III. SITE SELECTION PROCESS (BBNPP ER 9.3.1-9.3.3)

The site selection process is a five-stage process that progresses as follows:

1. Define and identify the Region of Interest (ROI) (ER 9.3.1.1).
2. Screen the ROI to identify suitable Candidate Areas (ER 9.3.1.1)
3. Screen and evaluate the candidate areas to identify Potential Sites (ER 9.3.1.2)
4. Conduct a technical evaluation of the Potential Sites to identify the Candidate Sites (ER 9.3.1.2)
5. Screen and evaluate the Candidate Sites to determine if any of the Alternative Sites could be judged as environmentally preferable, and obviously superior, to the Proposed Site (ER 9.3.2). For this site selection process:

   Candidate Sites - Proposed Site = Alternative Sites.

REGION OF INTEREST AND CANDIDATE AREAS (BBNPP 9.3.1.1)

Region of Interest

The first step in the siting process was to define and identify the ROI. As defined in Environmental Standard Review Plan (ESRP) 9.3 (NRC, 2007), the ROI is the largest area considered and is the geographic area within which sites suitable for the size and type of nuclear power generating facility proposed by the applicant are evaluated. The basis for an ROI can be the state in which the proposed site is located or the relevant service area for the proposed facility. The site selection process contains a description of the ROI, including the following elements:

- Major centers of population
- Areas predicted to be deficient in power
- Available bodies of water (for cooling)
- Railroads, highways, and waterways (existing and planned)
- Topographic features
- Major land use classifications (for example, residential and agricultural) and areas reserved for specific uses
- Location and description of existing and planned primary electrical generating facilities
- Existing and planned transmission network
- Transmission interconnections with other utilities
- Natural and man made features (for example, zones of seismic activity, unusual geologic features, and military installations) constituting potential hazards to construction or operation of a nuclear power generating facility

As discussed earlier, the BBNPP would be developed as a merchant facility, owned by PPL. A merchant facility is one that sells or conveys its capacity and electricity in competitive markets. As a merchant facility, the primary market area is based on PPL's fundamental business decisions on the economic viability of a nuclear power generating facility, the market for the facility's output, and the general geographic area where the facility should be deployed to serve the market.

The geographic scope or primary market area for the BBNPP is generally defined as the eastern part of the PJM Interconnection, LLC (PJM) classic market area. This area – the ROI – is closely approximated by the service territories for the electric delivery companies identified and depicted on Figure 9.3-1. (Figures 9.3-1 through 9.3-5 are taken from the BBNPP Environmental Report, Chapter 9, Section 3, and are included below.) The PJM classic market area is a subset of the entire PJM area. The primary market area and the ROI are one and the same.

For PPL Corporation and its marketing entity, PPL Energy Plus, the key drivers for selection of this defined ROI/primary market area include:

- Fit with the marketing plan: Assets and locations in the primary PJM east area fit well with the PPL Energy Plus marketing plan.
- Regulatory environment: A thorough understanding of state regulatory issues is one of the most important considerations in developing a new generating facility. States within the ROI, and particularly Pennsylvania, are well understood from a regulatory perspective.
- Market operations (RTO, ISO): PJM is a mature, well-functioning market that can readily fulfill PPL Corporation's marketing objectives.
- Electric transmission concerns: The eastern part of the PJM classic market area provides access to several key market areas and is not subject to some of the problems other areas have historically experienced in moving power to these markets.
- Probability of success/competitive advantages: Assets for which competition is expected to be less and where PPL has a competitive advantage rank highest. The eastern part of the PJM classic market area, particularly where PPL Corporation already has assets, scores high in these considerations.

