1.1 PROPOSED ACTION

The proposed federal action is issuance of an ESP to PSEG for the PSEG Site for one or two additional nuclear power units, under the provisions of 10 CFR Part 52, that would be operated as a merchant plant to supply baseload electrical power to the State of New Jersey (NJ). A specific reactor technology has not yet been selected. However, the design characteristics of four reactor technologies under consideration were used to establish a plant parameter envelope (PPE) (Site Safety Analysis Report [SSAR] Section 1.3). While issuance of the ESP does not authorize construction and operation of any new nuclear power units, this ER analyzes the environmental impacts that could result from the construction and operation of one or two new nuclear power units at the PSEG Site. These impacts are analyzed to determine if the site is suitable for the addition of the new nuclear plant, and whether there is an alternative site that is environmentally preferable to the proposed site.

1.1.1 PURPOSE AND NEED

An analysis of the need for power, based on annual PJM *Interconnection, LLC (PJM)* resource and load forecast data, is provided in Chapter 8. The relevant service area (RSA) for the new plant is the State of NJ which is part of the Eastern Mid Atlantic Zone of PJM, the Regional Transmission Organization (RTO) for the area. As the RTO, PJM is responsible for the reliable supply of bulk electricity within the region. Analysis of PJM data in 2009 identified that an additional 7900 MWe (Section 8.4) of baseload capacity would be required to meet the energy needs forecasted for 2021 (Reference 1.1-1). The projected 2021 need for baseload generation in NJ, based on the 2012 PJM load forecast, is projected to be in excess of 7300 MWe. This reduced need for baseload generation reflects the suppressed demand growth stemming from the 2008-2009 recession. Given that the expected need for baseload power in NJ is still substantial despite the effects of the recession, the conclusions reached by the initial 2009 need for power analysis that serve as the documented basis for the purpose and need of this project are still valid and applicable to NJ's energy landscape. Therefore, discussions regarding the results of the initial need for power analysis are maintained throughout the Environmental Report. Based on the above projected shortfall in baseload generation, PSEG is submitting this ESP application to preserve the option of constructing a new nuclear power plant at the PSEG Site for up to approximately 2200 MWe to help meet this shortfall.

The NRC established the licensing process used by PSEG in 10 CFR 52, Subpart C, *Combined Licenses*. This provision allows entities to apply for a COL that is, a combined construction permit and operating license for a nuclear power facility. A COL authorizes construction and operation of the facility. As described in 10 CFR 52, Subpart A, *Early Site Permits*, the NRC's issuance of an ESP allows an applicant to reserve a reactor site for up to 20 years (yr) prior to obtaining a COL.

The ESP process addresses and resolves site safety, environmental protection, and emergency preparedness issues. ESP licensing issues are resolved with finality during the ESP review process and are not reexamined in any subsequent licensing action involving the permitted site, absent any information meeting certain standards established by the NRC.

1.2.3 REACTOR INFORMATION

PSEG has not yet selected a specific reactor technology. Four different technologies are under consideration including:

- Advanced Passive 1000 (AP1000)
- U.S. Evolutionary Power Reactor (U.S. EPR)
- Advanced Boiling Water Reactor (ABWR)
- U.S. Advanced Pressurized Water Reactor (US-APWR)

This ESP application uses a PPE approach that encompasses all four reactor technologies (SSAR Section 1.3). The ESP analyzes the environmental impacts of the four reactor technologies using either one unit (U.S. EPR, ABWR, or US-APWR) or two units (AP1000) at the PSEG Site. Since a specific reactor technology has not been selected, the environmental impact analyses are based on reactor bounding conditions derived from detailed reactor information supplied by the vendors. The total bounding PPE value for the new plant is 6830 gross megawatts thermal (MWt) (SSAR Table 1.3-1 Item 17.3) and 2200 MWe net. Section 3.2, Reactor Power Conversion System, provides additional information on these reactor technologies.

1.2.4 COOLING SYSTEM INFORMATION

The new plant uses a recirculating (closed-cycle) cooling water system that includes natural draft, mechanical, or fan-assisted natural draft cooling towers. A new shoreline intake structure supplies makeup water from the Delaware River to the new plant. A new discharge structure conveys cooling tower blowdown to the Delaware River in conformance with New Jersey Pollutant Discharge Elimination System (NJPDES) permit requirements. Section 3.4, Cooling System, provides additional detail on the intake, discharge, and cooling tower components of the plant cooling system.

1.2.5 TRANSMISSION SYSTEM INFORMATION

The existing HCGS and SGS site is interconnected with the regional power grid via four 500 kilovolt (kV) transmission lines extending from the existing nuclear units to the Red Lion substation in DE, and to the New Freedom substation in NJ.

During development of the ESP application, PSEG ~~has~~ completed a conceptual evaluation of transmission requirements associated with the addition of generation at the PSEG Site. This evaluation included the ~~current~~ PJM Regional Transmission Expansion Plan ~~(RTEP)~~*, existing operational limits at HCGS and SGS,* and other PJM transmission planning inputs. PJM *routinely performs* analyses ~~evaluate~~*of* the regional transmission system ~~configuration and projects in the~~ *and forecasts appropriate upgrades to the system as part of its long term* planning cycle. These evaluations are not specific to the addition of new generation at the PSEG Site.

~~A~~*PSEG's conceptual evaluation indicates that a* new off-site transmission line may be needed to ~~enhance overall~~*accommodate new generation at the PSEG Site to ensure transient stability of the* transmission system ~~stability, dependent upon other~~*. The need for a new* transmission ~~projects in the PJM queue at the time PSEG submits a PJM application. The need for off-site~~

~~transmission~~ *line* is dependent *up*on a range of factors including the specific reactor technology selected~~, as well~~ *and the progress of regional transmission upgrade projects* as *part of PJM's* regional planning efforts ~~by~~*. Since the completion of this conceptual evaluation,* PJM*, as an example of their continuing assessment of system reliability, recently determined* that *additional grid improvements* are ~~external~~*necessary* to *address voltage and stability constraints in the region of Artificial Island. In response, PJM has solicited proposals from both regulated and non-regulated (merchant) transmission providers for system enhancements to address these constraints. PJM's determination of the need for this transmission system upgrade is independent of PSEG's interest in new nuclear generation and is not predicated on the construction of a new nuclear facility at the* PSEG~~.~~ *Site. Therefore, any transmission project mandated by PJM, including a new off-site transmission line is considered to be reasonably foreseeable and is considered to be an action that is independent from the potential development of the PSEG Site. Similarly, since these PJM sponsored grid improvements serve to enhance power delivery throughout the region, they inherently possess independent utility. Although PJM has not formally assessed the scope and structure of this future transmission upgrade, PSEG has accordingly identified the potential impacts of a new off-site transmission line whose technical attributes best meet PJM's goal of resolving these regional constraints.*

Section 3.7, *Power Transmission System*, provides additional details on the *existing PJM* transmission system. Information pertaining to alternative off-site transmission system corridors *considered by PSEG* is presented in Subsection 9.4.3. *Of the two potential transmission corridors presented in Subsection 9.4.3, the West Macro-Corridor to the Peach Bottom substation is considered to be the most effective route to address the regional voltage and stability constraints that PJM is attempting to resolve. Therefore, PSEG has used the characteristics of the West Macro-Corridor to evaluate the potential impacts of a new transmission line as representative of the regional transmission upgrade project currently being pursued by PJM. These potential impacts are addressed as part of the cumulative effects assessment provided in Section 10.5.*

1.2.6 PREAPPLICATION PUBLIC INVOLVEMENT

The NRC held a public outreach meeting on May 6, 2010 in Salem County, NJ. The purpose of the meeting was to provide information to the public on the ESP review process for the proposed site and opportunities for public involvement in that process. The meeting included a discussion of NRC perspectives, roles, and responsibilities with regard to the proposed site. An informal open house format was used, allowing the public the opportunity to speak directly with the NRC staff. The meeting included staff presentations on the regulatory framework for the ESP review process and a question-and-answer session. NRC staff also discussed upcoming opportunities for further public involvement during the application review process.

At PSEG's request, the NRC conducted two Category 1 public meetings during the preapplication period to discuss with PSEG staff approaches to address various regulatory requirements applicable to this application. Both meetings were held at the NRC headquarters in Rockville, Maryland.

1.2.7 CONSTRUCTION START DATE

- Salem-New Freedom South - This 500 kV line operated by PSE&G extends northeast from SGS for 42 mi. in a variable width but generally 350-ft. wide corridor from Salem to the New Freedom substation north of Williamstown, NJ.

Existing land uses along these transmission lines are assessed based on analysis of USGS LULC data. A 500-ft. wide corridor centered on the existing rights-of-way is used to characterize baseline land uses along the existing corridors. Three major land uses are identified (agriculture, forests, and wetlands) that collectively account for the majority of the 6920 ac. within the three transmission line corridor rights-of-way. Table 2.2-3 presents the acreage for each of 13 land uses along the transmission line corridors. Agriculture (pasture hay and cultivated crops) represents 39 percent of the total transmission line corridor right-of-way areas, while forests (deciduous, evergreen and mixed), and wetlands (woody and emergent herbaceous) represent 30 percent and 23 percent, respectively. Developed land (2 percent), open water (3 percent), and barren land (2 percent) account for the remaining land use.

2.2.3.2 Existing Access Road

The only other off-site corridor is the existing plant access road (Figure 2.2-2). This road extends through coastal wetlands from the PSEG Site in an easterly and east-northeasterly direction for 3.6 mi., where it connects to Alloway Creek Neck Road (an existing secondary road). Alloway Creek Neck Road continues through uplands to the town of Hancock's Bridge. The existing right-of-way for the access road is variable, ranging from 350 ft. to 450 ft. wide through state-owned lands.

Based on analysis of USGS LULC, within a 500-ft. corridor along the access road, two major land uses (agriculture and wetlands) account for 74 percent of the 379 ac. within this access road right-of-way. Table 2.2-3 presents the area for each of 13 land uses within the access road right-of-way. Agriculture represents 35 percent of the total right-of-way and wetlands 39 percent. Barren land (10 percent), developed land (13 percent), forests (2 percent), and open water (1 percent) account for the remaining land uses.

Alloway Creek Neck Road extends through an area that has been designated as Farm Project Area # 3 - Maskells Mill – Hagerville-Mannington Meadows, in Salem County's *Open Space and Farmland Preservation Plan*. This area is characterized by prime farmland soils and is not heavily forested. Twenty percent of the land in this project area is in farmland preservation with an additional 8 percent targeted for preservation. Several tracts of land in the vicinity have been dedicated as farmland preservation areas in Elsinboro Township, whereas none of the lands immediately adjacent to Alloway Creek Neck Road are in farmland preservation status. Fifty-two percent of the target farms' soils in this project area are prime soils, while another 35 percent are soils of statewide importance (Reference 2.2-4). A soils map indicates that Alloway Creek Neck Road passes through several areas designated as prime farmland soils (Reference 2.2-9).

2.2.3.3 Proposed Transmission Macro-Corridors

~~As stated in Chapter 1, PSEG is evaluating whether additional off-site transmission may be necessary for transmission stability, but the location and need have not yet been determined.~~ *As summarized in Subsection 1.2.5, PSEG completed a conceptual evaluation during development of the ESP application to identify potential transmission requirements associated*

with the addition of generation at the PSEG Site. This evaluation included the PJM Interconnection, LLC (PJM) Regional Transmission Expansion Plan, existing operational limits at HCGS and SGS, and other PJM transmission planning inputs. PJM routinely performs analyses of the regional transmission system and forecasts appropriate upgrades to the system as part of its long term planning cycle. These evaluations are not specific to the addition of new generation at the PSEG Site.

