuations in year-class strength, weather, demand, and fishing effort.

Until the 1980s, the hard clam was the most economically important species sought by commercial fishermen in Barnegat Bay. Landings of hard clams peaked in the 1950s, exceeding 300 metric tons per year, and declined steadily thereafter (Kennish 1984). From 1965-1977, approximately one sixth of hard clams harvested in New Jersey were from Barnegat Bay.

Blue crab, bluefish, and winter flounder made up more than 80 percent of the annual Barnegat Bay recreational catch in the 1970s (Kennish 1984). Blue crab was by far the most important species, comprising 65 percent or more of the annual recreational harvest. Finfish catches were dominated by bluefish, winter flounder, spot, summer flounder (*Paralichthys dentatus*), and weakfish. Bluefish, summer flounder, and weakfish are caught mostly in late summer and fall; spot and winter flounder are caught mostly in the spring.

Barnegat Bay from 1987 to Present

In response to growing concerns about the impact of development on Barnegat Bay, the New Jersey Legislature passed the Barnegat Bay Study Act (P.L. 1987 – Chapter 397) in 1987 requiring a study of the nature and extent of these impacts (BBNEP 2002). The Act created the Barnegat Bay Study Group and mandated a study of the Bay and its watershed. The study produced three reports: Profile of the Barnegat Bay (1990), Management Recommendations for the Barnegat Bay (1990), and A Watershed Management Plan for the Barnegat Bay (1995). After the release of the third and final report, the Barnegat Bay Watershed Association (now called the Barnegat Bay Watershed and Estuary Foundation) was formed and the Governor of New Jersey petitioned the United States Environmental Protection Agency (EPA) to add Barnegat Bay to the National Estuary Program. The EPA accepted Barnegat Bay into the program in July 1995.

The Barnegat Bay Estuary Program Characterization Report, released in January 2001, indicated that the priority problems in the estuary were:

- Water supply and water quality, including the issues of contaminated stormwater and runoff, nutrient loading, pathogen contamination, groundwater contaminations, and future water supply deficits;
- Habitat loss and alteration;
- Fisheries decline; and
- Human activities and competing uses.

The BBEP Characterization Report notes that estuarine organisms are adversely affected by OCGS chemical and thermal discharges, impingement, and entrainment but concludes that impacts are generally limited to near-field areas (i.e., intake canal and Forked River, discharge canal and Oyster Creek) and “continued operation of the OCNGS will not threaten the protection and propagation of balanced, indigenous (aquatic) populations in Barnegat Bay” (BBNEP 2001, Chapter 9).

The Barnegat Bay Comprehensive Conservation and Management Plan (CCMP), completed in May 2002, laid out an approach for restoring the Barnegat Bay

ecosystem that was keyed to these priorities.

The Barnegat Bay Estuary Program and its cooperating agencies have already had several successes:

- the volume of polluted stormwater entering the Bay has decreased, the result of improvements in stormwater management in the watershed

- bacterial contamination in the Bay is decreasing, the result of New Jersey's Clean Vessel Program and the Bay's designation as a "No Discharge Zone"

In addition, populations of several popular sportfish in the Bay appear to be recovering or expanding, the result of regional fisheries management initiatives and the rise of a conservation ("catch and release") ethic. Anecdotal information suggests that Barnegat Bay finfish populations are generally healthy and fishing for several species (e.g., striped bass, weakfish, bluefish) is excellent (Flyfishing Connection 1999; Fishing and Hunting News 2004; Haughey 2004; Honachefsky 2004).

The National Marine Fisheries Service (NMFS) maintains records on recreational landings of important species, including many of the species sought by anglers in Barnegat Bay. These data are organized by region (e.g., north Atlantic, mid-Atlantic, south-Atlantic) and by state, but are not available by watershed or waterbody. Most of the species in question range up and down the mid-Atlantic coast and use Barnegat Bay seasonally; therefore, data for the state of New Jersey are assumed to reflect the state of Barnegat Bay populations.

The NMFS data indicate that striped bass landings in New Jersey reached an all time low in the 1980s, but have exceeded 1,000,000 fish in every year since 1999 (NMFS 2005). In 2004, an estimated 1,760,506 striped bass weighing more than 4.6 million pounds were landed in New Jersey. These data, along with widely circulated stories by anglers and outdoor writers, indicate that striped bass fishing along the New Jersey shore and in Barnegat Bay is as good today as it was in the 1960s and 1970s, if not better.

Other species sought by anglers in Barnegat Bay include bluefish, weakfish, and summer flounder. Based on New Jersey recreational landings, bluefish numbers in recent years have been consistently high, more than 3,000,000 fish per year over the 2000 through 2004 period (NMFS 2005). In 2004 an estimated 4,151,920 bluefish weighing 3.3 million pounds were landed by N.J. fishermen. In the 1990s, bluefish landings ranged from 1,217,527 (1993) to 3,557,337 (1991) fish per year. These high bluefish landings are consistent with angler and outdoor writer reports of excellent fishing in Barnegat Bay. Based on anecdotal information, fishing for weakfish is excellent in Barnegat Bay. Data on weakfish landings in New Jersey, however, suggest that weakfish numbers peaked over the 1995-1996 period and have generally declined over the 1997-2004 period (NMFS 2005). Summer flounder landings have been high since 1990, ranging from 3 million to 13 million fish per year (NMFS 2005). No clearcut trend in landings are apparent. In 2004, an estimated 8.8 million summer flounder were landed by recreational fishermen (NMFS 2004).

The species that may be slowest to rebound is the hard clam, which declined in abundance in the 1960s and 1970s due to persistent recruitment failures that reduced standing stocks (Kennish 1984). This reduction in recruitment may have been related to water quality degradation in the Bay, but a variety of other factors (e.g., temperature or salinity changes, shellfish parasites and diseases, or changes in predator-prey interactions) could have affected reproductive success and survival of the young. The hard clam faces an

additional challenge to recovery in that blue crab populations are flourishing. Blue crabs feed heavily on hard clams, particularly young clams, and can decimate hard clam populations under certain circumstances.

2.3 Groundwater Resources

OCGS is located in the Atlantic Coastal Plain approximately two miles west of Barnegat Bay. The State of New Jersey has designated two Water Supply Critical Areas, where excessive water use poses a significant threat to the long-term integrity of a water supply source (NJDEP 2004b). OCGS is located in the southern portion of Water Supply Critical Area 1. Critical Area 1 was established in 1985 by the New Jersey Water Supply Administration. The Water Supply Administration regulates all ground and surface water diversions in excess of 100,000 gallons per day. The Critical Area 1 management zone affects the major aquifers (deep aquifers) in the area and was necessary because over-pumping introduced saltwater into the deep aquifers. These include the Englishtown, the Upper and Lower Potomac-Raritan-Magothy, and the Wenonah-Mount Laurel (NJDEP 2004b). Restrictions on with-drawals from the aquifers began in 1989 and resulted in an increase in shallow aquifer and surface water use (USGS 2003). Since the designation and resulting 40 to 50 percent reduction of groundwater pumping from the deep aquifers, groundwater levels have begun to rebound (USGS 2001). Most drinking water in Ocean County is supplied by groundwater (USEPA 2004a).

The shallowest significant aquifer in the vicinity of the site, the Kirkwood-Cohansey, comprises the Sand and the Kirkwood formations. The Kirkwood-Cohansey aquifer is generally under water-table conditions. The aquifer system is composed of fine- to coarse-grained pebbly sand with local clay bedding and can exceed 350 feet in thickness. Production can vary from 500 to 1,000 gallons per minute (gpm) with yields of 1,500 gpm possible. Brackish and salty water may occur in coastal areas (USGS 2001).

The next deeper aquifer is the confined Atlantic City Sand, comprised of medium to coarse sand, gravel, and shell fragments. This unit varies in thickness from 100 to 150 feet. Water quality is suitable for most purposes with production yields of 600 to 800 gpm and the possibility of 1,000 gpm (USGS 2001).

