

2.9 SOCIAL SERVICES AND PUBLIC FACILITIES

2.9.1 Public Water Supply

Because SSES is in Salem Township (in Luzerne County) and most of the SSES employees reside in Luzerne or Columbia Counties, the discussion of public water supply systems will be limited to Luzerne and Columbia Counties. SSES provides potable water for drinking, pump seal cooling, sanitation, and fire protection through the onsite groundwater well system. Three additional wells provide water to the Energy Information Center, Riverlands Recreation Area, and the West Building (former Emergency Operations Facility) (see Section 3.1.2 for greater detail). SSES does not use municipal water.

Luzerne County

Surface water is the primary source of potable water for the majority of Luzerne County residents. Sources include lakes, rivers, reservoirs, and their tributaries, but not the Susquehanna River. The Susquehanna River is a source for drinking water for residents south of Danville Borough, Montour County, PA (Gavin 2005). Currently, both surface and groundwater sources in the county provide adequate supply for the population. At times, water quality issues have identified in selected surface water bodies and groundwater sources from both point source and non-point source pollution. These issues have included excessive metals concentrations, acid mine drainage, turbidity, excessive sedimentation, sewage contamination, landfill leachate, and excessive volatile chemicals, nitrates/nitrites, pesticides, petroleum products and underground storage tank contamination (PDEP Undated). Although water quality has been an issue at some source locations, most sources and municipal water suppliers are able to provide water yields capable of sustaining both domestic and non-domestic uses.

Table 2.9-1 lists the largest municipal water suppliers (serving greater than 4,500 people) in Luzerne County.

Columbia County

Columbia County has 13 surface water sources and 11 groundwater sources. Water quality issues have been identified in two surface water bodies and some groundwater sources. These include excessive metals concentrations, acid mine drainage, sedimentation, sewage contamination, landfill leachate, and underground storage tank contamination. Columbia County's Comprehensive Plan (Columbia County 1993) states that, although water quality has been an issue in some source locations, most

Gavin, A. 2005. Susquehanna River Information. SSEC.
Personal communication with E.N. Hill, Tebeau Tech NUS
March 29.

sources are able to provide water yields capable of sustaining both domestic and non-domestic uses through 2010 estimates of need.

Table 2.9-2 lists the largest municipal water suppliers (serving greater than 4,500 people) in Columbia County.

Table 2.9-1. Major Luzerne County Public Water Suppliers^a

	Water Supplier ^b	Water Source ^b	Average Production (GPD) ^c	Maximum Production (GPD) ^c	Design Capacity (GPD) ^c
2400054	Freeland Borough Municipal Water Authority ✓	GW	430,438	709,000	1,613,200
2408004	HCA Water System Filter Plant -Hazleton	SW	5,394,000	7,700,000	10,000,000
2409002	Pennsylvania American Water Company -Ceasetown ^d ✓	SW	3,500,000	3,950,000	N/A
2409003	Pennsylvania American Water Company -Crystal Lake ✓	SW	3,420,000	5,000,000	6,000,000
2409013	Pennsylvania American Water Company -Huntsville ^e ✓	SW	N/A	4,500,000	N/A
2409012	Pennsylvania American Water Company -Nesbitt ^e ✓	SW	10,000,000	11,000,000	12,000,000
2409011	Pennsylvania American Water Company -Watres ^d ✓	SW	10,000,000	16,000,000	16,000,000
2400016	United Water Pennsylvania -Dallas ✓	GW	462,000	569,000	1,566,000

GW = Groundwater

SW = Surface water

GPD = Gallons per Day

N/A – Not Applicable or No Information Available.

a. Municipal water suppliers serving populations greater than 4,500.

b. EPA 2004

c. PDEP 2004

d. Ceasetown and Watres are part of the same water system.

e. Huntsville and Nesbitt are part of the same water system.

Table 2.9-2. Major Columbia County Public Water Suppliers^a

Water Supplier ^b	Water Source ^b	Average Production (GPD) ^c	Maximum Production (GPD) ^c	Design Capacity (GPD) ^c
4190013 Pennsylvania American Water Company -Berwick	GW	1,739,000	2,477,000	4,600,000
4190008 United Water Pennsylvania -Bloomsburg	SW	2,581,000	3,479,000	4,147,200 5,760,000

Pump capacity

GW = Groundwater

SW = Surface water

GPD = Gallons per Day

N/A – Not Applicable or No Information Available.

a. Municipal water suppliers serving populations greater than 4,500.