In order to capture the potential effects of developing off-site transmission, PSEG analyzed the potential effects of two new off-site macro-corridors~~. No decision has been made as to the selection of the macro-corridor or the specific route within the selected macro-corridor, but two macro-corridor alternatives have been preliminarily considered and are discussed in detail in Subsection 9.4.3.~~ *during development of the ESP application. Information pertaining to alternative off-site transmission system corridors considered by PSEG is presented in Subsection 9.4.3.* The two 5-mi. wide macro-corridors analyzed are the South and West Macro-Corridors. The West Macro-Corridor (55 mi. long) generally follows existing transmission line corridors, extending from the PSEG Site to Peach Bottom Substation. The South Macro-Corridor (94 mi. long) also follows existing transmission line corridors and is generally consistent with the *original* Mid-Atlantic Power Pathway project (MAPP) line that ~~has~~*had* been preliminarily planned ~~(but not currently approved~~ by PJM~~ Interconnection, LLC [PJM])~~ to extend from Indian River Substation to the PSEG Site. Each of these macro-corridors is developed with a common segment. From the PSEG Site, the hypothetical macro-corridor extends north and then west across the Delaware River to the Red Lion Substation. From this location, each of the potential macro-corridors diverge extending to the west (Peach Bottom) or south (Indian River).

The characteristics of land use within each hypothetical macro-corridor are presented in Table 2.2-4. Based on overall differences in macro-corridor length, the total land area within the South Macro-Corridor (316,429 ac.) is notably greater than the area contained within the West Macro-Corridor (191,523 ac.) (Subsection 9.4.3). Cultivated cropland (121,895 ac., 39 percent) is the largest land use type within the South Macro-Corridor. Other major land uses within the South Macro-Corridor include wetlands (20 percent), deciduous forest (13 percent), pasture hay (11 percent), and open water (8 percent). Comparatively, pasture hay (46,055 ac., 24 percent) is the largest land use type within the West Macro-Corridor. Other major land uses within the West Macro-Corridor include cultivated cropland (19 percent), deciduous forest (18 percent), wetlands (14 percent combined), and open water (11 percent).

Additional discussion regarding potential off-site transmission and its potential impact is provided in Chapter 4 (Impacts of Construction), Chapter 5 (Impacts of Station Operation) and Chapter 9 (Alternatives).

2.2.3.4 Proposed Access Road

Additional access road capacity is necessary to address future transportation needs for the PSEG Site. This access road is conceptually designed as a three-lane causeway to be constructed on elevated structures for its entire length through the coastal wetlands. The proposed causeway extends northeast from the PSEG Site along or adjacent to the existing transmission corridor right-of-way to the intersection of Money Island Road and Mason Point Road (Figure 2.2-2). The alignment runs roughly 200 ft. east of, and parallel to, the existing Red Lion transmission line for most of its length. Through the coastal wetlands, the causeway is

communication with the groundwater present in the Alluvium. These differences were also seen in the other piezometers installed in the tidal marshes (Locations AS-1, 2 and 3) although the differences are not as pronounced.

2.3.1.2.5 Summary

The PSEG Site is located in the NJ Coastal Plain. The regional geology and hydrogeology consists of southeasterly dipping sands and silts. The shallow aquifers beneath the PSEG Site, such as the alluvial deposits and Vincentown aquifer, are in direct contact with the Delaware River, are tidally influenced, saline, and are not considered adequate sources for potable water.

Observation wells were installed at the PSEG Site to better characterize the upper Alluvium as well as the underlying lower (Vincentown) aquifer. Hydrogeologic properties of these aquifers were determined by laboratory testing of soil samples as well as in-situ hydraulic conductivity tests.

Potentiometric contour maps generated from the PSEG Site data indicate that groundwater flow in these units is generally towards the Delaware Estuary, with localized influences from tides and the surrounding marsh. This is shown in the groundwater contours for the PSEG Site from the September data, (supplemented by HCGS and SGS well data) and presented in Figure 2.3-53. The tidal study indicated there is a stronger response to the tidal cycle in the lower (Vincentown) aquifer when compared the response in the shallow riverbed groundwater.

Average horizontal travel times, or velocities in the upper alluvial aquifer are 0.0087 ft/day (3.2 ft/yr) in the new plant area and 0.353 ft/day (12.9 ft/yr) in the eastern location. Average travel times for groundwater in the lower, Vincentown Aquifer, range from 0.0091 ft/day (3.3 ft/yr) in the new plant location to 0.0046 ft/day (1.7 ft/yr) in the eastern location.

The deeper aquifers, such as the Mount Laurel-Wenonah and PRM, are water supply aquifers. These water-bearing zones are also designated by USEPA as sole source. The Mount Laurel-Wenonah was used for water supply at the PSEG Site, but to avoid induced chloride migration from the overlying Vincentown aquifer pumping has been limited. HCGS and SGS currently withdraw water primarily from the PRM. The new plant withdraws groundwater for potable water and sanitary water systems as well as fire protection systems from the PRM. The site water balance (Figure 3.3-1) provides estimates of projected groundwater demand and is discussed further in Subsection 2.3.2.

2.3.1.3 **Transmission Corridors**

~~As stated in Chapter 1, PSEG is evaluating whether additional off-site transmission may be necessary for transmission stability, but the location and need have not yet been determined.~~ *As summarized in Subsection 1.2.5, PSEG completed a conceptual evaluation during development of the ESP application to identify potential transmission requirements associated with the addition of generation at the PSEG Site. This evaluation included the PJM Regional Transmission Expansion Plan, existing operational limits at HCGS and SGS, and other PJM transmission planning inputs. PJM routinely performs analyses of the regional transmission system and forecasts appropriate upgrades to the system as part of its long term planning cycle. These evaluations are not specific to the addition of new generation at the PSEG Site.*

In order to ~~assess~~*capture* the potential effects of developing off-site transmission, PSEG analyzed *the potential effects of* two new off-site macro-corridors ~~as discussed~~*during development of the ESP application. Information pertaining to alternative off-site transmission system corridors considered by PSEG is presented* in Subsection 9.4.3. The two, 5-mi. wide macro-corridors analyzed are the South and West Macro-Corridors. The West Macro-Corridor (55 mi. long) generally follows existing transmission line corridors, extending from the PSEG Site to Peach Bottom Substation. The South Macro-Corridor (94 mi. long) also follows existing transmission line corridors and is generally consistent with the MAPP line that ~~has been~~ *was* preliminarily planned ~~(but not currently approved~~ by PJM~~)~~ to extend from the PSEG Site to the Indian River Substation. Each of these macro-corridors was developed with a common segment. From the PSEG Site, the hypothetical macro-corridor extends north and then west across the Delaware River to the Red Lion Substation. From this location, the potential macro-corridors diverge extending to the west (Peach Bottom) or south (Indian River).

Based on GIS analysis the South Macro-Corridor contains a total of 1697 mi. of linear surface water features (perennial and intermittent streams, channelized waterways). In comparison, the West Macro-Corridor contains a total of 970 mi. of linear surface water features. Perennial streams and channelized waterways represent the majority of the surface water types crossed in each macro-corridor. Additionally, each macro-corridor follows a common alignment from the PSEG Site to the Red Lion Substation (Figure 2.2-6). Consequently, each macro-corridor crosses the Delaware River.

Additional discussion regarding potential off-site transmission and its potential impact is provided in Chapter 4 (Impacts of Construction), Chapter 5 (Impacts of Station Operation) and Chapter 9 (Alternatives).

2.3.2 WATER USE

This subsection describes surface water and groundwater uses that could affect or be affected by the construction and operation of an additional generating plant at the PSEG Site on Artificial Island. Descriptions of the types of consumptive and non-consumptive water uses, identification of their locations, and quantification of water withdrawals and returns are included. Water use, for the purposes of this subsection is broadly defined, encompassing human water supply needs for drinking and domestic uses, industrial uses, and agricultural uses. It also includes instream uses that do not involve water diversion such as navigation, recreation, and aquatic habitat needs that are based on water quality.

With 15 million people utilizing water supplied from the Delaware River Basin, along with in-stream flow needs for maintenance of aquatic habitats and water quality, water use is an important issue in this 13,600-sq. mi. watershed. The location of the new plant along the brackish waters of the Delaware River Estuary minimizes the potential impact on potable water supplies within the watershed. There are on-going programs and projects through the DRBC and other federal, state, and local agencies focused on assessing existing and future water uses and the capability of the system to meet those needs. Basin-wide, 92 percent of the water used (potable and non-potable) comes from surface water sources. Surface storage reservoirs, improved operational plans for reservoirs, water conservation planning/controls, and many other infrastructure and operational approaches have been applied at various

2.4.1.7 Ongoing Ecological Studies

PSEG conducts various ecological monitoring near the new plant as part of the EEP in conjunction with their NJPDES permit for SGS. Given the proximity of the new plant to SGS, these studies are directly applicable for the new plant. The ongoing annual ecological monitoring studies include:

- Impingement and entrainment sampling at the SGS circulating water intake structure
- Fish monitoring in the Delaware River and marsh creeks by the use of trawls, seines, and weirs
- Fish ladder monitoring at tributaries of the Delaware River
- Vegetative cover and geomorphology monitoring at four wetland restoration sites and two reference sites

Since 1995, PSEG has conducted a comprehensive wetland restoration program and biological monitoring program. The restoration program has successfully restored several common reed-dominated and other degraded wetland areas as part of the program encompassing more than 14,550 ac. throughout the Delaware Estuary in NJ and DE in accordance with site-specific NJDEP approved Management Plans. The common reed communities are treated using herbicide, or tidal exchange is reestablished to allow native marsh species (such as saltmarsh cordgrass) to repopulate the wetland sites. The monitoring is conducted in accordance with an NJDEP approved *Improved Biological Monitoring Work Plan* program. Each site is monitored yearly for successful restoration (Reference 2.4-159).

2.4.1.8 Off-Site Transmission and Access Corridors

2.4.1.8.1 Off-Site Transmission

~~As stated in Chapter 1, PSEG is evaluating whether additional off-site transmission may be necessary for transmission system stability, but the location and need have not yet been determined.~~ *As summarized in Subsection 1.2.5, PSEG completed a conceptual evaluation during development of the ESP application to identify potential transmission requirements associated with the addition of generation at the PSEG Site. This evaluation included the PJM Regional Transmission Expansion Plan, existing operational limits at HCGS and SGS, and other PJM transmission planning inputs. PJM routinely performs analyses of the regional transmission system and forecasts appropriate upgrades to the system as part of its long term planning cycle. These evaluations are not specific to the addition of new generation at the PSEG Site.*

In order to ~~assess~~*capture* the potential effects of developing off-site transmission, PSEG analyzed *the potential effects of* two new off-site macro-~~corridor alternatives as discussed in Subsection 9.4.3.~~*corridors during development of the ESP application. Information pertaining to alternative off-site transmission system corridors considered by PSEG is presented in Subsection 9.4.3.* The two, 5-mi. wide macro-corridors analyzed are the South and West Macro-Corridors. The West Macro-Corridor (55-mi. long) generally follows existing transmission line corridors, extending from the PSEG Site to Peach Bottom Substation. The South Macro-Corridor (94-mi. long) also follows existing transmission line corridors and is generally consistent with the MAPP line that ~~is~~*was* preliminarily planned ~~(but not currently approved~~ by

PJM~~)~~ from the PSEG Site to the Indian River Substation. Each of these macro-corridors is developed with a common segment. From the PSEG Site, the hypothetical macro-corridor extends north and then west across the Delaware River to the Red Lion Substation. From this location, each of the potential macro-corridors diverge extending to the west (Peach Bottom) or south (Indian River).