Reflecting historical power flows and constraints on the PJM transmission system, the ROI extends slightly west of the regulated service territory boundaries shown on Figure 9.3-1. This recognizes the advantages of situating the proposed facility east of PJM's Western Interface, which is often a point of constraint to the delivery of energy from western areas of PJM to eastern Pennsylvania, New Jersey, the Delmarva Peninsula, and the Washington/Baltimore metropolitan area. Such placement would allow PJM to dispatch more cost-effective generation located east of this interface to meet load demands, including periods when such constraints are experienced. (PJM, 2008)

INSERT FIGURE 9.3-1

The ROI covers approximately 31,296 mi^2 (81,296 km^2) and encompasses the major population centers of the cities of Wilmington, Delaware; Allenton/Bethlehem/Easton, Pennsylvania; Harrisburg, Pennsylvania; Scranton/Wilkes Barre, Pennsylvania; Philadelphia, Pennsylvania; Baltimore, Maryland; and Newark, New Jersey (Figure 9.3-1). The ROI is large enough (encompassing portions of four states) to have sufficient environmental diversity. Bodies of water available as sources of cooling water for the proposed nuclear facility include Susquehanna River, Juniata River, Lehigh River, Patuxent River, Delaware River, Chesapeake Bay, Barnegat Bay, Lake Wallenpaupack, and the Atlantic Ocean. Major interstate highways include I-70, I-76, I-78, I-80, I-81, I-83, I-95, I-270, I-278, I-280, I-287, I-476, and I-695. Railroads in Maryland include Amtrak, Maryland and Delaware Railroad, and the Maryland Midland Railway. Railroads in New Jersey include Amtrak; Black River and Western Railroad; and the New York, Susquehanna and Western Railway. Railroads in Pennsylvania include Amtrak; Juniata Valley Railroad; New York, Susquehanna and Western Railway; North Shore Railroad; and Canadian Pacific Railroad. Topographic features in the ROI range from flat floodplains along the rivers and coastal plains along the bays to steep hills, deep ravines, and mountain ranges. Topography in Maryland includes coastal plains, the Piedmont Plateau, the Appalachian Mountains, Backbone Mountain, and land features such as Cunningham Falls and Calvert Cliffs. Topography in New Jersey includes coastal plains, the Piedmont Plateau, the Appalachian Mountains, and land features, such as High Point State Park. Topography in Pennsylvania includes coastal plains, the Piedmont Plateau, Pocono Plateau, and the Appalachian Mountains. Major land use designations can be found throughout the ROI and include Residential, Rural, Agricultural, Industrial, Commercial, Public Facilities, Parks, Open Space, Preserves, Reserves, Natural Areas, Transportation, Communications and Utilities, Government Special Designation, and Education. There are several military installations throughout the ROI, including the U.S. Naval Academy located in Annapolis, Maryland.

Candidate Areas

The next step in the site selection process was to identify suitable candidate areas by screening the ROI using exclusionary criteria to exclude unsuitable areas. Candidate areas refer to one or more areas within the ROI that remain after unsuitable areas have been removed. Screening of the ROI was performed at a high level with the purpose of quickly identifying areas within the ROI that would not be suitable for the siting of a nuclear power generating station.

The criteria used in the screening of the ROI are listed below and are consistent with those identified in ESRP 9.3 (NRC, 2007) and the Electric Power Research Institute (EPRI) siting guide (EPRI, 2002):

- Distance from major population centers (that is, identifying sites that are located within 20 mi (32 km) of an area with less than 300 persons per square mile (ppsm)).
- Proximity to adequate transmission lines (that is, identifying sites that are located within approximately 30 mi (48.3 km) of 345 kV or 500 kV transmission lines).

In accordance with the EPR standard grid connection design, 345 kV or 500 kV transmission lines are needed.

- Proximity to a suitable source for cooling water (that is, identifying sites that are located within 15 mi (24.1 km) of an adequate source for cooling water).
- Non-dedicated land (that is, identifying sites that are not located within areas such as national and state parks, historic sites, and tribal lands).

The exclusionary criterion pertaining to population density used in this siting evaluation is more specific and more conservative than what is presented in 10 CFR 100, which outlines the NRC's reactor site criteria. The information presented in 10 CFR 100 does not specify a permissible population density or total population within this zone because the situation may vary from case to case.