The Wenonah-Mount Laurel aquifer underlies the Atlantic City Sand. The Wenonah-Mount Laurel aquifer is confined and consists of very fine to coarse glauconitic sand and shell layers. Aquifer thickness can vary from 60 to 120 feet with production ranging from 50 to 250 gpm with capabilities of 500 gpm possible. Water quality is suitable for most purposes (USGS 2001).

The next deeper aquifer is the Englishtown aquifer. The Englishtown aquifer consists of fine- to medium-grained sand with local clay beds. This confined aquifer generally ranges between 60 and 140 feet in thickness and has excellent water quality with production ranging from 300 to 500 gpm with 1,000 gpm possible (USGS 2001).

The Potomac-Raritan-Magothy aquifer system underlies the Englishtown aquifer. In the vicinity of the site the upper and lower units of the Potomac-Raritan-Magothy are combined. The aquifer consists of alternating layers of sand, gravel, silt, and clay. This confined aquifer is highly productive (2,000 gpm or more), extends throughout the Coastal Plain, and attains a thickness of 4,100 feet. Salty water increases with depth and in the downdip direction. The unit has high local iron concentrations (USGS 2001).

2.4 Critical and Important Terrestrial Habitats

The OCGS property (Figure 2-3) consists of the OCGS site, which lies west of Highway 9, and the former Finninger Farm, which lies east of Highway 9. The tract of land west of Highway 9, the OCGS site, includes the powerblock area, support facilities, roads, parking lots, an Independent Spent Fuel Storage Installation (ISFSI) and some undeveloped buffer areas. It totals approximately 150 acres. The tract of land east of US Route 9, the former Finninger Farm, is largely undeveloped and is maintained as a natural area. It comprises approximately 650 acres of old fields, abandoned orchards, forests, wetlands, and marshlands. The two parcels of land total approximately 800 acres.

The OCGS site contains a largely-undeveloped buffer strip of approximately 60 acres that lies parallel to US Route 9. This 60-acre parcel was the subject of a threatened and endangered habitat assessment in the spring and summer of 2004 that is discussed in more detail in Section 2.5. A small area of emergent/ scrub-shrub and forested wetlands lies in the southern part of this tract, adjacent to the discharge canal. This area appeared to provide suitable habitat for the state-listed pine barrens treefrog, but none was detected in field surveys that involved both active (playing taped calls to elicit a response) and passive listening for singing males.

The parcel east of US Route 9, the former Finninger Farm, is a largely undeveloped 650-acre tract that provides a mix of terrestrial and wetland habitats and supports a variety of wildlife. The property, formerly a cattle farm, was purchased by Jersey Central Power & Light Company in 1966. The property has been used by Jersey Central Power & Light and AmerGen since that time for disposal of material dredged from the OCGS intake and discharge canals. AmerGen has also placed monitoring equipment on the Finninger Farm property as a routine part of its ongoing radiological monitoring programs. Otherwise, the property functions as a undeveloped buffer area. The area is posted, gated, and patrolled by security to discourage trespassing.

Jersey Central Power & Light commissioned a study of the Finninger Farm property in 1995 in order to identify the most appropriate long-term use of the property. The study included a Natural Resources Inventory to aid in future planning efforts. The National Resources Inventory mapping determined that 10 percent of the property was covered with surface water, and the rest of the property was forested (25 percent) or abandoned farmland (65 percent). The eastern one-third of the site consisted of drained coastal wetlands that had been invaded by the giant reed (*Phragmites australis*). This species, which forms dense, monotypical stands in disturbed wetland sites, is regarded as a nuisance by some land managers because of its tendency to exclude wetland plants that provide more benefits to wildlife.

Jersey Central Power & Light Company, which operated OCGS for approximately 30 years, built a single 230-kilovolt transmission line to connect the plant to the regional transmission system (see Figure 2-2). This line originates at a substation west of the plant's powerblock area, runs northwest for approximately 1.5 miles, crossing the Garden State Parkway, then turns north to run approximately 9.5 miles to the Manitou Substation at Toms River. For most of its length, the line parallels the Garden State Parkway. Most of the land crossed by the line is pine forest, but the line also crosses a number of streams (three branches of Forked River, Huckleberry Branch, Deep Hollow Branch, Cedar Creek, Factory Branch, and Jakes Branch) and associated wetlands, as well as bogs, ponds, and agricultural areas.

The OCGS-to-Manitou line skirts the irregular eastern boundary of the Forked River Mountain Wildlife Management Area (WMA) for approximately 1.0 mile before crossing its northeastern corner. An approximately 1.5 mile-long segment of the corridor actually lies within the WMA. Further north, for approximately 1.0 mile of its length, the transmission corridor crosses Double Trouble State Park. The 11.0 mile-long transmission corridor does not cross any other wildlife management areas, wildlife refuges, state parks, or national parks.

OCGS property and the associated Oyster Creek-to-Manitou 230 kV transmission line lie on the northeastern edge of the New Jersey Pine Barrens or "Pinelands," a sparsely populated and mostly forested area of more than a million acres in southern New Jersey. Although parts of the Pine Barrens are composed almost entirely of stunted pines, it is a more varied eco-region than the name implies, and is actually composed of a mosaic of mixed pine-hardwood forests, hardwoods forests with few pines, and wetlands, most notably Atlantic white cedar bogs (Sutton and Sutton 1992). The plant communities of a given area of the Pine Barrens are determined by topography, soil type, soil fertility, depth of water table, and the frequency and intensity of local wildfires. In 1978, the U.S. Congress established the Pinelands National Reserve and called upon the State of New Jersey to create a planning agency to preserve, protect, and enhance the Reserve's unique natural and cultural resources (New Jersey Pinelands Commission undated). In 1979, the New Jersey State Legislature enacted the Pinelands Protection Act and created the New Jersey Pinelands Commission, which was charged with the development and implementation of the Comprehensive Management Plan for the Pinelands. This Management Plan spells out the type, amount and location of growth that can be accommodated while ensuring that the Pinelands remain protected. Proposals for development in the Pinelands must be submitted formally, as applications to the Commission, to ensure that the natural and cultural resources of the Pinelands are not adversely affected. The OCGS-to-Manitou transmission line was built prior to the enactment of the Pinelands Protection Act, and thus was not subject to its provisions.

The largely undeveloped Finninger Farm property provides habitat for terrestrial species. Ninety-nine bird species, including uncommon breeding "grassland" birds (those normally found in grasslands, pasturelands, and savannahs) were observed on this tract in surveys conducted in 1991 (Radis and Sutton 1991). Eleven amphibian and reptile species and 12 mammal species were observed during the 1991 survey.

Based on a review of species with designated critical habitat (FWS 2004), no critical habitat lies in the area of the OCGS property or is crossed by the OCGS-to-Manitou transmission line. The federally-threatened piping plover (*Charadrius melodus*) nests along the New Jersey shore and may be observed in Ocean County in spring, summer, and early fall (FWS 1996). There is no critical habitat for this species in New Jersey (Federal Register Volume 66, Number 132, July 10, 2001).

2.5 Threatened or Endangered Species

OCGS lies two miles inland from Barnegat Bay in east-central Ocean County, New Jersey (see Figure 2-2). Jersey Central Power & Light Company, which operated OCGS for approximately 30 years, built a single 230- kV transmission line to connect the plant to the regional transmission system (see Figure 2-2). This line runs approximately 11 miles from the OCGS 230 kV Substation to the Manitou Substation near Toms River. The Station and the OCGS-to-Manitou Line lie entirely in Ocean County. Table 2-1 lists state- and federally-protected species recorded from Ocean County, New Jersey, based on the New Jersey Heritage Program's database (NJDEP 2001). Most of these species have not been observed on the OCGS property, but could (particularly in the case of shorebirds and birds of prey) move through the property during seasonal migrations.

In 1991, the Izaak Walton League of America commissioned wildlife surveys at eight Ocean County sites, all adjacent to Barnegat Bay (Radis and Sutton 1991). One of the sites was the former Finninger Farm property, then owned by Jersey Central Power & Light Company. No rare, threatened, or endangered amphibians, reptiles, or mammals were observed during the 1991 surveys. Several uncommon avian species, including four currently listed by the State of New Jersey, were observed: the grasshopper sparrow (*Ammodramus savannarum*), the American bittern (*Botaurus lentiginosus*), the Northern harrier (*Circus cyaneus*), and the osprey (*Pandion haliaetus*) (Radis and Sutton 1991). Table 2-1 provides the status of each in New Jersey.