The characteristics of land cover within each hypothetical macro-corridor are presented in Table 2.4-10. Based on overall differences in macro-corridor length, the total land area within the South Macro-Corridor (316,429 ac.) is notably greater than the area contained within the West Macro-Corridor (191,523 ac.). Cultivated cropland (121,895 ac., 39 percent) is the largest land cover type within the South Macro-Corridor. Other major land cover types within the South Macro-Corridor include combined wetlands (20 percent), deciduous forest (13 percent), pasture hay (11 percent), and open water (8 percent). Comparatively, pasture hay (46,055 ac., 24 percent) is the largest land cover type within the West Macro-Corridor. Other major land cover types within the West Macro-Corridor include cultivated cropland (19 percent), deciduous forest (18 percent), wetlands (14 percent combined), and open water (11 percent).

In addition to the wetlands identified as part of the land cover analysis, National Wetland Inventory (NWI) wetlands within the 5-mi. macro-corridor are presented in Table 2.4-11. A total of 94,413 ac. of wetlands and open water areas mapped by NWI are contained within the 5-mi. wide South Macro-Corridor and 35,516 ac. within the West Macro-Corridor. Estuarine and marine wetlands dominate the wetland types, accounting for 49,257 ac. in the South Macro-Corridor and 15,362 ac. in the West Macro-Corridor. Freshwater forested/shrub wetlands are the second most abundant type, accounting for 24,408 ac. and 7337 ac. in the South and West Macro-Corridors, respectively. Estuarine and marine deepwater habitats associated with the Delaware River are also common, accounting for 12,607 ac. in the South Macro-Corridor, and 6680 ac. in the West Macro-Corridor. The other relatively common wetland type represented within the macro-corridor area is freshwater emergent wetland, consisting of 5457 ac. in the South Macro-Corridor and 4188 ac. in the West Macro-Corridor.

Additional discussion regarding potential off-site transmission and its potential impact is provided in Chapter 4 (Impacts of Construction), Chapter 5 (Impacts of Station Operation) and Chapter 9 (Alternatives).

2.4.1.8.2 Access Corridor

Additional access road capacity is needed to address the future transportation needs for the PSEG Site. A new access is conceptually designed as a three-lane causeway to be constructed on elevated structures for its entire length through the coastal wetlands. The proposed causeway extends northeast from the PSEG Site along or adjacent to the existing Red Lion transmission corridor to Money Island Road, with an at-grade roadway continuing to the intersection of Money Island Road and Mason Point Road (Figure 2.4-3). The alignment runs roughly 200 ft. east of, and parallel to, the existing Red Lion transmission line for most of its length. Through the coastal wetlands, the causeway is constructed on elevated structures, thereby reducing environmental impacts. Existing land uses along the alignment of the proposed causeway are illustrated in Figure 2.4-3 and summarized as part of the vicinity in Table 2.4-3. Additional discussion regarding the proposed access road and its potential impact is provided in Chapter 4 (Impacts of Construction) and Chapter 5 (Impacts of Station Operation).

2.4.2.5 Off-Site Transmission Corridors

~~As described in Subsection 2.4.1.8.1, PSEG analyzed two new off-site macro-corridors as a means to assess potential impacts of off-site transmission alternatives as discussed in Subsection 9.4.3. The two, 5-mi. wide macro-corridors analyzed are the South and West Macro-Corridors. The West Macro-Corridor (55-mi. long) generally follows existing transmission line corridors, extending from the PSEG Site to Peach Bottom Substation. The South Macro-Corridor (94-mi. long) also follows existing transmission line corridors and is generally consistent with the MAPP line that is preliminarily planned (but not currently approved by PJM) to extend from the PSEG Site to the Indian River Substation.~~*As summarized in Subsection 1.2.5, PSEG completed a conceptual evaluation during development of the ESP application to identify potential transmission requirements associated with the addition of generation at the PSEG Site. This evaluation included the PJM Regional Transmission Expansion Plan, existing operational limits at HCGS and SGS, and other PJM transmission planning inputs. PJM routinely performs analyses of the regional transmission system and forecasts appropriate upgrades to the system as part of its long term planning cycle. These evaluations are not specific to the addition of new generation at the PSEG Site.*

In order to capture the potential effects of developing off-site transmission, PSEG analyzed the potential effects of two new off-site macro-corridors during development of the ESP application. Information pertaining to alternative off-site transmission system corridors considered by PSEG is presented in Subsection 9.4.3. The two, 5-mi. wide macro-corridors analyzed are the South and West Macro-Corridors. The West Macro-Corridor (55-mi. long) generally follows existing transmission line corridors, extending from the PSEG Site to Peach Bottom Substation. The South Macro-Corridor (94-mi. long) also follows existing transmission line corridors and is generally consistent with the MAPP line that was preliminarily planned by PJM to extend from the PSEG Site to the Indian River Substation. Each of these macro-corridors is developed with a common segment. From the PSEG Site, the hypothetical macro-corridor extends north and then west across the Delaware River to the Red Lion Substation. From this location, each of the potential macro-corridors diverge extending to the west (Peach Bottom) or south (Indian River).

Based on the configuration of the macro-corridors, both the South and the West Macro-Corridors cross the Delaware River at RM 62, and the West Macro-Corridor also crosses the Susquehanna River near Peach Bottom. The Delaware River is tidal in this area, with flow rates and water levels dominated by tidal cycles (Subsection 2.3.1). Aquatic biota in the area of the proposed Delaware River transmission line crossing is similar to that in the vicinity of the PSEG Site as described in Subsection 2.4.2.1.2. Detailed evaluation of aquatic biota in the area of the Susquehanna River crossing would be completed when a final decision is made on transmission needs and if the final design included an instream structure.

Representatives from MACTEC and PSEG conducted meetings in February and August 2009 with the NJ HPO and the DE State Historic Preservation Office (SHPO). The February meeting with the NJ Historic Preservation Office consisted of a review of the Phase I archaeological investigation and overall project approach for historic properties. An additional meeting was held in August to review the results from the Phase I investigation and to discuss viewshed issues for historic properties located within the 10-mi. radius of the PSEG Site. Consultation with the DE SHPO concentrated on viewshed issues at NRHP listed historic properties located within the 10 mi. radius of the PSEG Site. Consultation with the NJ HPO and the DE SHPO will continue throughout the duration of the new plant licensing process.

2.5.3.7 Transmission Corridors

~~As stated in Chapter 1, PSEG is evaluating whether an additional off-site transmission line may be necessary for transmission stability, but the location and need have not yet been determined.~~

~~In order to assess the potential effects of developing an off-site transmission line on historic properties, PSEG analyzed two off-site macro-corridor alternatives as discussed in Subsection 9.4.3.~~*As summarized in Subsection 1.2.5, PSEG completed a conceptual evaluation during development of the ESP application to identify potential transmission requirements associated with the addition of generation at the PSEG Site. This evaluation included the PJM Regional Transmission Expansion Plan, existing operational limits at HCGS and SGS, and other PJM transmission planning inputs. PJM routinely performs analyses of the regional transmission system and forecasts appropriate upgrades to the system as part of its long term planning cycle. These evaluations are not specific to the addition of new generation at the PSEG Site.*

In order to capture the potential effects of developing off-site transmission, PSEG analyzed the potential effects of two new off-site macro-corridors during development of the ESP application. Information pertaining to alternative off-site transmission system corridors considered by PSEG is presented in Subsection 9.4.3. The two, 5-mi. wide macro-corridors analyzed are the South and West Macro-Corridors. The West Macro-Corridor (55-mi.) generally follows existing transmission line corridors, extending from the PSEG Site to Peach Bottom Substation. The South Macro-Corridor (94-mi.) also follows existing transmission line corridors and is generally consistent with the MAPP line that ~~has been~~ *was* preliminarily planned ~~(but not currently approved~~ by PJM~~)~~ to extend from Indian River Substation to the PSEG Site. Each of these macro-corridors was developed with a common segment. From the PSEG Site, the hypothetical macro-corridor extends north and then west across the Delaware River to the Red Lion Substation. From this location, each of the potential macro-corridors diverge extending to the west (Peach Bottom) or south (Indian River).

Based on GIS analysis of NRHP listed sites, the South Macro-Corridor contains a total of 147 listed properties within the 5-mi. wide area. New Castle and Kent counties (DE) contain the most sites (61 and 54, respectively), whereas fewer sites are found in the macro-corridor in Salem (NJ) and Sussex County (DE) (11 and 21, respectively). In comparison, the West Macro-Corridor contains a total of 52 NRHP listed sites. The three counties containing NRHP listed sites in the macro-corridor are New Castle (21), Cecil (MD, 20), and Salem (11).

serves to establish the basis for eventual land acquisition and EAB control, necessary to support the issuance of a future combined license.

Subsequent to the agreement in principle with the USACE, PSEG will develop a lease agreement for the USACE CDF land to the north of the PSEG Site, depicted on the Site Utilization Plan for the concrete batch plant and temporary construction / laydown use. At the completion of construction, the leased land will be returned to USACE use, subject to any required long-term EAB control conditions. Section 4.3 provides additional detail.

It is anticipated that, as part of the federal decision-making process the USACE will evaluate the potential environmental impacts of the property transfer. This land transfer is expected to be a relevant factor to the overall nature and composition of impacts associated with the construction and operation of the new plant.

2.8.2 NON-FEDERAL PROJECT ACTIVITIES

There are several non-federal project activities within the region that are not dependent on the new plant and are not likely to have any direct impact on its construction and operation. These other major activities will require various federal and state permits. EAs or EISs may also be prepared by any involved federal permitting agencies.

The non-federal project activities identified within the region are as follows:

- Mid-Atlantic Power Pathway
- Liquidfied Natural Gas (LNG) Terminal and Facilities in Logan Township, NJ and Philadelphia, PA
- Southern NJ to Philadelphia Mass Transit and Philadelphia Waterfront Transit Expansions.
- NJ and Philadelphia Port Improvements
- Mad Horse Creek Wildlife Management Area Wetland Restoration

2.8.2.1 **Mid-Atlantic Power Pathway (MAPP)**

PJM is the Federal Energy Regulatory Commission (FERC) approved Regional Transmission Organization for the District of Columbia and all or parts of 13 states including DE, Illinois, Indiana, Kentucky, MD, Michigan, NJ, North Carolina, Ohio, PA, Tennessee, Virginia, and West Virginia. PJM coordinates the movement of wholesale electricity and manages the high-voltage electric grid. PJM develops Regional Transmission Expansion Plans which identify required transmission system upgrades and enhancements to preserve grid reliability (Reference 2.8-9). In October 2007, the PJM Board approved a new 500 kV interstate electricity transmission line, known as the MAPP that will help relieve congestion on the power grid and provide access to more affordable sources of electricity (Reference 2.8-6).

The proposed line was originally planned to be built primarily along existing rights–of-way and was intended to originate in Possum Point, Virginia and pass through Burches Hill, Chalk Point, Calvert Cliffs, and Vienna generating stations in Maryland, and Indian River and Cedar Creek generating stations in DE before terminating at the SGS. The line ~~is~~*was* expected to be

overhead construction with the exception of the Chesapeake Bay crossing, which ~~is~~ *was* expected to be submarine cable construction.

~~The current projection is that MAPP will be completed in sections, with the Possum Point to Indian River portion of the line being completed by 2014. The in-service date for the remaining portion of the line is not decided~~. In 2009, PJM indicated that the section from Indian River to the SGS is undergoing continuing study, and there are no plans for immediate construction of this project. *Subsequently PJM determined that the MAPP project in its entirety is no longer warranted based on subsequent transmission studies and removed the project from its transmission queue.*

2.8.2.2 Liquified Natural Gas Facilities

Two LNG terminals are planned within the region of the PSEG Site. FERC approved British Petroleum's proposed Crown Landing LNG Terminal in Logan Township, NJ, and listed the Freedom Energy Center LNG Import Terminal in Philadelphia as a proposed LNG facility (References 2.8-5 and 2.8-7).