NRC Regulatory Guide 4.7, Rev. 2 (NRC, 1998) contains the same information as presented in 10 CFR 100, but adds the following specific criterion:

> Preferably a reactor would be located so that, at the time of initial site approval and within about 5 years thereafter, the population density, including weighted transient population, averaged over any radial distance out to 20 mi (32 km) (cumulative population at a distance divided by the circular area at that distance), does not exceed 500 ppsm. A reactor should not be located at a site whose population density is well in excess of the above value.

The EPRI siting guide contains the most conservative criterion with regard to population density and recommends that a new reactor not be located in an area with greater than or equal to 300 ppsm (300 persons per 2.6 km^2) (EPRI, 2002). Consistent with the current industry guidance as detailed in the EPRI document, this siting evaluation used the conservative population criterion (300 ppsm) as an exclusionary criterion in identifying candidate areas.

Figure 9.3-2 identifies the areas eliminated during screening of the ROI because they did not satisfy the exclusionary criteria. (It should be noted some of the identified excluded areas overlap.)

Information gathered from the initial screening was used to identify areas that satisfied the exclusionary screening criteria. The results of screening the ROI for areas that satisfied the exclusionary screening criteria yielded those candidate areas identified on Figure 9.3-3.

INSERT FIGURE 9.3-2

INSERT FIGURE 9.3-3

POTENTIAL AND CANDIDATE SITES (BBNPP 9.3.1.2)

Potential Sites

The next step in the site selection process was to screen and evaluate the candidate areas using refined discretionary criteria in order to identify potential geographic locations for the placement of the proposed nuclear station. Information used in the screening and evaluation of the candidate areas was obtained from publically held images, publicly held information on geographic information system (GIS) databases that generally included electric power producing plants and brownfield sites, topographic maps showing roads, urban areas, wetlands, parks, and other dedicated lands. Information on electric power plants within the ROI (Delaware, Maryland, New Jersey, and Pennsylvania) was obtained from the DOE, Energy Information Administration (EIA) (EIA, 2008a) (EIA, 2008b) (EIA, 2008c) (EIA, 2008d). Information on brownfield sites within the ROI was obtained from the State of Delaware Department of Natural Resources Environmental Control (DNERC, 2008); the State of Maryland Department of the Environment (MDE), Maryland Brownfield, Voluntary Cleanup Program and State Remediation Sites database (MDE, 2008); the State of New Jersey Brownfield SiteMart (NJSiteMart, 2008); and the State of Pennsylvania Brownfield PA Site Search (PASiteSearch, 2008). Compiling the information resulted in more than several thousand brownfield sites, 6 hydroelectric sites, 47 natural gas sites, 59 other power generating stations (for example, coal, wood, and oil), 8 nuclear sites, and federal (DOE and Department of Defense) sites being considered for redevelopment within the ROI candidate areas that needed to be screened.

The screening process used to identify the potential sites considered discretionary criteria consistent with those identified in ESRP 9.3 (NRC, 2007) and which was used in the process of identifying the candidate areas (that is, distance of a site from population centers, proximity of transmission lines, proximity to suitable source of cooling water). However, identifying potential sites required a more detailed review of available information. The criteria used in screening the candidate areas to identify potential sites include:

- Proximity of a site to either existing 345 kV or 500 kV transmission lines. The closer a site can be located to existing transmission system infrastructure, the fewer environmental impacts are associated with constructing transmission corridors that join the new nuclear facility with the existing transmission system.
- Identifying sites that are located within 20 mi (32 km) of an area with fewer than than 300 ppsm
- Proximity of a site to an existing nuclear power generating facility infrastructure
- Identification of sites near suitable water supply sources (rivers, lakes, and coastal areas)
- Avoidance of areas that contained land use restrictions
- Ownership and/or availability of adequate land area

The screening process also included a consideration of existing site conditions, including whether the site was improved or potentially contained wetlands or floodplains.

Aerial screening was used to identify areas within which potential sites were identified. The screening of the potential sites was conducted as an iterative process by applying refined criteria until an appropriate number of potential sites were identified. The goal of the screening process was to use a logical process that produced a list of the best potential sites located within the candidate areas.