The recently-completed "Threatened and Endangered Species Habitat Impact Assessment for Oyster Creek Generating Station National Security Upgrades" is the most up-to-date source of information on threatened and endangered species at the Oyster Creek site. This assessment was conducted in 2004 in support of proposed national security upgrades at OCGS, and focuses on the undeveloped part of the site that lies between the facilities on the west and US Route 9 on the east. This threatened and endangered species assessment included a review of New Jersey Department of Environmental Protection Natural Heritage Program records of sensitive species in the project area, a review of the Heritage Program's maps of threatened and endangered species habitat and occurrences, a review of the Heritage Program's Grid Map of rare plants and ecological communities, a review of vernal habitat maps provided by Rutgers University and NJDEP, and field surveys. In addition, a formal request was made to the Natural Heritage Program regarding the possible presence of sensitive species and habitats in the vicinity of the site. The Natural Heritage Program response, dated May 11, 2004 (Lord 2004), provides the basis for much of the discussion that follows.

Based on a review of the Natural Heritage Database and Landscape Project records, Lord (2004) reported that the following state-listed animal species occur in the vicinity of the OCGS site: barred owl (*Strix varia*), Cooper's hawk (*Accipter cooperii*), Northern pine snake (*Pituophis m. melanoleucus*), pine barrens treefrog (*Hyla andersoni*), and wood turtle (*Clemmys insculpta*). Table 2-1 provides the state and federal status of each of these species.

AmerGen conducted an on-the-ground reconnaissance of the undeveloped area potentially affected by the security upgrades in May 2004 to ensure that no listed species would be affected by the proposed action. Based on an examination of site conditions (including soils, plant communities, topography, existing barriers to animal movement, possible sources of disturbance), AmerGen concluded that barred owls, Cooper's hawks, Northern pine

snakes, and wood turtles were unlikely to occur in the project area. Because potential habitat for the Pine Barrens treefrog was present, they conducted more focused surveys for this species. None were observed and none were detected vocalizing, despite conditions that were ideal (warm, humid nights in June, a peak period for male singing). Treefrogs were heard calling at a control site several miles from OCGS.

The Natural Heritage Database and Landscape Project habitat mapping also indicated that foraging habitat for two additional state listed animal species, the black skimmer (*Rhynchops niger*) and the black-crowned night heron (*Nycticorax nycticorax*) lay within ¼ mile of the site (Lord 2004).

The New Jersey Natural Heritage Program letter of May 11, 2004 also indicated that four rare wetland plants "may" occur in the immediate vicinity of the site (Lord 2004). Two of the four plants were state-listed, the Pine Barren boneset (*Eupatorium resinosum*) and the New Jersey rush (*Juncus caesariensis*). The Pine Barren boneset is a perennial herb that is found in bogs, wetlands, and pine barrens savannas in the Coastal Plain of New Jersey and the Carolinas (CPC undated; Radford et al. 1973). The New Jersey rush is a grass-like perennial that is found in the Coastal Plain of New Jersey, Maryland, Virginia, and North Carolina (Schuyler 1990; Environment Canada 2003).

Prior to 1992, no special-status marine species were observed or captured in the OCGS cooling canals. However, between June 1992 and July 1994, nine sea turtles were impinged on the OCGS intake trash rack (NMFS 2001). The increase in the number of sea turtles observed in Barnegat Bay and the number of sea turtles impinged at OCGS has been attributed to the U.S. Army Corps of Engineers' modification of Barnegat Inlet. This modification of the Inlet, completed in 1991, created a deeper channel that sea turtles use to move into Barnegat Bay from the open waters of the Atlantic Ocean. It also followed the implementation in 1987 (full implementation in 1989) of federal regulations requiring U.S. shrimp trawlers to use Turtle Exclusion Devices that substantially reduced fishing-related mortality of sea turtles in south Atlantic and Gulf coastal waters.

In November 1993, NRC requested a formal consultation with the NMFS regarding possible impacts of OCGS on listed sea turtles, a request that was followed by a Biological Assessment in January 1995. The NMFS issued a Biological Opinion on the effects of OCGS on loggerhead, green, and Kemp's ridley sea turtles in September 1995 that concluded the operation of OCGS might adversely affect these three species but was not likely to jeopardize their continued existence. The accompanying Incidental Take Statement permitted the annual take of 10 loggerhead (*Caretta caretta*; no more than 3 lethal), 3 Kemp's ridley (*Lepidochelys kempi*; no more than 1 lethal), and 2 green (*Chelonia mydas*; no more than 1 lethal) sea turtles. This Incidental Take Allowance extended for five years, to September 21, 2000.

On September 18, 2000, NRC requested reinitiation of formal consultation and submitted an updated Biological Assessment. After requesting and subsequently receiving supplemental information, the NMFS issued its Biological Opinion in July 2001. The Biological Opinion concluded that:

"…the proposed action (continued operation of OCGS) may adversely affect but is not likely to jeopardize the continued existence of endangered Kemp's ridley, green, or threatened loggerhead sea turtles. No critical habitat has been designated in the action area; therefore, none will be affected." (NMFS 2001, pg. 31).

The Biological Opinion also noted that "…the action being considered in this

Opinion is not expected to affect leatherback (*Dermochelys coriacea*) or hawksbill (*Eretmochelys imbricata*) sea turtles, which are listed as endangered under the ESA [Endangered Species Act]."

The Incidental Take Statement accompanying the July 2001 Biological Opinion authorized the annual take of 5 loggerhead (no more than 2 lethal), 4 Kemp's ridley (no more than 3 lethal), and 2 green (no more than 1 lethal) sea turtles during the continued operation of OCGS. The Biological Opinion included Reasonable and Prudent Measures that must be implemented at OCGS to minimize impacts to sea turtles as well as a list of Terms and Conditions that implement the Reasonable and Prudent Measures. These non-discretionary Terms and Conditions include requirements for regular inspections of the intake trash racks in summer and fall; requirements for capturing, handling, resuscitating, and treating injured sea turtles; requirements for recording and reporting sightings and strandings; requirements for necropsies of dead turtles; and reporting requirements, including an annual report to NMFS on incidental takes (NMFS 2001, pp. 33-34).

On August 7, 2004, OCGS recorded the fifth incidental take of a Kemp's ridley, thus exceeding the station's incidental take limit. On August 26, 2004, the NRC requested of NMFS a reinitiation of Endangered Species Act Section 7 consultation on sea turtles at OCGS (Kuo 2004). On March 29, 2005 NRC submitted a Biological Assessment to NMFS (Adams accession no. ML050900162). The consultation is ongoing and NMFS expects to issue its Biological Opinion no later than September 10, 2005.

No other federally- or state-listed threatened or endangered species is known to occur at OCGS or along the OCGS-to-Manitou transmission corridor.

2.6 Demography

The GEIS presents a population characterization method that is based on two factors: "sparseness" and "proximity" (USNRC 1996, Section C.1.4).

2.6.1 REGIONAL DEMOGRAPHY

"Sparseness" measures population density and city size within 20 miles of a site and categorizes the demographic information as follows:

Demographic Categories Based on Sparseness

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

Source: USNRC 1996.

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

Demographic Categories Based on Proximity

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

Source: USNRC 1996.

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

GEIS Sparseness and Proximity Matrix

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

Low Population Area | Medium Population Area | High Population Area

Source: USNRC 1996, pg. C-159.

AmerGen used 2000 census data from the U.S. Census Bureau (USCB) (USCB 2003a, 2003b, 2004) and geographic information system software (ArcView®) to determine most demographic characteristics in the OCGS vicinity. As derived from 2000 USCB information, 434,476 people live within 20 miles of OCGS (USCB 2003b; Figure 2-4). Applying the GEIS sparseness measures, OCGS has a population density of 610 persons per square mile within 20 miles and falls into the least sparse category, Category 4 (greater than or equal to 120 persons per square mile within 20 miles).