In 2006, FERC issued a final EIS for the Crown Landing LNG Terminal (Reference 2.8-4). This EIS addressed impacts from British Petroleum's proposed LNG off-loading and processing facility to be located on a 175-ac. site along the Delaware River. This new facility would also involve the construction of 11 mi. of natural gas pipeline in NJ and PA from the terminal site to an existing facility in Brookhaven, PA. The facility would include an off-loading pier that extends into DE waters. The project is delayed by jurisdictional disputes between DE and NJ, which resolved in favor of DE. In 2009, Hess Corporation announced that they acquired the British Petroleum project and property to pursue future development of the terminal.

Philadelphia Gas Works has a LNG storage facility in Philadelphia's Port Richmond that stores supplemental gas during the low-demand warm months for use during the peak heating season. Philadelphia Gas Works proposed to modify its current Richmond storage facility to accept LNG from tankers and build an additional storage container to turn the facility into a state-of-the-art import shipping terminal for the delivery of shipments of LNG directly from ocean-going tankers (Reference 2.8-7). The new LNG facility would be called the Freedom Energy Center LNG Import Terminal. However, in February 2006 the Philadelphia City Council voted against any LNG import facility plans within the city's limits (Reference 2.8-1).

These projects remain as either "approved" (Crown Landing LNG Terminal) or "potential" (Freedom Energy Center LNG Import Terminal) projects on FERC's Website, but it is not clear that either project will move forward. Neither of these projects is expected to have any direct impact on the construction and operation of the new plant.

2.8.2.3 Southern New Jersey to Philadelphia Mass Transit and Philadelphia Waterfront Transit Expansions

The Port Authority Transit Corporation, a subsidiary of the Delaware River Port Authority, is currently evaluating the need and potential for expanded rapid transit service to Gloucester, Camden, Cumberland and portions of Atlantic and Salem counties in NJ. Several alternatives

Existing infrastructure will be modified to integrate the new unit(s) with the existing units; however, none of the existing units' structures or facilities that directly support power generation are shared or modified. As described in Section 3.7, depending on the reactor technology selected, up to two new switchyards are required for the new plant, and the existing on-site transmission lines will be modified as required to incorporate the new generation capacity into the electric grid. One new off-site transmission line may be required depending on future studies *and transmission improvement projects* by the Regional Transmission Organization – PJM Interconnection, LLC (PJM). The existing security perimeter will be expanded to include the new plant. The existing sewage treatment facility, training, administrative buildings, warehouses, and other support facilities will be used, expanded, or replaced, to support the new plant, based on economic and operational considerations.

During construction, the laydown area and temporary construction support facilities require 205 ac. (SSAR Table 1.3-1, Item 18.2). After new plant construction is complete, areas used for construction support are restored where appropriate to match the overall site appearance or used for other necessary site or industrial support purposes. These areas include equipment laydown and module fabrication areas, batch plant area, areas around completed structures, and construction parking.

required to fully identify the requisite transmission system upgrades that are necessary to accommodate a new nuclear plant at the PSEG Site. These PJM analyses have not been initiated, but formal entry into the PJM generation queue and commencement of these analyses is anticipated when a reactor technology is selected. PJM will evaluate the additional new plant generation along with the regional transmission system configuration and independent projects in the planning cycle at that time (Reference 3.7-1).

~~Considering that an additional offsite transmission line may be required, PSEG has performed a study to evaluate the magnitude of potential environmental impacts associated with two conceptual 500-kV transmission macro-corridors from the PSEG Site. Additional details on the study are provided in Subsection 9.4.3.~~
As is summarized in Subsection 1.2.5, PSEG completed a conceptual evaluation during development of the ESP application to identify potential transmission requirements associated with the addition of generation at the PSEG Site. This evaluation included the PJM Regional Transmission Expansion Plan, existing operational limits at HCGS and SGS, and other PJM transmission planning inputs. PJM routinely performs analyses of the regional transmission system and forecasts appropriate upgrades to the system as part of its long term planning cycle. These evaluations are not specific to the addition of new generation at the PSEG Site. In order to capture the potential effects of developing off-site transmission, PSEG analyzed the potential effects of two new off-site macro-corridors during development of the ESP application. Information pertaining to alternative off-site transmission system corridors considered by PSEG is presented in Subsection 9.4.3.

PSEG transmission lines and rights-of-way are patrolled about five times each year to ensure that the physical and electrical integrity of transmission line supports, hardware, insulators, and conductors are acceptable for safe and reliable service. This periodic transmission line patrol is conducted by helicopter and ground patrols. Climbing inspections of structures are performed approximately every three years depending on the age of the line. Additional information on maintenance of transmission corridors, electric field effects, induced current hazards, corona noise, and radio/television interference is provided in Section 5.6.

3.7.3 REFERENCES

3.7-1 PJM Interconnection, Website, http://www.pjm.com/ , accessed June 17, 2009.

9.4.3.1 Macro-Corridor Study

The purpose of this study was to provide an approximation of the magnitude of potential environmental impacts associated with two conceptual 500 kV transmission macro-corridors. The termination points were selected to link the new plant to a strong regional 500 kV substation that could provide synchronizing support to improve grid stability margin. Because a transmission routing study has not been completed and precise transmission line routes have not been established, each macro-corridor was evaluated as a 5 mi. wide band generally following existing transmission line corridors. The following macro-corridors were evaluated:

- The South Macro-Corridor runs north from the PSEG Site, turns west to cross the Delaware River, and then runs south to the Indian River Substation in Delaware. The South Macro-Corridor generally follows existing transmission line corridors, and it has a total length of approximately 94 mi. This routing was preliminarily identified as the final segment of the Mid-Atlantic Power Project (MAPP) transmission line, but the segment has not been approved by PJM and is not in the current Regional Transmission Expansion Plan (RTEP). Although this segment of the MAPP line has been deferred by PJM for future study, it provided a logical conceptual route for the macro-corridor.

- The West Macro-Corridor runs north from the PSEG Site, turns west to cross the Delaware River, and then continues west to the Peach Bottom Substation in PA. The West Macro-Corridor generally follows existing transmission line corridors, and it has a total length of approximately 55 mi.

Each of these macro-corridors was developed with a common segment. From the PSEG Site the common segment extends north and then west across the Delaware River to the Red Lion Substation in DE, following the existing Hope Creek to Red Lion right-of-way. From this location, the macro-corridors diverge, extending to the west (Peach Bottom Substation) or south (Indian River Substation). When a specific route is selected, this segment may pursue a more direct path (e.g., crossing the river closer to the PSEG Site); however, crossing the Delaware River in the same area as existing transmission lines was selected for the purposes of defining the bounding conceptual macro-corridors.

As stated above, each macro-corridor was evaluated as a 5 mi. wide band that generally followed existing transmission line corridors between the end points. These 5 mi. wide bands were simplified so as not to follow the detailed alignments of the existing corridors. This approach allowed a general characterization of environmental resources within the existing corridors as well as those adjacent lands that might be subject to new transmission routing. When detailed routing studies are performed, it is anticipated that existing transmission line ROWs or alignments adjacent to existing ROWs will be used as much as possible.

The two macro-corridors described above were developed outside of formal PJM processes associated with transmission system improvements. Following PSEG's ESP application, PJM, independent of new nuclear generation, determined that transmission system improvements are desirable in the region of Artificial Island to address system voltage and stability constraints. Although this transmission upgrade is currently in the proposal stage, the project can be considered independent and reasonably foreseeable. Of the two macro-corridors described above, the West Macro-Corridor to Peach Bottom substation has the technical attributes that best resolve these constraints and is considered representative of the project being pursued by

PJM. Therefore, the West Macro-Corridor is evaluated as a cumulative impact in Section 10.5. The analytical approach of the macro-corridor study for both alternative routes and their associated impacts are presented below with only the potential West Macro-Corridor discussed in Section 10.5.

Table 9.4-1 identifies the counties potentially crossed by the South and West Macro-Corridors. Figures 9.4-1 and 9.4-2 illustrate the counties potentially crossed by each macro-corridor.

The land along the South Macro-Corridor is characterized by low elevations and low topographic relief that is typical of the Coastal Lowlands subregion of the Mid-Atlantic Coastal Plain. This subregion is characterized by poor drainage, shallow water tables, abundant wetlands, and tidal streams and rivers (Reference 9.4-2). The land along the West Macro-Corridor is also characterized by low elevations along the eastern half of the macro-corridor, but as the macro-corridor travels further west, it passes into more upland areas that are characteristic of the Northeastern Highland physiographic province.

The following subsection describes the methods used to evaluate the potential environmental impacts of these macro-corridors.

9.4.3.1.1 Methods

In the context of this study, environmental features were considered to be the factors important in environmental impact assessment and transmission corridor development. The environmental features considered included the following:

- U.S. Geological Survey (USGS) Land Use/Land Cover (LULC)
- Wetlands
- Hydrography (streams, rivers)
- Infrastructure
- Parklands
- Nature Preserves/Natural Areas
- Wildlife Refuges
- Forest Preserve Lands
- Historic Properties
- Prime and unique farmland
- Natural Heritage Data
- Floodplains

Available GIS coverages for the above listed environmental features were obtained from a variety of available public sources for each corridor including:

- **Land Use/Land Cover** – USGS Land Cover Institute. Multi-Resolution Land Characteristics Consortium, National Land Cover Database. Available at: http://www.mrlc.gov/nlcd.php

CHAPTER 10

ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

10.0 INTRODUCTION

This chapter presents the potential environmental consequences of constructing and operating a new plant at the PSEG Site. The environmental consequences are evaluated in the following five sections:

- Unavoidable adverse impacts of construction and operations (Section 10.1)
- Irreversible and irretrievable commitments of resources (Section 10.2)
- Relationship between short-term uses and long-term productivity of the human environment (Section 10.3)
- Benefit-cost balance (Section 10.4)
- Cumulative impacts (Section 10.5)

During development of the ESP application, PSEG completed a conceptual evaluation of transmission requirements associated with the addition of generation at the PSEG Site. This evaluation included the PJM Interconnect, LLC (PJM) Regional Transmission Expansion Plan, existing operational limits at Hope Creek Generating Station (HCGS) and Salem Generating Station (SGS), and other PJM transmission planning inputs. PJM routinely performs analyses of the regional transmission system and forecasts appropriate upgrades to the system as part of its long term planning cycle. These evaluations are not specific to the addition of new generation at the PSEG Site.

PSEG's conceptual evaluation indicates that a new off-site transmission line may be needed to accommodate new generation at the PSEG Site to ensure transient stability of the transmission system. The need for a new transmission line is dependent upon a range of factors including the specific reactor technology selected and the progress of regional transmission upgrade projects as part of PJM's regional planning efforts. Since the completion of this conceptual evaluation, PJM, as an example of their continuing assessment of system reliability, recently determined that additional grid improvements are necessary to address voltage and stability constraints in the region of Artificial Island. In response, PJM has solicited proposals from both regulated and non-regulated (merchant) transmission providers for system enhancements to address these constraints. PJM's determination of the need for this transmission system upgrade is independent of PSEG's interest in new nuclear generation and is not predicated on the construction of a new nuclear facility at the PSEG Site. Therefore, any transmission upgrade project mandated by PJM, including a new off-site transmission line, is considered to be reasonably foreseeable and is considered to be an action that is independent from the potential development of the PSEG Site. Similarly, since this PJM sponsored grid improvement serves to enhance power delivery throughout the region, it inherently possesses independent utility. Although PJM has not formally assessed the scope and structure of this future transmission system upgrade, PSEG has accordingly identified the potential impacts of a new off-site transmission line whose technical attributes best meet PJM's goal of addressing these regional constraints.