As identified in Figure 9.3-4, the results of the candidate area screening identified potential sites within the ROI that included existing nuclear facilities, PPL Corporation-owned properties (such as coal, gas/oil fired, hydroelectric plants, and greenfield buffer lands), and suitable brownfield/ industrial development sites. (As noted in Section II, a greenfield site is a site that has not been developed for any purpose, although it may lie within the boundaries of a property that has been developed in another area.)

It is noted that an identified potential site (Sandy Bend brownfield site, Mifflin County, Pennsylvania) lies within the defined ROI, but falls just outside the electric delivery company service territories shown on Figure 9.3-1. Because of its location for access to the existing transmission system, the site meets the definition for inclusion in the ROI.

Candidate Sites

Identification of the candidate sites was performed by conducting a technical evaluation of the potential sites using a two-step process. The first step of the process involved identifying criteria to evaluate each of the potential sites. The criteria used to evaluate the potential sites were selected to be appropriate: (1) to the ROI, (2) to the status of the proposed applicant's nuclear power generating facility being a merchant nuclear power generating facility, and (3) to the technology involved with constructing and operating the proposed nuclear facility.

ESRP 9.3 provides the following information about candidate site qualification criteria (NRC, 2007):

- Consumptive use of water should not cause significant adverse effects on other users.
- The proposed action should not jeopardize Federal, State, and affected Native American tribal listed threatened, endangered, or candidates species or result in the destruction or adverse modification of critical habitat.
- There should not be any potential significant impacts to spawning grounds or nursery areas of populations of important aquatic species on Federal, State, and affected Native American tribal lists.

- Discharges of effluents into waterways should be in accordance with Federal, State, regional, local, and affected Native American tribal regulations and would not adversely affect efforts to meet water quality objectives.
- There should be no preemption of or adverse impacts on land specially designated for environmental, recreational, or other special purposes.
- There would not be any potential significant impact on terrestrial and aquatic ecosystems, including wetlands, that are unique to the resource area.
- There are no other significant issues that preclude the use of the site.

The following criteria were used to evaluate and score the potential sites identified in Figure 9.3-4:

- Available land, 420 ac (170 ha): This is an exclusionary criterion based on the availability of the identified site and adjoining available area to support an EPR footprint (240 ac (97 ha)) plus approximately 180 ac (73 ha) of additional land needed for ancillary structures, construction buildings, construction laydown areas and parking areas.
- Distance to cooling water supply was scored based on the distance in miles from the potential site to its closest cooling water supply.
- Flooding data were gathered from Federal Emergency Management Agency (FEMA) maps (FEMA, 2008) and scored based on the site's proximity to 100-year or 500-year floodplains.
- Distance to population centers was scored based on the site's proximity to a population center (defined as a census tract (CT) with more than 300 ppsm (300 persons per 2.6 km^2). The regional population density analysis was based on the population density within a 10 mi (16.1 km) radius of the site, based on data for CTs.
- Wetland data were gathered from National Wetland Inventory (NWI) wetland maps. Each site was evaluated based on the presence or absence of wetlands at or surrounding the site. Site area was defined as an approximate 0.5 mi (0.8 km) radius around site.
- Railroad access was evaluated according to each site's proximity (within 5 mi (8 km)) to an active rail line.
- Transmission access was evaluated according to each site's proximity (within 15 mi (24.1 km)) to a 500 kV transmission line, and the existing transmission corridor was scored based on whether the site has access to any existing transmission connection, including 230 kV, 345 kV, and 500 kV lines. It is noted that the distance to transmission access and existing transmission corridor criteria only refer to direct grid access requirements.
- Ecological evaluations of the sites were based upon the number of state-listed rare, threatened, and endangered species in the county (aquatic and terrestrial). The site was characterized by its location (county) and was then scored according to the county species data (from 0 to over 100 species).
- The need for additional land acquisition also was evaluated for each site. This criterion was based on whether or not additional surrounding land (other than the

minimum land needed for the EPR footprint) would be needed and likely could be acquired for construction laydown areas and the appurtenant structures of the proposed nuclear power generating station. Scoring of this criterion was evaluated based on whether additional land acquisition would be required. The rating was broken down further by characterizing the readily available land surrounding the site as low-density or high-density development.