As estimated from 2000 USCB information, 4,243,462 people live within 50 miles of OCGS (USCB 2003b; Figure 2-4). This equates to a population density of 1,132 persons per square mile. Applying the GEIS proximity measures, OCGS is classified as Category 4 (greater than or equal to 190 persons per square mile within 50 miles). According to the GEIS sparseness and proximity matrix, the OCGS ranks of sparseness Category 4 and proximity Category 4, result in the conclusion that OCGS is located in a high population area.

All or parts of 16 counties, Toms River, Atlantic City, Camden, Trenton, NJ and Philadelphia, PA are located within 50 miles of OGCS (Figure 2-1).

Because more than 80 percent of employees at OCGS reside in Ocean County, New Jersey, it is the county with the greatest potential to be socioeconomically affected by the proposed action (see Section 3.4). Ocean County's population is increasing at a faster rate than the New Jersey population. From 1970 to 2000, New Jersey's average annual population growth rate was 0.6 percent (USCB 1995 and WNJPIN Undated), while Ocean County increased by 4.8 percent (USCB 1995 and WNJPIN Undated). Most of this growth occurred between 1970 and 1990. Since 1990 the growth rate had slowed considerably, and is projected to remain low throughout the license renewal term (Table 2-2). Ocean County remains the fastest growing county in New Jersey (WNJPIN Undated).

Table 2-2 estimates populations and annual growth rates for Ocean County, New Jersey, through the license renewal term. Between the years 2000 and 2030, the population of Ocean County is projected to

increase at an average annual rate of 1.7 percent (WNJPIN Undated). The population of New Jersey is projected to grow at an average annual rate of 0.7 percent (WNJPIN Undated).

Because of its location on the Atlantic Ocean, Ocean County has a summer influx of tourists. The Barnegat Bay region of New Jersey is a well-known summer resort area, attracting visitors from the Middle Atlantic. It is estimated that the population in the area surrounding the OCGS site can increase by 30 to 60 percent during the summer months.

2.6.2 MINORITY AND LOW-INCOME POPULATIONS

NRC performed environmental justice analyses for previous license renewal applications and concluded that a 50-mile radius could reasonably be expected to encompass minority and low-income populations that could be affected by plant operations. For purposes of its environmental justice analyses, the NRC has determined the state is the appropriate environmental impact area for comparative analysis. AmerGen has adopted this approach for identifying minority and low-income populations that could be affected by renewal of the OCGS operating license.

AmerGen used ArcView® geographic information system software to combine USCB TIGER line data with USCB 2000 census data to determine the minority characteristics by block group (a block group is a subdivision of a census tract).

2.6.2.1 Minority Populations

The NRC "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues" defines a "minority" population as: American Indian or Alaskan Native; Asian; Native Hawaiian or other Pacific Islander; Black races; all other single minorities; multi-racial; and Hispanic ethnicity (USNRC 2001, Appendix D). The guidance indicates that a minority population exists if either of the following two conditions exists:

1. The minority population in the census block group or environmental impact site exceeds 50 percent.

2. The minority population percentage of the environmental impact area is significantly greater (typically at least 20 percentage points) than the minority population percentage in the geographic area chosen for comparative analysis.

NRC guidance calls for use of the most recent USCB decennial census data. AmerGen used 2000 census data (USCB 2003a, 2003b, 2004) to determine the percentage of the total population in New Jersey, New York, and Pennsylvania of each minority category, and in identifying minority populations within 50 miles of OCGS.

AmerGen included an entire block group if any part of its area lay within 50 miles of OCGS. The 50-mile radius includes 3,326 block groups (Table 2-3). AmerGen divided USCB population numbers for each minority population within each block group by the total population of that block group to obtain the percent of the block group's population represented by each minority. For each of the 3,326 block groups within 50 miles of OCGS, AmerGen calculated the percent of the population in each minority category and compared the result to the corresponding geographic area's minority threshold percentages to determine whether minority populations exist. AmerGen defines the geographic area for OCGS as all of New Jersey when the block group is in New Jersey, all of New York when the block group is in New York, and all of Pennsylvania when the block group is in Pennsylvania.

USCB data (USCB 2003b) (Table 2-3) for New Jersey characterizes 0.1 percent of the

state as American Indian or Alaskan Native, 5.7 percent Asian, 0.0 percent Native Hawaiian or other Pacific Islander, 13 percent Black races, 0.2 percent all other single minorities, 1.6 percent multi-racial, 34 percent aggregate of minority races, and 13.3 percent Hispanic ethnicity. USCB data (USCB 2003b) for New York characterizes 0.3 percent of the state as American Indian or Alaskan Native, 5.5 percent Asian, 0.0 percent Native Hawaiian or other Pacific Islander, 14.8 percent Black races, 0.4 percent all other single minorities, 1.9 percent multi-racial, 38 percent aggregate of minority races, and 15.1 percent Hispanic ethnicity. USCB data (USCB 2003b) for Pennsylvania characterizes 0.1 percent of the state as American Indian or Alaskan Native, 1.7 percent Asian, 0.0 percent Native Hawaiian or other Pacific Islander, 9.8 percent Black races, 0.1 percent all other single minorities, 0.9 percent multi-racial, 15.9 percent aggregate of minority races, and 3.2 percent Hispanic ethnicity. In this analysis, Hispanic ethnicity is considered independent of race. For example, Hispanics who consider themselves Black are include in both the Black and Hispanic ethnicity analyses.

Table 2-3 presents the numbers of block groups in each county in the 50-mile radius that exceed the threshold for minority populations. Based on the "more than 20 percent" or the "exceeds 50 percent" criteria, no block groups within 50 miles have American Indian or Alaska Native, Native Hawaiian or Pacific Islander, or "other single minority" populations. Figures 2-5 through 2-9 locate the minority block groups within the 50-mile radius.

Forty-seven census blocks within the 50-mile radius have Asian populations that exceed the state average by 20 percent or more (Figure 2-5). Of those 47 block groups, 5 have Asian populations of 50 percent or more.

Three hundred forty-four census blocks within the 50-mile radius have Black Races populations that exceed the state average by 20 percent or more (Figure 2-6). Of those 344 block groups, 206 have Black Races populations of 50 percent or more.

One census block within the 50-mile radius has a multi-racial minority population that exceeds the state average by 20 percent or more (Figure 2-7).

Five hundred ninety-four census blocks within the 50-mile radius have aggregate minority populations that exceed the state average by 20 percent or more (Figure 2-8). Of those 594 block groups, 527 have aggregate minority populations of 50 percent or more.

One hundred ninety-one census blocks within the 50-mile radius have Hispanic ethnicity populations that exceed the state average by 20 percent or more (Figure 2-9). Of those 191 block groups, 87 have Hispanic ethnicity populations of 50 percent or more.

2.6.2.2 Low-Income Populations

NRC guidance defines low-income based on statistical poverty thresholds (USNRC 2001, Appendix D). AmerGen divided USCB low-income households in each census block group by the total households for that block group to obtain the percentage of low-income households per block group. USCB data (USCB 2004) characterize 8.5 percent of New Jersey, 14.6 percent of New York, and 11.0 percent of Pennsylvania households as low-income households. A low-income population is considered to be present if:

1. The low-income population in the census block group or the environmental impact site exceeds 50 percent.

2. The percentage of households below the poverty level in an environmental impact area is significantly greater (typically at least 20 percentage points) than the low-income population percentage in the geographic area chosen for comparative analysis.

Table 2-3 identifies the low-income block groups in the region of interest. Figure 2-10 locates the low-income block groups.

One hundred fifty-two census blocks within the 50-mile radius have low-income households that exceed the state average by 20 percent or more. Of these 152 block groups, 27 have 50 percent or more low-income households.

2.7 Taxes

OCGS pays annual property taxes to Ocean and Lacey Townships in Ocean County. The majority of the annual OCGS tax payment is paid to Lacey Township, so the focus of this analysis will be on Lacey Township. In recent years, the OCGS payment to Ocean Township has ranged between $11,000 and $13,000, annually. OCGS payments to Lacey Township ranged from $1.6 million to $1.8 million annually over the same period (Table 2-4).