Of the two potential transmission corridors presented in Subsection 9.4.3, the West Macro-Corridor to the Peach Bottom substation is considered to be the most effective route for

addressing the regional voltage and stability constraints that PJM is attempting to resolve. Therefore, PSEG is using the characteristics of the West Macro-Corridor to evaluate the potential impacts of a new transmission line as representative of the regional transmission upgrade project currently being pursued by PJM. However, for consistency with earlier parts of the ER, Sections 10.1 to 10.4 provide a summary of potential adverse impacts as discussed in Chapters 4 and 5. These sections include a discussion of the potential impacts of the South Macro-Corridor, whereas Section 10.5 provides an analysis of only the West Macro-Corridor as part of the cumulative impact assessment.

10.1 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Unavoidable adverse impacts are predicted adverse environmental impacts that cannot be avoided and for which there are no practical means of further mitigation. This section considers unavoidable adverse impacts from construction and operation of a new plant at the PSEG Site, any potential transmission line and a proposed causeway.

10.1.1 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS OF CONSTRUCTION

Construction impacts are discussed in detail in Chapter 4. Table 4.6-1 describes those impacts and identifies the measures and controls available to reduce or eliminate impacts. As noted in Table 4.6-1, most of the impacts are SMALL, as they are either not detectable or are minor compared to the availability of the affected resources. Table 10.1-1 summarizes construction-related impacts that result in a measurable loss or permanent change in resources, the mitigation and control measures available to reduce those impacts, and the remaining unavoidable adverse impacts after mitigation and control measures are applied. For many of the impacts related to construction activities, the mitigation measures are referred to as best management practices (BMPs). Typically, these mitigation measures are based on the types of activities that are to be performed. The mitigation measures are implemented through permitting requirements, and plans and procedures developed for the construction activities.

Unavoidable adverse impacts from construction of a new plant at the PSEG Site occur mostly in Salem County, New Jersey (NJ), excepting any potential transmission line. If a new 500 kilovolt (kV) transmission line is required, unavoidable adverse impacts occur in Salem County, NJ, and either Kent, New Castle and Sussex counties in Delaware (DE), or New Castle County in DE, Cecil and Harford Counties in Maryland (MD), and York County in Pennsylvania (PA), dependent upon routing.

Unavoidable adverse impacts of the new plant include land use changes on up to 2728 acres (ac.) of land along potential off-site transmission rights-of-way, impacts to three archaeological sites identified as potentially eligible for the National Register of Historic Places (NRHP) along the proposed causeway, impacts to potential submerged archeological resources in areas where dredging is necessary, and effects on up to 229 ac. of wetlands (139 ac. jurisdictional, 90 ac. in licensed disposal facilities that are considered non-jurisdictional) on-site and along the proposed causeway (Table 4.3-3).

In addition, the potential off-site transmission rights-of-way cross up to 814 ac. of wetlands (Table 4.3-5) and 1026 ac. of floodplains (Subsection 4.2.1.3.2). Most wetlands and floodplains are unaffected by transmission line construction except in the limited footprints of transmission towers and any necessary access points, but 210 ac. of forested wetlands potentially are converted to non-forested (herbaceous) wetland types by tree clearing. It is not certain that a new transmission line is required, but potential impacts can be mitigated by using BMPs during construction. To the extent possible, the new transmission line will use or be located adjacent to existing rights-of-way.

Impacts to archaeological sites from construction of the proposed causeway will be mitigated through additional Phase II surveys and consultation with the New Jersey Historic Preservation Office (HPO) for identification of appropriate mitigation methods, if required. Consultation with HPO will be conducted during the design phase to determine needs for additional surveys and

Impacts to historic properties along the proposed access causeway and the potential transmission corridor will be mitigated in consultation with the State Historic Preservation Office (SHPO) for NJ, DE, MD, and PA. Any required mitigation reduces the MODERATE impacts to SMALL impacts. If a transmission line is not required, then impacts to historic properties are limited to the proposed causeway and potential visual impacts in DE and NJ.

Changes in land-use resulting from the construction of a potential off-site transmission line~~,~~ if required, are minimized by using existing transmission line rights-of-way to the extent possible. For lands crossed by transmission lines, current agricultural and other uses may continue, which reduces impacts. If a new transmission line is not required, the MODERATE land use impacts are reduced to SMALL.

Mitigation measures will be employed to address decreases in LOS on local roads resulting from construction-related traffic. Carpooling, staggered shifts, the installation of traffic lights/ controls and construction of additional turn lanes at key intersections will be evaluated to address the impacts. These construction-related LOS mitigation measures also serve to keep LOS impacts from operations-related traffic SMALL.

The new plant may use oil-fired auxiliary boilers to provide plant-related heating during the winter months and steam for plant start-up purposes. Auxiliary boiler operation results in emissions of carbon monoxide (CO), nitrogen oxides (NO_x), sulfur oxides (SO_x), and particulate matter including $PM_{2.5}$. While the impacts of these emissions on final air quality are SMALL, the modeled 24-hr. $PM_{2.5}$ concentration due to auxiliary boiler emissions in combination with the cooling tower emissions exceeds the applicable SIL in some locations, including a small part of the $PM_{2.5}$ non-attainment area in New Castle County, DE. The modeled 24-hr. $PM_{2.5}$ concentration due to the auxiliary boilers and mechanical draft cooling towers shows a slight exceedance of the applicable NAAQS when combined with background concentrations in NJ. After a reactor technology is selected and detailed design is completed for the cooling towers and auxiliary boiler equipment, PSEG will consult with NJDEP and perform more detailed modeling as necessary. Applicable emissions rates in effect at the time will be used in detailed equipment design and specification, along with identification of the appropriate engineering and operational controls. The final modeling will demonstrate that all air quality impacts are SMALL.

The majority of the adverse environmental impacts associated with the new plant construction and operation at the PSEG Site are SMALL or reduced to SMALL through the application of mitigation and control measures. MODERATE impacts include wetland losses, changes in land use, decreases in LOS on local roads, potential disturbance of historic properties, and the modeled exceedance of the 24-hr. $PM_{2.5}$ NAAQS and SIL. These MODERATE impacts have measurable adverse effects that are offset by mitigative measures that eliminate unavoidable impacts and ensure that any remaining unavoidable impacts are SMALL.

Table 10.1-2 (Sheet 3 of 8)
Operations-Related Unavoidable Adverse Environmental Impacts

Element	Adverse Impact	Mitigation/Control Measure	Unavoidable Adverse Environmental Impacts
Water Quality, continued	There is a potential for impacts to groundwater quality due to accidental spills.	Design assures that accidental spills affect only soils and shallow aquifers that are not used for potable water. BMPs and spill controls and countermeasures are used to limit and contain chemical spills. Any necessary remedial measures are implemented as required by NJDEP.	A minor potential for shallow groundwater water quality impact exists. Impacts are not anticipated to water quality of deeper aquifers used for potable water.
	Potential water quality impacts may occur from maintenance of transmission corridors.	Established ~~PSE&G~~ right-of-way management measures and *state-mandated* BMPs are implemented *by PSE&G and other interfacing utilities*. Herbicides are applied per an integrated pest management plan with provisions to address application near waterways.	Minor, infrequent and short-term decreases in water quality results are due primarily to maintenance vehicles crossing shallow streams in remote locations along off-site transmission line rights-of-way.
Aquatic Ecology	The cooling water intake results in entrainment and impingement of aquatic biota.	The closed cycle cooling system design includes provisions to assure that intake volumes and velocities are in accordance with USEPA 316(b) Phase I facility requirements. Intake monitoring is implemented per NJPDES requirements to demonstrate compliance with USEPA requirements.	There is a minor loss of aquatic biota, predominantly fish and crabs, relative to abundant standing stocks.

Table 10.1-2 (Sheet 6 of 8)
Operations-Related Unavoidable Adverse Environmental Impacts

Element	Adverse Impact	Mitigation/Control Measure	Unavoidable Adverse Environmental Impacts
Terrestrial Ecology, continued	Bird collisions with the cooling towers or the transmission lines may occur. There is a potential for electrocution of birds roosting on/near transmission lines.	Previous HCGS surveys indicate low incidence of bird collisions with plant buildings and structures. Specific measures and controls for bird collisions are not needed as impacts are minor. Towers and lines are designed to industry standards to minimize risks of avian contact with energized components.	Occasional bird collisions and contacts occur with cooling towers and transmission lines.
Socioeconomic	Public exposure to increased noise levels due to plant equipment and cooling tower operation is a potential impact.	The nearest residences are almost three miles from the plant, and noise levels at nearest residences are below protective levels for daytime and night time, mitigation is not warranted or necessary.	Unavoidable adverse environmental impacts are not anticipated.
	Public exposure to transmission line noise and potential electric shock.	Noise levels at the edge of rights-of-way and under transmission lines are below NJDEP protective level of 65 dBA *or equivalent DE, MD or PA mandates*, mitigation is not warranted or necessary. Transmission lines are designed to comply with NESC standards to avoid electric shock risks; therefore, no mitigation is necessary.	Unavoidable adverse environmental impacts are not anticipated.
	The cooling tower(s), cooling tower plumes, and new off-site transmission, if required, alter the existing viewscape.	The PSEG Site has an existing cooling tower and is remote from residential and commercial areas. Consultation with NJ HPO and DE SHPO will identify any necessary mitigation. If a new transmission line is needed it will be located within or adjacent to existing transmission line rights-of-way to the extent possible to minimize any required mitigation.	Minor changes in viewscape occur.

10.5 CUMULATIVE IMPACTS

This section discusses cumulative adverse impacts to the region's environment that could result from the new plant's construction and operation. A cumulative impact is defined in Council of Environmental Quality regulations (40 CFR 1508.7) as an "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions."

To address cumulative impacts, the *context of the* existing environment in the region surrounding the PSEG Site (Chapter 2) ~~was~~ *is* considered in conjunction with the environmental impacts presented in Chapters 4 and 5 for constructing and operating a new plant at PSEG Site. PSEG is also seeking renewal of its operating licenses for HSGS and SGS for 20 years beyond the current term of 40 years. This section contemplates the renewal of HCGS and SGS operating licenses, and the cumulative impacts of the three plants on the affected environment. *Additionally, the effects of other identified "actions" as described in Section 2.8 of the ER, are evaluated as part of the cumulative effects analysis. The cumulative impact ratings for each resource are developed by assessing the potential for the effects of other identified "actions" to change the prior impact rating assessed for each resource in Chapters 4 and 5.*

As is described in Subsection 1.2.5, subsequent to submittal of the ESP application, PJM determined that additional grid improvements are necessary to address voltage and stability constraints in the region of Artificial Island. In response, PJM has solicited proposals from both regulated and non-regulated (merchant) transmission providers for system enhancements to address these constraints. PJM's determination of the need for this transmission system upgrade is independent of PSEG's interest in new nuclear generation and is not predicated on the construction of a new nuclear facility at the PSEG Site. Therefore, any transmission project mandated by PJM, including a new off-site transmission line, is considered to be reasonably foreseeable and is considered to be an action that is independent from the potential development of the PSEG Site. Similarly, since this PJM sponsored grid improvement serves to enhance power delivery throughout the region, it inherently possess independent utility. Although PJM has not formally assessed the scope and structure of this future transmission upgrade, PSEG identified the potential impacts of a new off-site transmission line whose technical attributes best meet PJM's goal of addressing these regional constraints.

Of the two potential transmission corridors presented in Subsection 9.4.3, the West Macro-Corridor to the Peach Bottom substation is considered to be the most effective route to address the regional voltage and stability constraints that PJM is attempting to resolve. Therefore the characteristics of the West Macro-Corridor are used to evaluate the potential impacts of a new transmission line as representative of the regional transmission upgrade project currently being pursued by PJM. These potential impacts are addressed as part of the cumulative effects analysis provided in the following subsections.