- An expansion potential criterion was based on the site's availability of additional land to accommodate the potential for the expansion of the plant for a second unit. This criterion was measured by evaluating the amount of land potentially available adjacent to the potential site up to 840 ac (340 ha). This evaluation was conducted by assessing the site and the surrounding land using a radius of approximately 0.9 to 1 mi (1.4 to 1.6 km). A score of 5 indicated that the site and surrounding land was sufficient for expansion potential. A score of 3 indicated that the site's surrounding land was expected to be readily available for sale/purchase such as land described as low-density development (rural, few residences within the 840 ac (340 ha)). A score of 1 indicated that the land would not be readily available for sale/purchase based on the other uses of the land, such as industrial, commercial, major transportation corridors, or high density developments (residential).
- An ownership criterion was based on the site's ownership status. A score of 5 was assigned to any properties currently owned by PPL Corporation or its subsidiaries. A score of 3 was assigned to privately owned properties, such as landfills or other companies not within the power sector. A score of 1 was assigned to competitor-owned properties. A competitor was defined as any company within the power sector (coal, nuclear, hydroelectric) that could be a direct competitor to PPL.
- Environmental remediation was evaluated based upon the site's need for environmental remediation or cleanup of hazardous materials. The purpose of this criterion was to identify remediation that might be necessary at a site so as to preclude the site from being considered for development of a nuclear facility. The sites were characterized based upon their land use and then scored based on if the site would need remediation performed and the type and amount of remediation (for example, landfill - cleanup required; coal/oil or other brownfields - unknown if cleanup is necessary; nuclear or hydroelectric plants - no anticipated cleanup necessary).

The second step of the potential site evaluation involved scoring and ranking each potential site. A team was developed based on their knowledge, skills, and specific areas of expertise to conduct the evaluation, scoring, and ranking of the potential sites. For the evaluation, the team used readily available reconnaissance level information sources, which included publicly available data and images, information available from PPL, files and personnel. Each discretionary criterion was scored based on a point scale of suitability. GIS analysis was performed for the majority of the discretionary criteria, with the exception of ecology (threatened and endangered species), additional land acquisition, and environmental remediation. A preliminary score with amplifying remarks reflecting the overall suitability of each potential site was assigned based on the information collected by the evaluation team members. The scores and remarks developed by the

evaluation team were subsequently challenged and adjusted in a collaborative fashion where necessary. The potential sites were ranked according to their raw scores and average scores. The raw score was based on the sum of all the scores for the site, while the average score was based upon the sum of the scores divided by the number of discretionary criteria available.

The potential site evaluation scoring process was performed as follows: the exclusionary criterion for site size (420 ac (170 ha)) was applied to the list of potential sites and those sites that failed to meet this criterion were not considered for further evaluation. Next, discretionary criteria were applied to the remaining potential sites and the sites were scored and ranked accordingly.

The highest scoring potential sites were:

- Bell Bend greenfield site (BBNPP Site) adjacent to SSES, Luzerne County, Pennsylvania
- Montour greenfield site adjacent to Montour Coal Power Plant (Montour site), Montour County, Pennsylvania
- Martins Creek greenfield site (Martins Creek site), Warren County, New Jersey
- Sandy Bend brownfield site (Sandy Bend site), Mifflin County, Pennsylvania

Based on having the highest scores, these four sites were chosen as candidate sites and are identified on Figure 9.3-5.

The next highest scoring sites consisted of a nuclear power station and brownfield sites. The nuclear site was not considered for further evaluation because the site is owned and operated by a direct competitor to PPL in the energy market. The brownfield sites were not carried forward as candidate sites for further review because the sites were located a distance from a suitable cooling water supply, a transmission corridor was not located on or near the site, the sites were located in areas that have population centers, and the sites do not have suitable acreage for expansion potential.

INSERT FIGURE 9.3.5

REFERENCES WILL BE ADDED AT THE END OF THE SECOND HALF OF THIS SECTION.