From 2001 through 2003, Lacey Township collected between $36 and $45 million annually in total property tax revenues (see Table 2-4). Each year the Township forwards a percentage of these revenues to Ocean County and the Lacey Township School District to meet operating budgets. From 2001 to 2003, Lacey Township distributed between $9.7 and $10.6 million annually to Ocean County. (Ocean County's property tax revenues for 2003 were approximately $250 million). For the same period, the Township distributed between $24.1 and $30.8 million annually to the Lacey Township School District. The remainder of the Township's property tax revenues is reserved for the Township operating budget. The Township operating budget includes funding for township operations, fire protection services, public works, ambulance services, police forces, and township road maintenance. Libraries and hospitals are funded through the County.

For the years 2001 through 2003, OCGS's property taxes have represented 4.1 to 4.9 percent of Lacey Township's total property tax revenues (Table 2-4).

On January 28, 1999, the New Jersey Assembly and Senate passed the "Electric Discount and Energy Competition Act." The Act initiated the phasing in of electric industry deregulation in New Jersey. As a result, many tax-related changes have taken place, including changes in property tax assessment valuation methodologies for electric power stations. Stations are now assessed using fair market value instead of net book value methodologies. These changes could affect OCGS's future tax payments to Ocean and Lacey Townships. AmerGen is appealing the current assessment and plans to negotiate a graduated reduction in payments to minimize the financial disruption to the Townships caused by a sudden decrease in revenues.

2.8 Land Use Planning

This section focuses on Ocean County and one of the County's municipalities, Lacey Township, because the majority of the permanent OCGS workforce lives in Ocean County, and Lacey Township is the primary recipient of OCGS property tax payments. Ocean County is the fastest growing county in New Jersey. From 1970 to 2000, Ocean County's population increased 4.8 percent. To accommodate this growth, regional and local planning officials have shared goals of encouraging expansion and development in areas where public facilities, such as water and sewer systems, have been planned, and discouraging incompatible land use mixes in contiguous areas and strip development.

The New Jersey Pinelands

The New Jersey Pinelands (or Pine Barrens) contain over a million acres of pine-oak forests, streams and rivers, farms, crossroad hamlets, and small towns stretched across southern New Jersey. In 1976, in response to mounting environmental concerns, the New Jersey Legislature, along with Congress, enacted legislation protecting the Pinelands of New Jersey from unnecessary and unwarranted development pressure. In 1979, New Jersey enacted the Pinelands Protection Act which requires that county and municipal master plans and land use ordinances be brought into conformance with the Pinelands Comprehensive Management Plan (CMP) developed by the New Jersey Pinelands Commission, a Pinelands oversight committee (Township of Lacey 1991).

The protected Pinelands constitute nearly one quarter of the state, located roughly in the southeastern quadrant. All or portions of seven counties and 52 municipalities in New Jersey are located within the Pinelands Area (Township of Lacey 1991).

The CMP identifies five regions for growth. Each region can be developed at densities appropriate to the carrying capacity of the land. The Pinelands region, one of the five regions, is divided into three subregions: the Pinelands Preservation Area and the Pinelands Protection Area, both located west of the Garden State Parkway; and the Pinelands National Reserve, east of the Parkway. Each of these subregions has various restrictions on development (Township of Lacey 1991).

Lacey Township

Lacey Township covers 98.5 square miles of land area; 14.7 percent of which is water (USCB 2000). Seventy-three square miles of Lacey Township is within the protected New Jersey Pinelands. The entire area of Lacey Township west of the Garden State Parkway (42,469 acres) comprises approximately 30,632 acres of Preservation Area (most restrictive) and 11,837 acres of Protection Area (less restrictive). The Protection Area is further divided into Forest Area (10,874 acres) and Rural Development (963 acres) (Township of Lacey 1991).

The area of Lacey Township east of the Garden State Parkway is in the Pinelands National Reserve which is defined in the National Parks and Recreation Act of 1978. Although the Pinelands CMP was prepared for the entire National Reserve, the actual regulatory authority of the Pinelands Commission is limited to the area west of the Garden State Parkway in Lacey Township (Township of Lacey 1991). With few exceptions, development of areas east of the Garden State Parkway is guided by the Township of Lacey and Ocean County Master Plans (Township of Lacey 1991).

In 1991, Lacey Township had adequate services and infrastructure to support its population and planners recognized that the Township would continue to grow. The Township of Lacey Master Plan addresses that the Township will have to provide adequate services and infrastructure to

meet future demand (Township of Lacey 1991).

Growth in Lacey Township is guided by five goals (Township of Lacey 1991):

1. Maintain the existing quality of life of Lacey Township residents.

2. Provide contiguous land areas and compatibility among users so as to protect sensitive natural areas, resources, and wildlife for future generations.

3. Encourage residential development at appropriate densities while providing for aesthetic and economic diversities.

4. Situate new development in locations which maintain the attractive character of Lacey Township.

5. Encourage the continued maintenance of all navigable waterways.

2.9 Social Services and Public Facilities

2.9.1 PUBLIC WATER SUPPLY

Because OCGS is located in Lacey Township (in Ocean County) and most of the OCGS employees reside in Ocean County, the discussion of public water supply systems will be limited to Ocean County. OCGS provides bottled water for drinking. Two onsite groundwater wells (see Section 3.1.2) provide water for reactor make-up, potable and non-potable domestic uses, and the sanitation system.

Ocean County

Groundwater is the source for the major water suppliers in Ocean County (Table 2-5). Section 2.3 describes the local groundwater aquifers in the area of Ocean County.

2.9.2 TRANSPORTATION

Road access to OCGS is via US Route 9, a two-lane paved road with a northeast-southwest orientation. To the west, the Garden State Parkway runs parallel to US Route 9. These two roads are intersected by Lacey Road (Ocean County Route 614), a two-lane paved road north of OCGS, and Warren Grove Road (Ocean County Route 532), a two-lane paved road south of OCGS. (See Figure 2-2). Employees traveling from the north or northwest of OCGS will use the Garden State Parkway, Lacey Road, and US Route 9 to reach the station. Employees traveling from the south or southwest of OCGS will use the Garden State Parkway, Warren Grove Road, and US Route 9 to reach the station. Employees traveling from the northeast will use New Jersey 37 and US 9 and employees traveling from the southeast will use New Jersey 72 and US 9. When nearing OCGS, all employees must use US Route 9.

In determining the significance levels of transportation impacts for license renewal, the NRC uses the Transportation Research Board's level of service (LOS) definitions (USNRC 1996). LOS is a quantitative measure describing operational conditions within a traffic stream and their perception by motorists.

Limited data are available for US Route 9 from north of the plant to its intersection with NJ 166 in Beachwood. Along this section of Route 9, traffic on the roadway is below capacity (LOS of A, B, or C), although some intersections at certain times of day are operating above capacity (LOS F) (NJDOT undated).

Table 2-6 lists roadways in the vicinity of OCGS annual average number of vehicles per day, as determined by the New Jersey Department of Transportation.

2.10 Meteorology and Air Quality

Meteorological information, as it relates to analysis of severe accidents, is included in Appendix F.

EPA has established National Ambient Air Quality Standards (NAAQS) for six common pollutants: nitrogen dioxide, sulfur dioxide, carbon monoxide, lead, ozone, and particulate matter with aerodynamic diameters of 10 microns or less (PM_{10}). The EPA has designated all areas of the United States as having air quality better ("attainment") or worse ("non-attainment") than the NAAQS.

Ocean County is in attainment for all air quality standards with the exception of the 1-hour ozone NAAQS (USEPA 2004b) and the new 8-hour ozone NAAQS.

In July 1997, EPA issued final rules establishing a new 8-hour ground-level ozone standard and a standard for particulate matter with a nominal size of less than 2.5 microns ($PM_{2.5}$). After several years of litigation, the $PM_{2.5}$ and 8-hour ground-level ozone standards have been upheld.