10.5.1 CUMULATIVE IMPACTS FROM CONSTRUCTION

This *sub*section discusses the potential cumulative ~~effects~~*impacts* of PSEG Site construction activities (including the proposed causeway ~~and potential transmission line~~) and the construction impacts of other major projects in the region. *Impacts associated with construction*

of the new plant are summarized in tabular form in Section 4.6. However, the potential transmission impacts for the South Macro-Corridor, as summarized in Section 4.6, are not assessed in this subsection. Instead, the potential impacts of a transmission line constructed in the West Macro-Corridor are assessed since the line is considered representative of the regional transmission project currently being pursued by PJM independent of nuclear development at the PSEG Site.

Past HCGS and SGS construction related impacts are part of the existing baseline conditions at the PSEG Site and are therefore intrinsically integrated as part of the cumulative effects analysis. Cumulative impacts of the new plant and other identified present and reasonably foreseeable future actions are assessed for land use, ecological resources (terrestrial and aquatic ecosystems, sensitive species), water resources (groundwater and surface water use and water quality, surface water hydrology) and the socioeconomic environment, (noise levels, air quality, socioeconomic resources, and environmental justice populations). The sensitivity of cumulative effects analysis is resource based, and an appropriate context of analysis was selected for each of the resources described below.

10.5.1.1 Land Use

PSEG currently owns 734 ac. of lands on the PSEG Site. As described in Subsection 2.2.1, PSEG is pursuing an agreement in principle with the USACE to acquire an additional 85 ac. immediately to the north of HCGS. With the land acquisition, the entire PSEG Site will be 819 ac. (Figure 3.1-2). The specific timing of land acquisition is not currently known and is subject to further PSEG and USACE actions. However, the agreement in principle with the USACE will establish the basis for eventual land acquisition and Exclusion Area Boundary (EAB) control, necessary to support the issuance of a future COL.

Subsequent to the agreement in principle with the USACE, PSEG will develop a lease agreement for the USACE CDF land to the north of the PSEG Site, as depicted on the Site Utilization Plan (see Figure 3.1-2) for the concrete batch plant and temporary construction/ laydown use. At the completion of construction, the leased land will be returned to the USACE, subject to any required long-term EAB control conditions.

The proposed causeway provides additional access to the PSEG Site and impacts 69 ac. of coastal marsh and adjacent uplands (45 ac. permanently and 24 ac. temporarily).
~~PSEG has identified two off-site transmission corridor alternatives that may be considered in future transmission routing studies in the event a new transmission line is necessary to accommodate grid stability requirement (Subsection 9.4.3). A particular corridor has not been selected, as this is dependent on a variety of factors including the selection of a reactor technology, formal transmission impact studies, and regional transmission planning efforts. These studies are performed at the time of COLA development after a reactor technology has been selected. If required, this transmission line right-of-way includes a total of 2728 ac. of land over a distance of up to 107 mi. Lands crossed by the potential off-site transmission line are influenced by past development patterns and are dominated by agricultural uses (cultivated fields, pastures, etc.), deciduous forests, and estuarine wetland types. In consideration of total acreage of similar lands within the 5-mi. wide macro-corridor within both the 6-mi vicinity and the region (Table 2.4-10), the amount of lands affected by potential off-site transmission is small. If off-site transmission is needed, PSEG will route the new transmission line in or along existing rights-of-way to the extent practicable to minimize land use impacts.~~

Potential land use impacts of the West Macro-Corridor are associated with rights-of-way that include a total of 1557 ac. of land over a distance of up to 55 miles. Lands crossed by the potential off-site transmission line are influenced by past development patterns and are dominated by agricultural uses (cultivated fields, pastures, etc.), deciduous forests, and estuarine wetland types. Overhead transmission lines do not alter uses of common land use categories such as cultivated crops, pastures, open water or emergent herbaceous wetlands. The amount of lands affected by the potential off-site transmission line and those in the vicinity and region are shown in Table 9.4-2.. It is expected that any new transmission line constructed in the West Macro-Corridor will be routed in or along existing rights-of-way to the extent practicable to minimize land use impacts.

As described in Section 4.1, the impacts of construction on land use are SMALL. Impacts of a new transmission line in the West Macro-Corridor as is discussed in Section 9.4.3 are MODERATE based on the area of lands potentially affected. PSEG is not aware of any *other* large projects that may alter or change the predominant land uses in Salem County or the other counties ~~the transmission line corridor crosses.~~*crossed by the West Macro-Corridor.* Therefore, ~~cumulative~~*the incremental* impacts ~~of changing land use~~*from NRC-authorized activities* are SMALL*, and no further mitigation is warranted*.

10.5.1.2 Water Resources

New plant construction results in impacts to both surface water and groundwater resources. Potential effects to surface water resources include the loss of perched artificial ponds within PSEG's desilt basin and the USACE CDF, filling of marsh creek channels to support site development, alteration of the shoreline of the Delaware River for barge facility, heavy haul road and intake structure construction, and dredging within the near-shore Delaware River to support barge facility operations and intake and discharge structures (Subsection 4.3.1).

The cumulative effects analysis on water resources is focused on other projects that may affect the Delaware River and Bay and its associated water resources. A project identified in the vicinity of the PSEG Site that entails disturbance of surface water resources is the USACE Main Channel Deepening Project. The resource potentially affected by both actions is the Delaware River. In their Environmental Assessment and Supplemental Environmental Impact Statement, the USACE has indicated that the project does not have a significant impact on the Delaware River. Water quality impacts at the point of dredging and at the CDFs are minimal (Reference 10.5-1). By comparison, the PSEG Site construction activities affect much smaller areas of the Delaware River and have smaller and more localized impacts on flow patterns and water quality than the USACE project. ~~The minor impacts from the PSEG project in conjunction with the USACE channel deepening project are not expected to result in a greater incremental impact on water resources. Therefore, cumulative impacts from the PSEG project to surface water flows and water quality are SMALL.~~

~~Construction activities associated with the new plant require some use of groundwater from the same geologic formations as that used by the existing facilities. Surface water will be used for construction. PSEG intends to install two additional production wells to facilitate new plant operations. However, there are no other large groundwater users in the vicinity of the PSEG Site. Therefore, cumulative impacts to groundwater during construction are SMALL.~~*The*

potential new off-site transmission line associated with the West Macro-Corridor crosses the Delaware River, parallel to the existing 500 kV transmission line (Figure 2.2-6). Similarly, the potential off-site transmission line crosses the Susquehanna River parallel to the existing transmission line. It is expected that work in the Delaware and Susquehanna rivers associated with construction of the footings for the transmission towers would employ many of the same BMPs used by PSEG to protect the aquatic ecosystem during construction of the barge and cooling water intake structures (CWIS). The footings for the towers result in some loss of river bottom habitat, but this loss is small compared to the available habitat in the river. Any impacts to water resources associated with the construction of the tower footings in the Delaware and Susquehanna rivers are SMALL.

The West Macro-Corridor crosses several intermittent and perennial streams (Table 9.4-3). The off-site transmission of electricity is anticipated to consist of elevated lines, therefore impacts occur only within the footprint required for support structures and where access roads are necessary for construction or maintenance. It is anticipated that most support structures are sited in upland areas outside of stream channels thus avoiding stream impacts. Furthermore, access roads are located to avoid and/or minimize impacts to streams. Construction impacts associated with these potential transmission line crossings are associated with clearing activities and potential runoff and sedimentation. In order to meet regulatory requirements PSEG has developed procedures and BMPs to protect aquatic communities and prevent degradation of water quality as part of its program to maintain existing transmission corridors. It is expected that similar measures are used by the developer during the construction of any new transmission line in the West Macro-Corridor to meet mandatory regulatory requirements.

Based on the results of the transmission macro-corridor analysis, the hypothetical rights-of-way of the West Macro-Corridor cross up to 492 ac. of floodplains (Subsection 9.4.3.1.2.8). However, most floodplains are unaffected by the transmission line except in the limited footprints of transmission towers and any necessary access points.

As described in Section 4.2, the impacts of construction on surface water resources are SMALL. Impacts of a new transmission line in the West Macro-Corridor as is discussed in Section 9.4.3 are SMALL based on the surface water resources affected. The minor impacts from the PSEG project in conjunction with the USACE channel deepening project and potential off-site transmission are not expected to result in a greater incremental impact on surface water resources. PSEG is not aware of any other large projects that may alter or change the surface water resources in Salem County or the other counties crossed by the West Macro-Corridor. Therefore, the incremental impacts from NRC-authorized activities are SMALL, and no further mitigation is warranted.

As described in Section 4.2, the impacts of construction on groundwater resources are SMALL. Surface water will be used for construction. PSEG intends to install two additional production wells to facilitate new plant operations. However, there are no other large groundwater users in the vicinity of the PSEG Site. Construction of a new transmission line in the West Macro-Corridor is not expected to impact groundwater. PSEG is not aware of any other large projects that may alter or change the groundwater resources in Salem County or the other counties crossed by the West Macro-Corridor. Therefore, the incremental impacts from NRC-authorized activities are SMALL, and no further mitigation is warranted.

10.5.1.3 Ecological Resources

New plant construction at the PSEG Site impacts 385 ac. (permanent and temporary uses) of upland and wetland habitats on the site (Table 4.3-1). Much of these lands are characterized as low quality, previously disturbed old field habitats that have become naturalized following the construction of the HCGS and SGS plants. These low quality habitats are often dominated by the invasive common reed (*Phragmites australis*). Construction activities affect wetlands that consist of coastal wetlands (105 ac.), unmapped coastal wetlands (34 ac.), and unmapped coastal wetlands within permitted disposal facilities (90 ac. within PSEG's desilt basin and within the USACE CDF) (Table 4.3-3). A total of 9.5 ac. of coastal riparian zones and open water habitat along the shoreline of the Delaware River are affected by new plant development.

The proposed causeway impacts 41 ac. of wetlands~~(~~*, including* 21 ac. *of* permanent impacts primarily due to shading effects~~,~~ and 20 ac. ~~temporarily~~*of temporary impacts* during construction~~,~~ *(*Table 4.3-3).~~ An off-site transmission line may be developed that affects 2728 ac. of land over a distance of up to 107 mi. Lands crossed by the potential off-site transmission line are influenced by past development patterns and are dominated by agricultural uses (cultivated fields, pastures, etc.), deciduous forests, and estuarine wetland types (Table 4.3-4). Considering the total acreage of similar habitats within the 5-mi. wide macro-corridor in the 6-mi vicinity and the region (Table 2.4-10), the amount of lands affected by potential off-site transmission is small. If off-site transmission is needed, PSEG will route the new transmission line in or along existing rights-of-way to the extent practicable to minimize land cover impacts. Therefore, cumulative impacts to terrestrial ecosystems are SMALL~~

The cumulative effects analysis on aquatic ecosystems and wetlands is focused on other projects that may affect the Delaware River and Bay and its associated water resources. Other projects identified in the vicinity of the PSEG Site that entail disturbance of similar resources include*:* the USACE Main Channel Deepening Project~~ and~~*;* the habitat restoration at Mad Horse Creek Wildlife Management Area funded as a result of the 2004 *Athos I* oil spill on the Delaware River at Paulsboro, NJ (Section 2.8~~).~~*); and construction of a new transmission line in the West Macro-Corridor.*

The channel deepening project affects a stretch of the Delaware Bay and Delaware River extending from the Philadelphia to the mouth of the Delaware Bay. New plant construction impacts on-site water bodies, small marsh creeks, and requires dredging of a 92-ac. area to support barge facility and intake structure operations (Subsection 4.3.2.3). The effects of these activities on water quality and aquatic biota are localized and not contributory to any cumulative effects on the ecosystem of the Delaware River or Estuary. As indicated previously, the*;* PSEG project is not expected to result in any incremental increases in ~~impact~~ *impacts* to ecological resources affected by the USACE project. Therefore, cumulative impacts of the PSEG project on aquatic ecosystems similarly affected by the main channel deepening are SMALL.