On April 15, 2004, the EPA Administrator implemented designations, classifications, and boundaries for areas of the country with respect to the 8-hour ground-level ozone NAAQS in accordance with the requirements of the Clean Air Act (69 FR 23857). Ocean County, New Jersey was included in the non-attainment area of "Philadelphia-Wilmington, Atlantic City, PA-DE-MD-NJ". This non-attainment area was classified as "moderate" and the maximum attainment dates extends through June 2010 (USEPA 2004c). Designations under the 1-hour ozone NAAQS will be revoked one year from the effective date of the 8-hour ozone NAAQS designations.

On December 17, 2004, the EPA Administrator announced final designations, classifications, and boundaries for areas of the country with respect to the $PM_{2.5}$ NAAQS. Ocean County, New Jersey was designated as an unclassifiable/attainment area under the new $PM_{2.5}$ standards. Designations under the $PM_{2.5}$ NAAQS became effective on April 5, 2005 (70 FR 944).

2.11 Historic and Archaeological Resources

Area History in Brief

Aboriginal people migrated to New Jersey approximately 15,000 years ago. Three major cultural traditions dominated the prehistory of New Jersey and the Middle Atlantic Coastal Plain: the Paleo-Indian Tradition (15,000 to 10,000 years ago); the Archaic Tradition (10,000 to 3,000 years ago); and the Woodland Tradition (3,000 years ago to European contact) (BBNEP 2001).

When the first European explorers and settlers came to the area now known as New Jersey, they found the Late Woodland period people, who lived in the lower half of "Lenapehoking" (The Land of the Lenape) and called themselves "Lenape," meaning "common" or "ordinary" people. The Lenape were divided into three groups: the Unalachtigo, "the people who lived near the ocean," Unami, "the people down the river," and Unalimi or Minisink, "the people of the stony country" (BBNEP 2001).

There are many theories as to who was the first non-native person to see the shores of North America, dating back to the Vikings. According to historical sources, the first recorded European to sight land in Ocean County was Henry Hudson in 1609, although there is written evidence that Giovanni da Verrazano made contact with the Lenape in 1524, 85 years before Henry Hudson sailed the New Jersey coast (BBNEP 2001).

When the European immigrants arrived in the mid-1600's and early 1700's, they settled first along the coastal bays and inlets of the Hudson, Hackensack, Passaic and Raritan River valleys in northern New Jersey, as well as the Delaware River valley and inner coastal plain south of Trenton. The area between the Delaware and the Atlantic Ocean in the southern part of the outer coastal plain was still "unsettled" in 1765 (BBNEP 2001). This vast area, eventually called the "Pine Barrens," was used largely for lumbering and hunting, and later for the resources that produced the colonial industries (BBNEP 2001).

From the 17th through the 20th centuries, European settlers engaged in a number of vocations and avocations in the New Jersey pine barrens, such as, hunting, fishing, lumbering, shipbuilding, bog iron manufacture, charcoal manufacture, cranberry and blueberry cultivation, salt hay and eelgrass harvesting, Sphagnum moss harvesting, mineral extraction (silica), salt harvesting, and tourism. A number of these industries no longer exist for various reasons, including resource depletion. Today, healthcare, tourism and the marine industry are three of the largest sectors of the economy in Ocean County (BBNEP 2001).

Maritime History

Ocean County has a long maritime history. The earliest commercial activities were connected to shipbuilding, and included whaling and fishing. Toms River and Tuckerton were important privateering ports during the Revolutionary War. Boat building in the Barnegat Bay area has continued through the 19th, 20th, and 21st Centuries (BBNEP 2001).

Initial Operation

The Final Environmental Statement (FES) for operation of OCGS listed 47 important historic landmarks in Ocean County (USAEC 1974). Two of the landmarks were National Historic Register sites: Hangar Number 1 at the Lakehurst Naval Air Station, twenty miles north-northwest of OCGS, and Barnegat Lighthouse, six miles southeast. In the FES, the U. S. Atomic Energy Commission (AEC) reported that "[t]he site includes no historic places. The

station and transmission lines do not intrude upon or otherwise affect the setting and significance of any historic place. In addition, the Curator of Cultural History of the New Jersey State Museum found no evidence of archaeological sites within the station property bounded by the South Branch Forked River, the Parkway, and the Bay. The Historic Sites Office of the New Jersey Department of Environmental Protection confirmed that there are no National Register or State Register sites in the area and that no historical or architectural structures are impaired" (USAEC 1974). No additional studies were done as a direct result of this suggestion, however, as late as 1997 state and county historic preservation offices were contacted prior to dredging the initake canal. This resulted in an updated database of archaeological/historic sites of interest but did not identify any archaeological sites on OCGS property.

Current Status

As of 2002, the National Register of Historic Places listed 27 locations in Ocean County, New Jersey (U.S. Department of the Interior 2004). Of these 27 locations, 5 fall within a 6 mile radius of OCGS (Figure 2-2). Table 2-7 lists the five National Register of Historic Places sites within the 6-mile radius of OCGS. The Historic Preservation Office of the NJDEP lists approximately 100-110 additional sites, including maritime vessels, of historical significance within Ocean County (NJDEP 2004d).

2.12 Known or Reasonably Forseeable Projects in Site Vicinity

Forked River Power Plant

The Forked River Power Plant (FRPP) is adjacent to OCGS property. The FRPP is a two unit simple cycle dual-fired (gas and oil) power plant with 66 MW(e) net capacity. It is owned by Jersey Central Power and Light, a subsidiary of FirstEnergy, an Ohio utility, and used for peaking demand periods of operation (DOE 2000). FRPP can also provide emergency offsite power to OCGS in the unlikely event of a Station Blackout Event (loss of offsite power and failure of the emergency diesel generators to start).

Department of Defense Facilities

Approximately 15 miles northwest of OCGS is Naval Air Engineering Station (NAES) Lakehurst (also known as NAVAIR Lakehurst), the northeast's largest naval aviation installation and home to the Naval Air Warfare Center Aircraft Division, as well as fourteen joint and interagency commands (NAES Undated). It occupies 7,430 government-owned acres in the million-acre Pinelands National Reserve in central New Jersey. The New Jersey Wildlife and Game Refuge bounds the base to the north and the Manchester Fish and Wildlife Preserve to the south. On its western boundary, it abuts Fort Dix and McGuire Air Force Base (MAFB) to form a contiguous 42,000-acre Department of Defense facility (NAES Undated).

Fort Dix is a major training and mobilization center for the Army Reserve and National Guard. Fort Dix consists of 31,065 acres of land, of which 13,765 acres are range and impact areas and 14,000 are classified as contiguous maneuver area. The remainder of the installation is the cantonment area. Fort Dix training areas are bordered by the Lebanon State Forest (26,000 acres), NAES, and selected Wildlife Management Areas (34,900 acres) (Fort Dix 2002).

McGuire Air Force Base (MAFB) is located in Wrightstown, New Jersey, approximately 20 miles from OCGS. MAFB is an active facility that occupies 3,536 acres within the Pinelands National Reserve. The primary mission of MAFB is to provide massive, rapid-response airlift capabilities for military forces in combat. McGuire's operations include military transport, aircraft maintenance, refueling, and storage (USEPA Undated).

Permitted Dischargers to Water

In its "Envirofacts Warehouse" online database, EPA identifies permitted dischargers to water. A search in Ocean County revealed 195 facilities that discharge to the waters of the United States. Of the 195 facilities that discharge to the waters of the United States, many discharge to Barnegat Bay or to rivers that flow into Barnegat Bay, including the Forked River (USEPA 2004d). Detailed information concerning these facilities may be accessed through EPA's "Envirofacts Warehouse".

Table 2-1. Endangered and Threatened Species that Could Occur at or Near OCGS or Along the Associated OCGS-Manitou Transmission Line.

Scientific Name	Common Name	Federal Status[a]	State Status[a]
Mammals			
Lynx rufus	Bobcat	-	E
Birds			
Accipiter cooperii	Cooper's hawk	-	T
Ammodramus savannarum	Grasshopper sparrow	-	T
Bartramia longicauda	Upland sandpiper	-	E
Botaurus lentiginosus	American bittern	-	E
Calidris canutus	Red knot	-	T
Charadrius melodus	Piping plover	T	E
Circus cyaneus	Northern harrier	-	E
Cistothorus platensis	Sedge wren	-	E
Falco peregrinus	Peregrine falcon	-	E
Haliaeetus leucocephalus	Bald eagle	T	E
Laterallus jamaicensis	Black rail	-	T
Melanerpes erythrocephalus	Red-headed woodpecker	-	T
Nyctanassa violacea	Yellow-crowned night-heron	-	T
Nycticorax nycticorax	Black-crowned night-heron	-	T
Pandion haliaetus	Osprey	-	T
Podilymbus podiceps	Pied-billed grebe	-	E
Pooecetes gramineus	Vesper sparrow	-	E
Rynchops niger	Black skimmer	-	E
Sterna antillarum	Least tern	-	E
Sterna dougallii dougallii	Roseate tern	E	E
Strix varia	Barred owl	-	T
Reptiles and Amphibians			
Ambystoma tigrinum tigrinum	Eastern tiger salamander	-	E
Clemmys insculpta	Wood turtle	-	T
Clemmys muhlenbergii	Bog turtle	T	T
Crotalus horridus horridus	Timber rattlesnake		E
Elaphe guttata guttata	Corn snake	-	E
Hyla andersoni	Pine barrens treefrog	-	E
Hyla chrysoscelis	Cope's gray treefrog	-	E
Pituophis melanoleucus	Northern pine snake	-	T
Caretta caretta	Loggerhead sea turtle	T	E
Lepidochelys kempi	Kemp's ridley	E	E
Dermochelys coriacea	Atlantic leatherback turtle	E	E
Eretmochelys imbricate	Atlantic hawksbill turtle	E	E
Chelonia mydas	Atlantic green turtle	T	E
Invertebrates			
Cicindela dorsalis dorsalis	Northeastern beach tiger beetle	T	E
Nicrophorus americanus	American burying beetle	E	E

Table 2-1. Endangered and Threatened Species that Could Occur at or Near OCGS or Along the Associated OCGS-Manitou Transmission Line (Continued).

Scientific Name	Common Name	Federal Status[a]	State Status[a]
Plants			
Amaranthus pumilus	Seabeach amaranth	T	E
Aster radula	Low rough aster	-	E
Cacalia atriplicifolia	Pale Indian plantain	-	E
Cardamine longii	Long's bittercress	-	E
Cirsium virginianum	Virginia thistle	-	E
Clitoria mariana	Butterfly-pea	-	E
Corema conradii	Broom crowberry	-	E
Desmodium pauciflorum	Few-flower tick-trefoil	-	E
Eleocharis tortilis	Twisted spike-rush	-	E
Eriophorum tenellum	Rough cotton-grass	-	E
Eupatorium resinosum	Pine Barren boneset	-	E
Fraxinus profunda	Pumpkin ash	-	E
Galactia volubilis	Downy milk-pea	-	E
Glaux maritima	Sea-milkwort	-	E
Gnaphalium helleri	Small everlasting	-	E
Helonias bullata	Swamp-pink	T	E
Hottonia inflata	Featherfoil	-	E
Jeffersonia diphylla	Twinleaf	-	E
Juncus caesariensis	New Jersey rush	-	E
Juncus torreyi	Torrey's rush	-	E
Limosella subulata	Awl-leaf mudwort	-	E
Linum intercursum	Sandplain flax	-	E
Luzula acuminate	Hairy wood-rush	-	E
Melanthium virginicum	Virginia bunchflower	-	E
Myriophyllum tenellum	Slender water-milfoil	-	E
Myriophyllum verticillatum	Whorled water-milfoil	-	E
Narthecium americanum	Bog asphodel	C	E
Oenothera humifusa	Sea-beach evening-primrose	-	E
Onosmodium virginianum	Virginia false-gromwell	-	E
Plantago pusilla	Dwarf plantain	-	E
Polygonum glaucum	Sea-beach knotweed	-	E
Prunus angustifolia	Chickasaw plum	-	E
Ranunculus cymbalaria	Seaside buttercup	-	E
Rhododendron atlanticum	Dwarf azalea	-	E
Rhynchospora globularis	Coarse grass-like beaked-rush	-	E
Rhynchospora knieskernii	Knieskern's beaked-rush	T	E

Table 2-1. Endangered and Threatened Species that Could Occur at or Near OCGS or Along the Associated OCGS-Manitou Transmission Line (Continued).

Scientific Name	Common Name	Federal Status[a]	State Status[a]
Rhynchospora microcephala	Small-head beaked-rush	-	E
Schwalbea americana	Chaffseed	E	E
Scirpus longii	Long's woolgrass	-	E
Scirpus maritimus	Saltmarsh bulrush	-	E
Spiranthes laciniata	Lace-lip ladies'-tresses	-	E
Stylisma pickeringii var	Pickering's morning glory	-	E
Tridens flavus var chapmanii	Chapman's redtop	-	E
Triglochin maritima	Seaside arrow-grass	-	E
Utricularia biflora	Two-flower bladderwort	-	E
Utricularia minor	Lesser bladderwort	-	E
Uvularia puberula var nitida	Pine Barren bellwort	-	E
Verbena simplex	Narrow-leaf vervain	-	E
Xyris fimbriata	Fringed yellow-eyed-grass	-	E
Zigadenus leimanthides	Death-camus	-	E

a. E = Endangered; T = Threatened; C = Candidate; - = Not listed.
Source: NJDEP NHP 2001.

Table 2-2. Estimated Populations and Annual Growth Rates in Ocean County, New Jersey from 1980 to 2030.

Year	Number	Annual Percent Increase
1970[a]	208,470	--
1980[a]	346,038	6.6
1990[a]	433,203	2.5
2000[b]	510,916	1.8
2010[b]	593,300	1.6
2020[b]	677,000	1.4
2030	777,703	1.5

a. USCB 1995.
b. WNJPIN Undated.

Table 2-3. Minority and Low-Income Population Census Blocks within 50-Mile Radius of OCGS.

County	State	FIPS No.	Total Block Groups Within 50 Miles	Minority Population Block Groups within 50 Miles								Low-Income Block Groups Within 50 Miles	2000 Population Adjusted for Area Within 50 Miles
				American Indian or Alaskan Native	Asian	Native Hawaiian or Other Pacific Islander	Black Races	All Other Single Minorities	Multi-Racial Minorities	Aggregate of Minority Races	Hispanic Ethnicity		
Bucks	Pennsylvania	42017	232	0	2	0	9	0	0	13	2	1	325180.1
Montgomery	Pennsylvania	42091	12	0	0	0	0	0	0	0	0	0	7099.7
Philadelphia	Pennsylvania	42101	458	0	3	0	30	0	0	121	45	50	449486.2
Richmond	New York	36085	33	0	1	0	0	0	0	1	0	0	44115.3
Somerset	New Jersey	34035	25	0	0	0	9	0	0	11	0	0	48221.1
Middlesex	New Jersey	34023	382	0	33	0	8	0	1	87	50	16	475385
Mercer	New Jersey	34021	237	0	3	0	65	0	0	77	19	20	347717.9
Monmouth	New Jersey	34025	529	0	2	0	52	0	0	60	9	19	615301
Burlington	New Jersey	34005	295	0	0	0	41	0	0	40	0	3	423394
Camden	New Jersey	34007	407	0	0	0	84	0	0	106	38	47	508110.7
Gloucester	New Jersey	34015	136	0	0	0	12	0	0	7	0	3	159862
Salem	New Jersey	34033	3	0	0	0	0	0	0	0	0	0	399.5
Ocean	New Jersey	34029	342	0	0	0	1	0	0	6	3	6	510916
Cumberland	New Jersey	34011	38	0	0	0	1	0	0	14	11	2	46918.3
Atlantic	New Jersey	34001	177	0	3	0	32	0	0	51	14	12	252552
Cape May	New Jersey	34009	20	0	0	0	0	0	0	0	0	0	28803.8
Totals			3326		47		344		1	594	191	179	4,243,462.6
Counties completely within 50-mile radius													