Subsection 2.8.2.5 describes the planned restoration activities within the Mad Horse Creek Wildlife Management Area. The proposed Mad Horse Creek restoration restores nearly 200 ac. of the Mad Horse Creek Wildlife Management Area to address injuries to shoreline and bird resources resulting from the 2004 *Athos I* oil spill. NJDEP and the National Oceanic and Atmospheric Administration (NOAA) are proposing a tidal wetland restoration project that allows construction of *Spartina alterniflora* habitat. Restoration is accomplished through fill material removal to lower the marsh elevation and allow tidal inundation. Unavoidable impacts of new

plant construction to wetlands on the PSEG Site and within the vicinity is mitigated by habitat restoration and enhancement, as described in Subsection 4.3.1, using proven experience and techniques developed by the PSEG Estuary Enhancement Program. Sensitive species that utilize such marsh habitats (bald eagle-foraging only, northern harrier, osprey) are positively affected by the proposed Mad Horse Creek restoration effort and by the proposed mitigation for the new plant (i.e., restoration of low quality marsh habitats). Consequently, cumulative adverse impacts to sensitive species are not expected.

~~In summary, upland terrestrial habitats of the PSEG Site are generally of low quality and dominated by the invasive strain of *Phragmites*. Impacts to aquatic ecosystems are localized relative to the channel deepening project and small in comparison to the available resources of the Delaware River and Bay. Construction related impacts to wetlands and marsh creeks are mitigated by restoration and enhancement measures. Therefore, PSEG has concluded that the cumulative impacts of new plant~~*Construction of a new transmission line in the West Macro-Corridor to the Peach Bottom substation affects 1557 ac. of land over a distance of up to 55 mi. Ecological cover types crossed by the transmission line are influenced by past development patterns and are dominated by agricultural uses (cultivated fields, pastures, etc.), deciduous forests, and estuarine wetland types (Table 9.4-2). Construction of a new transmission line in the West Macro-Corridor to the Peach Bottom substation would also impact up to 289 ac. of wetlands (Table 9.4-4). It is expected that any new transmission line will be routed in or along existing rights-of-way to the extent practicable to minimize land cover impacts.*

Table 9.4-3 presents the length of the streams for each of the USGS categories crossed by the hypothetical 200-ft. wide rights-of-way associated with the West Macro-Corridor. There are a total of 970 mi. of streams within the West Macro-Corridor. Based on the adjusted hypothetical rights-of-way, 7.9 mi. of streams are crossed. It is expected that approximately 95 percent of stream channels can be avoided in the location of transmission towers. Crossing of major rivers (Delaware River, Susquehanna River) will require the placement of in-stream structures. Structures placed near the navigation channel will likely require the placement of dikes, bulkheading, rip rap, or other protective structures to guard against collisions with marine vessels.

It is expected that in-stream work in the Delaware River and Susquehanna River associated with construction of the footings for the transmission towers will employ many of the same BMPs used by PSEG to protect the aquatic ecosystem during construction of the barge and CWIS structures. The footings for the towers result in some loss of river bottom habitat, but this loss is small compared to the available habitat in the river. It is expected that Ecological protection provisions that minimize potential impacts to aquatic species are developed as part of the route development and permitting process.

As described in Section 4.3, the impacts of construction on ecological resources are SMALL. *Impacts of a new transmission line in the West Macro-Corridor as is discussed in Section 9.4.3 are MODERATE for wetlands and terrestrial resources. PSEG is not aware of any other large projects that may adversely impact the ecological resources in Salem County or the other counties crossed by the West Macro-Corridor. Therefore, the incremental impacts from NRC-authorized activities are SMALL, and no further mitigation is warranted.*

10.5.1.4 Socioeconomic Resources

Existing noise levels on the PSEG Site attenuate to background levels near the site boundary. During new plant construction, site and traffic noise levels increase above those now experienced at PSEG Site, but attenuate to acceptable levels prior to reaching off-site residential receptors. The noise emissions return to levels typical of a power generation facility after construction ceases. No other large construction activities are planned in the vicinity that contribute to noise levels of nearby sensitive resources (e.g., residential receptors). Consequently, cumulative effects associated with noise from construction are SMALL.

New plant construction results in increased air emissions from commuter traffic and the operation of construction equipment. Air emission impacts from construction are SMALL, because emissions are controlled at the sources where practicable, emissions are maintained within established regulatory limits designed to minimize impacts, and the distance between the construction site and the public limits off-site exposures. This is the only large construction project currently planned in the vicinity. Therefore, adverse cumulative impacts to air quality are not expected.

The maximum construction workforce for the new plant is 4100 people. Of these workers, 82 percent are expected to reside in the four-county Region of Influence (Salem County, Cumberland County, and Gloucester County in NJ and New Castle County in DE). This workforce could have short-term SMALL impacts to the housing markets, social services, educational facilities, and community support services (fire and police protection, water/wastewater infrastructure). While some large development projects are planned in the Philadelphia area (Section 2.8) no other construction projects of this magnitude have been identified in the four-county Region of Influence. Consequently, cumulative impacts on the physical or social environment due to other large construction workforces are not expected within the 50-mi. region and the Region of Influence.

Potential adverse impacts are not disproportionately concentrated in such a manner as to impact environmental justice populations within the 50-mi. region or the four-county Region of Influence. Transportation improvements mitigate the potential transportation related impacts to environmental justice populations in Salem County. Based on factors including the isolated location of the construction site, the established adequacy of community infrastructure and public services, effective planning procedures, and sufficient tax revenues generated by the construction-related activity, environmental justice populations within Salem County are not disproportionately affected. No other projects are identified that may affect the same environmental justice populations potentially affected by the new plant. Consequently, cumulative impacts to environmental justice populations are not expected.

~~No other cumulative impacts due to construction have been identified.~~
Portions of any new transmission line constructed in the West Macro-Corridor may pass through developed areas. Although route selection for any new transmission line attempts to avoid residential and other developed land to the extent feasible, some developed properties may be purchased along the transmission right-of-way. Because of the proximity of these developed land uses, a higher potential exists for fugitive dust, emissions, and noise impacts during construction. In un-forested areas, noise and emission impacts are minimal and confined to small areas near the towers. By comparison, emissions and noise levels may be greater in areas that require clearing due to the increased use of equipment and the workforce needed to clear wooded areas, remove woody debris, and grade the cleared areas. It is expected that appropriate construction management practices are employed to reduce noise and emissions in

these areas. Any increases in fugitive dust, emissions, and noise are short-term and impacts to the public are SMALL.

Transmission line construction is also expected to result in employment of a construction workforce over a prolonged period. However, most of these workers are expected to reside in the region surrounding the PSEG Site. Given the large resident workforce available within the region (Table 2.5-21), impacts from this workforce on housing markets, social services, educational facilities, and community support services (fire and police protection, water/wastewater infrastructure) are SMALL. Additionally, potential adverse impacts are not disproportionately concentrated in such a manner as to impact environmental justice populations within the region or areas along the West Macro-Corridor. Figures 2.5-10 to 2.5-16 indicate that few, if any, environmental justice populations are located in the area potentially crossed by the West Macro-Corridor. Therefore, cumulative impacts to environmental justice populations are SMALL.

As described in Section 4.5, the impacts of construction on socioeconomic resources are SMALL. Impacts of a new transmission line in the West Macro-Corridor are also SMALL. PSEG is not aware of any other large projects that may have an adverse impact on socioeconomic resources in Salem County or the other counties crossed by the West Macro-Corridor. Therefore, the incremental impacts from NRC-authorized activities are SMALL, and no further mitigation is warranted.

10.5.2 CUMULATIVE IMPACTS OF OPERATIONS

This *sub*section discusses the potential cumulative ~~effects~~ *impacts* of PSEG Site operation~~s~~ activities *(including the proposed causeway)* and *the operation impacts of* other major projects in the region. *Impacts associated with operation of the new plant are summarized in tabular form in Section 5.10. However, the potential transmission impacts for the South Macro-Corridor, as summarized in Section 5.10, are not assessed in this subsection. Instead, the potential impacts of a transmission line constructed in the West Macro-Corridor are assessed since the line is considered representative of the regional transmission project currently being pursued by PJM independent of nuclear development at the PSEG Site.*

Cumulative impacts to land use, ecological resources, water resources, the socioeconomic environment, and human health are discussed. The geographic context for each analysis is similar to that given in the previous subsection.

10.5.2.1 **Land Use**

Anticipated impacts to land use from new plant operation result from the deposition of solids from cooling tower operation, periodic maintenance activities of the cooling water intake structure (desilting of the intake bays, and potentially limited dredging of the intake area to maintain depth), and periodic maintenance of the PSEG Site grounds. Each of these activities is predominantly confined to the PSEG Site and its immediate environs. ~~Consequently, cumulative impacts on site land use are SMALL.~~

Operational activities in the vicinity of the PSEG Site are associated with maintenance of the proposed causeway and potential off-site transmission ~~lines~~ *line* (vicinity and region). PSE~~&~~G's control and management of ~~these~~ *existing transmission* rights-of-way preclude construction of

residential and industrial features on the transmission corridors. ~~PSEG has not identified any other projects in the vicinity of the PSEG Site that have the potential to alter land use. Therefore, PSEG concludes that cumulative impacts of plant operation on land use in the vicinity are SMALL~~*It is expected that similar controls are in place restricting land use along developed portions of the West Macro-Corridor. However, as is described in Subsection 5.1.2, it is expected that the developer of any new transmission line acquires rights-of-way (either by outright purchase of the land or easement) in a manner that provides access and control over how the land in the rights-of-way is managed. Land use in the rights-of-way and underneath the high-voltage lines is compatible with the reliable transmission of electricity. Vegetation communities in the rights-of-way are kept at an early successional stage. Allowable activities within the rights-of-way are variable, but may include farming for feed (hay, wheat, corn), for livestock or grazing*.

~~PSEG also considered the potential for cumulative visual impacts due to cooling tower operation. As described in Subsection 5.1.3, the new plant cooling tower is predicted to be visible at a number of sites within the 10-mi. radius that are listed on the National Register of Historic Places. However, because of the large distance of the new plant from known historic sites, and the physical similarity of the new plant cooling towers with the existing HCGS cooling tower, the cumulative impact of the view of the new cooling towers on the viewshed of historic properties is SMALL.~~
As described in Section 5.1, the impacts of operation on land use are SMALL. Impacts of the operation of a new transmission line in the West Macro-Corridor are SMALL. PSEG is not aware of any other large projects that may alter or change the predominant land uses in Salem County or the other counties crossed by the West Macro-Corridor. Therefore, the incremental impacts from NRC-authorized activities are SMALL, and no further mitigation is warranted.

PSEG also considered the potential for cumulative visual impacts due to cooling tower operation. As described in Subsection 5.1.3, the new plant cooling tower is predicted to be visible at a number of sites within the 10-mi. radius that are listed on the National Register of Historic Places. However, the large distance of the new plant from known historic sites, and the physical similarity of the new plant cooling towers with the existing HCGS cooling tower minimizes the cumulative impact of the view of the new cooling towers on the viewshed of historic properties. A new transmission line in the West Macro-Corridor is expected to be located along existing rights-of-way and visual impacts are SMALL. PSEG is not aware of any other large projects that may alter or change the viewshed in Salem County or the other counties crossed by the West Macro-Corridor. Therefore, the incremental impacts from NRC-authorized activities are SMALL, and no further mitigation is warranted.