Block groups where minorities or low-income populations exceed 50 percent

County	State	FIPS No.	Total Block Groups Within 50 Miles	Minority Population Block Groups within 50 Miles								Low-Income Block Groups Within 50 Miles	2000 Population Adjusted for Area Within 50 Miles
				American Indian or Alaskan Native	Asian	Native Hawaiian or Other Pacific Islander	Black Races	All Other Single Minorities	Multi-Racial Minorities	Aggregate of Minority Races	Hispanic Ethnicity		
Bucks	Pennsylvania	42017	232	0	0	0	3	0	0	10	1	0	325180.1
Montgomery	Pennsylvania	42091	12	0	0	0	0	0	0	0	0	0	7099.7
Philadelphia	Pennsylvania	42101	458	0	0	0	13	0	0	57	3	7	449486.2
Richmond	New York	36085	33	0	1	0	0	0	0	1	0	0	44115.3
Somerset	New Jersey	34035	25	0	0	0	5	0	0	11	0	0	48221.1
Middlesex	New Jersey	34023	382	0	4	0	3	0	0	87	40	3	475385
Mercer	New Jersey	34021	237	0	0	0	49	0	0	77	3	1	347717.9
Monmouth	New Jersey	34025	529	0	0	0	33	0	0	60	2	2	615301
Burlington	New Jersey	34005	295	0	0	0	26	0	0	40	0	0	423394

Table 2-3. Minority and Low-Income Population Census Blocks within 50-Mile Radius of OCGS (Continued).

Block groups where minorities exceed 50 percent (continued)

County	State	FIPS No.	Total Block Groups Within 50 Miles	Minority Population Block Groups within 50 Miles								Low-Income Block Groups Within 50 Miles	2000 Population Adjusted for Area Within 50 Miles
				American Indian or Alaskan Native	Asian	Native Hawaiian or Other Pacific Islander	Black Races	All Other Single Minorities	Multi-Racial Minorities	Aggregate of Minority Races	Hispanic Ethnicity		
Camden	New Jersey	34007	407	0	0	0	49	0	0	106	23	9	508110.7
Gloucester	New Jersey	34015	136	0	0	0	3	0	0	7	0	1	159862
Salem	New Jersey	34033	3	0	0	0	0	0	0	0	0	0	399.5
Ocean	New Jersey	34029	342	0	0	0	0	0	0	6	2	2	510916
Cumberland	New Jersey	34011	38	0	0	0	0	0	0	14	9	0	46918.3
Atlantic	New Jersey	34001	177	0	0	0	22	0	0	51	4	2	252552
Cape May	New Jersey	34009	20	0	0	0	0	0	0	0	0	0	28803.8
Totals			3326	0	5	0	206	0	0	527	87	27	4,243,462.6
Counties completely within 50-mile radius													

State Percentages

State	State Fips.	American Indian or Alaskan Native	Asian	Native Hawaiian or Other Pacific Islander	Black Races	All Other Single Minorities	Multi-Racial Minorities	Aggregate of Minority Races	Hispanic Ethnicity	Low-Income
New Jersey	34	0.1	5.7	0	13	0.2	1.6	34	13.3	8.5
New Jersey	36	0.3	5.5	0	14.8	0.4	1.9	38	15.1	14.6
Pennsylvania	42	0.1	1.7	0	9.8	0.1	0.9	15.9	3.2	11

FIPS = Federal Information Processing Standards

Table 2-4. Oyster Creek Generating Station Property Tax Information 2001-2003.

Year	Lacey Township Property Tax Revenues	Property Tax Paid by OCGS	Percent of Lacey Township Revenues
2001	$36,485,905	$1,770,053	4.9
2002	$40,573,260	$1,677,843	4.1
2003	$44,967,097	$1,838,252	4.1

Table 2-5. Major Ocean County Public Water Suppliers[a].

Water Supplier[b]	Water Source[b]	Average Daily Use (2003) (MGD)[c]	Maximum Daily Capacity (MGD)[c]
Barnegat Township Water and Sewer	GW	0.34	1.26
Beachwood Water Department	GW	0.69	2.09
Berkeley Township MUA	GW	0.52	1.01
Berkeley Water Company	GW	0.80	2.63
Brick Township MUA	SW	9.15	47.31
Crestwood Village Water Company	GW	1.38	6.05
Jackson Township MUA	GW	2.51	11.04
Lacey Township MUA	GW	1.88	7.2
Lakewood Township MUA	GW	2.02	2.22
Little Egg Harbor Township MUA	GW	1.29	5.95
Long Beach Township – Brant Beach	GW	1.00	7.52
Manchester Township Water Utility	GW	1.90	7.63
NJ American Water Company -Lakewood	SW	3.04	7.92
NJ American Water Company – Ocean City	GW	2.76	12.24
Ocean Township MUA - Pebble Beach	GW	0.77	3.82
Point Pleasant Beach Water Department	Purchased GW	N/A	N/A
Point Pleasant Water Department	GW	1.03	4.68
Stafford Township MUA	GW	1.41	0.94
Tuckerton Water and Sewer Department	GW	0.34	0.72
United Water – Toms River	GW	12.31	30.24

GW = Groundwater
SW = Surface water
MUA = Municipal Utilities Authority
MGD = Million Gallons Daily
N/A – Not Applicable

a. Municipal water suppliers serving populations greater than 4,500. These suppliers serve approximately 90 percent of the Ocean County population.
b. USEPA 2004a
c. NJDEP 2004c

Shaded row indicates that demand exceeds supply.

Table 2-6. Traffic Counts for Roads in the Vicinity of OCGS.

Roadway and Location	Annual Average Daily Traffic (AADT)	Year (Most Current)
County Route 532 between the Garden State Parkway and US 9 – Station 6D5C912.	3,003	1999
US 9 between County Route 532 and County Route 614 – Station 6-1-013.	19,930	2002
County Route 614 between US 9 and the Garden State Parkway.	None Available	NA
County Route 614 west of the Garden State Parkway -- Station 6-4-503.	5,575	2003
Garden State Parkway between Interchange 69 at County Route 532 and Interchange 67	69,880	2003
Garden State Parkway between Interchange 67 and Interchange 63 at NJ 72	52,750	2003
US 9 between County Route 532 and NJ 72 – Station 6-0-106.	16,245	2002
US 9 between County Route 614 and the Garden State Parkway – south of Laurel Blvd.	17,480	1991
US 9 between County Route 614 and the Garden State Parkway – north of Laurel Blvd.	14,660	1991
US 9 between County Route 614 and NJ 37 – Station 6-6-006.	20,926	2002
Garden State Parkway between Interchange 74 at County Route 614 and Interchange 77	81,170	2003
Garden State Parkway between Interchange 77 and Interchange 80.	85,770	2003
Garden State Parkway between Interchange 80 and Interchange 81.	116,100	2003
Garden State Parkway between Interchange 81 and Interchange 82.	107,410	2003
On NJ 166, the parallel road to the coincident section of US 9 and the Garden State Parkway: between US 9 and NJ 37.	27,154	2001
NJ 72 -- 1.75 miles east of US 9.	23,980	2003
NJ 37 -- at milepost 12.5 -- just east of the bridge over Barnegat Bay.	38,013	2003

Note: All AADTs represent traffic during the average 24-hour day during the year indicated.

Table 2-7. Sites Listed in the National Register of Historic Places that fall within a 6-mile Radius of OCGS.

Site Name	Location
Barnegat Light Public School	501 Central Ave., Barnegat Light
Barnegat Lighthouse	North end of Long Beach Island, off Broadway Ave., Barnegat Light
Double Trouble Historic District	South of Beachwood off of Garden State Parkway, Beachwood
Falkinburg Farmstead	28 Westcott Avenue, Ocean Township, Wareton
Manahawkin Baptist Church	North Main Street (US 9) and Lehigh Avenue, Manahawkin

Source: U.S. Department of the Interior 2004.

LEGEND

- ★ Oyster Creek
- 50 Mile Radius
- Transmission Line
- County
- National or State Forest
- National Wildlife Refuge
- Urban Areas

0 10 20 Miles

FIGURE 2-1
50-Mile Vicinity Map

Continue To Next Page