Non-radioactive solid wastes from new plant operation are disposed in permitted landfills. The volume of additional wastes is minimized through waste minimization programs in a manner similar to that at the existing SGS and HCGS. Landfill capacity required by the new plant is small relative to the regional residential and industrial demand. Consequently, cumulative impacts of waste disposal on off-site land use are SMALL.

10.5.2.2 Water Resources

The new plant uses groundwater for some operational systems. The average withdrawal rate for the existing units, combined with the new plant operations slightly exceeds the current site permitted annual withdrawal rate. No other significant current or future users of groundwater in

the vicinity of the PSEG Site have been identified. Therefore, cumulative impacts to groundwater during operation are SMALL.

Operational activities that could impact surface water such as NJPDES permitted discharges are SMALL. Based on computer modeling, blowdown from the new plant cooling towers produces a thermal plume (1.5 degrees Fahrenheit [°F])) that extends up to 300 to 500 ft. downstream and upstream, and has a width of 450 ft. (Subsection 5.2.3). The plume is not large enough to affect the water quality or biota of the river. The new plant discharge is located north of the existing HCGS and SGS discharges and produces a plume that merges with those of the existing plants. As described in Subsection 5.2.3.1.2, the new plant plume is contained within SGS's thermal plume, such that the combined temperatures from the new plant and the existing SGS and HCGS thermal plumes are less than the maximum temperature elsewhere in the SGS thermal plume. Consequently, cumulative thermal impacts of new plant operation are SMALL.

The new plant cooling system withdraws make up water from the Delaware River. PSEG has an allocation of 6695 acre-feet of storage in the Merrill Creek Reservoir that is available to offset freshwater consumptive use during periods of declared drought. The total consumptive losses are 0.01 percent of the tidal flows at the PSEG Site (Subsection 5.2.2.1). No other significant current or future users of surface water in the vicinity of the PSEG Site have been identified. Consequently, the cumulative impacts of water withdrawal on the Delaware River are SMALL.

As described in Section 5.2, the impacts of operation to water resources are SMALL. PSEG is not aware of any other large projects that may alter or change the water use and quality in Salem County or the other counties crossed by the West Macro-Corridor. Therefore, the incremental impacts from NRC-authorized activities are SMALL, and no further mitigation is warranted.

10.5.2.3 Ecological Resources

Potential cumulative operational impacts of the new plant relate to the operation and maintenance of off-site transmission lines and the impingement and entrainment of aquatic biota from cooling water system (CWS) operation. Potential cumulative impacts from transmission operation include those associated with the operation of the existing HCGS and SGS transmission lines and *those associated with a potential new transmission line in the West Macro-Corridor that is representative of the regional transmission upgrade project currently being pursued by PJM. Potential impacts* include the potential for electrocution or physical collision. As discussed in Subsection 5.6.1, appropriate measures are included in transmission line designs to reduce avian power line interaction such that these effects are minimized. PSEG uses BMPs on vegetation within *existing* transmission corridors and works in consultation with resource agencies to minimize potential effects to sensitive species. ~~Thus, the potential for cumulative impacts to ecological resources from maintenance and operation of the transmission lines is SMALL.~~*Similarly, the developer of any new line in the West Macro-Corridor is expected to consult with agencies and use BMPs to minimize effects to sensitive species.*

The new plant CWS is designed as a closed-cycle system consisting of an intake structure that withdraws a small volume of water from the Delaware River, at a through-screen velocity of less than 0.5 ft/sec. As such, the design of the CWS is considered Best Technology Available under the Phase I Clean Water Act 316(b) regulations. As described in Subsection 5.3.1.2, estimated impingement mortality and entrainment rates result in the loss of a relatively small number of

aquatic biota relative to the abundance of the standing stocks in the river and bay, and do not adversely affect the stability of the overall community or important species. Regarding the potential impacts from intake operation on aquatic biota, species richness and diversity levels of the fish community in the vicinity of SGS and HCGS are documented in PSEG's NJPDES permit renewal filings as high as, or higher than, they were in the 1970's. Species lists from preoperational studies and current studies are similar, and most of the important species' populations have either remained stable or varied due to regional or coast-wide environmental factors. The on-going HCGS and SGS operation does not result in an impact to the aquatic community that destabilizes resident populations. ~~Therefore, cumulative impacts of the operation of the new plant intake system on aquatic biota are SMALL.~~

As described in Section 5.3, the impacts of operation on ecological resources are SMALL. Impacts of the operation a new transmission line in the West Macro-Corridor as is discussed in Section 9.4.3 are SMALL. PSEG is not aware of any other large projects that may adversely impact ecological resources in Salem County or the other counties crossed by the West Macro-Corridor. Therefore, the incremental impacts from NRC-authorized activities are SMALL, and no further mitigation is warranted.

10.5.2.4 Socioeconomic Resources

PSEG has not determined the cooling tower configuration for the new plant. In terms of visual impact, the bounding condition assumes the operation of two natural draft cooling towers that are slightly taller in size and similar in configuration to the HCGS tower. The three cooling towers are visually grouped together so the aesthetics and visual impact is only slightly different from that which currently exists. ~~Cumulative impacts on the viewscape are therefore SMALL.~~

It is expected that any new transmission line in the West Macro-Corridor are located parallel to existing transmission lines to the extent practicable, and in accordance with established industry practices and procedures that take into consideration environmental and visual impacts. As is described in Subsection 5.6.3.5, natural vegetation normally is retained at transmission line road crossings to help minimize ground-level visual impacts, where possible. Contractors performing routine vegetation control on transmission lines are instructed to maintain a screen of natural vegetation in the rights-of-way on each side of major highways and water-ways, unless safety or engineering requirements dictate otherwise. Accordingly, the visual impacts to members of the public from any new transmission line are expected to be SMALL. PSEG is not aware of any other large projects that may alter or change the predominant viewshed in Salem County or the other counties crossed by the West Macro-Corridor. Therefore, cumulative impacts on the viewscape are SMALL.

Cooling tower operation results in localized effects such as ground level fogging, shadowing from the cooling tower and associated plume, and salt deposition on surrounding terrestrial ecosystems. Aside from the existing cooling tower at the HCGS site, there are no other cooling towers located nearby that could contribute to these effects. Because of the distances between the existing HCGS cooling tower and the new plant cooling towers (more than 2000 ft.) the localized effects of cooling tower operation (i.e., less than 1000 ft.) and the salt-tolerance of the adjacent plant communities, the cumulative impacts of cooling tower operation are SMALL.

Air quality impacts do not result from the reactors, but from support equipment and cooling towers. Emissions of criteria pollutants from the new plant are from the emergency diesel

generators and/or combustion turbines and the auxiliary boiler(s). The region surrounding the PSEG Site has several large industrial facilities with permitted releases to the air. Areas having air quality as good as, or better than, the NAAQS are designated as attainment areas. Areas having air quality that is worse than the NAAQS are designated as non-attainment areas. Salem County is next to (but not included in) the Philadelphia-Wilmington $PM_{2.5}$ non-attainment area and is located in the Philadelphia-Wilmington-Atlantic City 8-hr. ozone non-attainment area. Based on modeling results, NO_x impacts are in compliance with the NAAQS and PSD increment. However, predicted SO_2 and PM_{10}/$PM_{2.5}$ concentrations indicate that a modeling analysis must be conducted during the PSD permitting phase that includes background concentrations and other sources to demonstrate compliance with the NAAQS and PSD increments. After a reactor technology is selected and detailed design is completed for the cooling towers, emergency power equipment and auxiliary boiler equipment, PSEG will consult with NJDEP and perform more detailed multi-source modeling. Applicable emissions rates in effect at the time will be used in detailed equipment design and specification, along with identification of the appropriate engineering and operational controls. The modeling will demonstrate that the new plant will be in compliance with the NAAQS/NJAAQS and ensure that the cumulative impacts to air quality are SMALL.

Noise from the existing HCGS and SGS is typically indistinguishable from background at the site boundary, and the new plant generates similar levels of noise (primarily associated with cooling tower and intake structure operation). Additional traffic generated noise occurs on the regional roadway network. No other sources of industrial noise occur in the vicinity of the PSEG Site such that the new plant operation results in a cumulatively greater impact on noise pollution. ~~Cumulative~~*High-voltage transmission lines can emit noise when the electric field strength surrounding them is greater than the breakdown threshold of the surrounding air, creating a discharge of energy. However, as described in Subsection 5.6.3.3, transmission line noise typically meets regulatory limits at the edge of the right-of-way. No audible noise issues are expected from any new transmission line in the West Macro-Corridor, and noise impacts are expected to be SMALL. Therefore, cumulative* impacts from operations-related noise are SMALL.

Socioeconomic impacts, including increased tax revenues to Salem County, are cumulative with socioeconomic changes brought about through the operation of the existing HCGS and SGS plants, and changes due to normal population growth. Up to 600 workers are employed at the new plant to support operations. It is estimated that most of these new employees come from within the 50-mi. region. Some of these employees, as well as most new workers from outside the 50-mi. region, are expected to relocate to localities within the Region of Influence that provide convenient access to the new PSEG plant. Taxes resulting from the new plant operation (direct payment of corporate taxes and indirect contribution of payroll taxes) are beneficial and offset the additional demands on local community services (education, police, fire protection, water and wastewater, etc.) within the four-county Region of Influence. No other projects that involve in-migration of a large workforce have been identified in the area. Cumulative socioeconomic impacts are therefore SMALL.

As described in Section 5.8, the impacts of operation to socioeconomic resources are SMALL. PSEG is not aware of any other large projects that may alter or change socioeconomic resources in Salem County or the other counties crossed by the West Macro-Corridor. Therefore, the incremental impacts from NRC-authorized activities are SMALL, and no further mitigation is warranted.

10.5.2.5 Human Health

The new plant releases small quantities of radionuclides to the environment. Gaseous effluent activity releases and liquid effluent activity releases are given in Tables 5.4-1 and 5.4-2 respectively. Values for gaseous effluent releases and liquid effluent releases from the new plant are taken from SSAR Tables 1.3-7, and 1.3-8 respectively. These values are multiplied by two to account for the possibility of dual units.

It should be noted that the doses from the new plant are higher than from the existing HCGS and SGS units because doses from the existing units are based on actual site measurements, compared to the conservatively calculated, theoretical doses from the new plant. For 2007, the collective total effective dose equivalent (TEDE) to workers was 118 person-rem at SGS and 191 person-rem at HCGS (Reference 5.4-1). This combines to a total of 309 person-rem. The maximum annual occupational dose from the new plant in combination with that from the existing SGS and HCGS at the PSEG Site is less than the 40 CFR 190 criteria (Table 5.4-10). Overall, the cumulative impacts to workers from occupational radiation doses ~~is~~*are* SMALL.

The fuel cycle specific to a new plant at the PSEG Site contributes to the cumulative impacts of fuel production, storage and disposal for all nuclear units in the United States. The cumulative impacts of the fuel cycle for the existing reactors are SMALL and the impacts from the addition of two new units do not change that conclusion. Fuel and waste transportation impacts from two new units are SMALL, and do not significantly increase the cumulative impacts of transportation of nuclear reactor fuel and wastes.

As described in Sections 5.4, 5.6, and 5.7, the impacts of radiation and the uranium fuel cycle as a result of operations are SMALL. PSEG is not aware of any other large projects that may adversely affect human health in Salem County or the other counties crossed by the West Macro-Corridor. Therefore, the incremental impacts from NRC-authorized activities are SMALL, and no further mitigation is warranted.

10.5.3 CONCLUSION

In conclusion, the impacts from the new plant construction and operation at the PSEG Site do not contribute significantly to existing or future cumulative impacts to the vicinity or the region.

10.5.4 REFERENCES

10.5-1 U.S. Army Corps of Engineers, *Delaware River Main Stem and Channel Deepening Project*, *Environmental Assessment.* Philadelphia, PA., 2009.