b. EPA 2004

c. PDEP 2004

2.9.2 Transportation

Road access to SSES is via US Route 11, a two-lane paved road with a northeast-southwest orientation (Figures 2.1-2 and 2.1-3). SSES lies to the west of US Route 11 and the Susquehanna River. Approximately four miles north of SSES, US Route 11 intersects with State Route (SR) 239, which travels in a northwest-southeast direction. East of this intersection, SR 239 crosses the Susquehanna River. Several miles south of SSES, US Route 11 intersects with SR 93. East of this intersection, SR 93 crosses the Susquehanna River. East of the intersection of SR 93 and the Susquehanna River, SR 93 intersects SR 339, which has a northeast-southwest orientation. Five to ten miles south of SSES, SRs 93 and 339 intersect with Interstate 80, which has an east-west orientation. Five to ten miles southeast of SSES, Interstate 80 intersects with Interstate 81, which has a northeast-southwest orientation. Employees traveling from the north or northwest of SSES would use SR 239 and US Route 11 to reach the station. Employees traveling from the northeast would use US Route 11. Employees traveling from the south or southwest of SSES could use varying combinations of the following roads to reach the station: Interstate 80, SR 339, SR 93, and US Route 11. Employees traveling from the east and southeast could use SR 239, Interstates 80 and 81, SR 93, and US Route 11. When nearing SSES, all employees must use US Route 11.

Luzerne County

Luzerne County has, in conjunction with Lackawanna County, developed a Long Range Transportation Plan (Lackawanna/Luzerne Counties 2003). The Plan depicts the

existing transportation system, proposed modifications, and future projections for the system in these counties. For the purposes of this report, Luzerne County information only will be the focus of this subsection.

The existing Luzerne County highway system provides local access to Scranton, Wilkes-Barre, Hazleton, and regional access to New York City, Philadelphia, and other major northeast cities. Public transit in the Luzerne County Area is based in the cities of Hazleton and Kingston Borough (with the hub located in Wilkes-Barre). The Luzerne County Transportation Authority and the City of Hazleton manage these systems. The Luzerne County Rail Corporation operates rail services within Luzerne County. Services include freight and limited passenger rail. Airports serving Luzerne County include the Wilkes-Barre/Scranton International Airport, Seaman's Field, the Wyoming Valley Airport, and the Hazleton Airport (Lackawanna/Luzerne Counties 2003).

Luzerne County is host to a diverse highway network. Interstate 80 runs east-west through the southern half of Luzerne County providing direct access east to New Jersey and New York City, less than 100 miles away, and access to Ohio and the western states. Interstate 80 is a four-lane divided highway built to accommodate large volumes of passenger vehicles and motor freight. Oriented north-south are Interstates 81 and 476 (the Pennsylvania Turnpike Northeast Extension). Interstate 81 runs north through Hazleton and Wilkes-Barre into upstate New York and south to Harrisburg and the Maryland border. The Pennsylvania Turnpike Northeast Extension is a direct route from Interstate 80 north to Wilkes-Barre and Scranton terminating at Interstate 81. The Extension provides access to regional centers to the south, including Allentown and Philadelphia. U.S. Route 11 runs northeast-southwest through Wilkes-Barre, connecting it with Harrisburg and New York State (Lackawanna/Luzerne Counties 2003).

Traffic volumes are measured in terms of Average Annual Daily Traffic (AADT), which is an average of daily traffic for every day of the year. In Luzerne County, traffic volumes are highest on the interstate highways such as Interstate 81, Interstate 80, and 476. Heavier traffic volumes are especially concentrated around the cities of Wilkes-Barre and Hazleton (Lackawanna/Luzerne Counties 2003).

Between 1992 and 2001, traffic has grown on all interstate highways in Luzerne County. Between 1992 and 2001, increases in traffic volumes on Interstate 80 have ranged from 24 percent to 110 percent or from 4,550 to over 15,000 AADT (Lackawanna/Luzerne Counties 2003). On some roadway segments, truck traffic has increased at a greater rate than passenger vehicle traffic. Historic traffic volume data have shown that this is the case on sections of Interstate 80 in Luzerne County (Lackawanna/Luzerne Counties

3.0 PROPOSED ACTION

NRC

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

PPL Susquehanna proposes that the NRC renew the operating licenses for SSES for an additional 20 years. Renewal would give PPL Susquehanna and the Commonwealth of Pennsylvania the option of relying on SSES to meet future electricity needs. Section 3.1 discusses the plant in general. Sections 3.2 through 3.4 address potential changes that could occur as a result of license renewal.

3.1 GENERAL PLANT INFORMATION

General information about SSES is available in several documents. In 1981, the U.S. Nuclear Regulatory Commission published the *Final Environmental Statement related to the operation of Susquehanna Steam Electric Station* (NRC 1981). The *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996) describes SSES features and, in accordance with NRC requirements, PPL Susquehanna maintains the Final Safety Analysis Report for SSES (PPL 2005). PPL Susquehanna has referred to each of these documents while preparing this environmental report for license renewal.

3.1.1 REACTOR AND CONTAINMENT SYSTEMS

SSES is a two-unit plant with boiling water reactors (BWR) and generators supplied by General Electric (GE). Bechtel Corporation was the architect-engineer and construction contractor. The original steam turbines supplied by GE were replaced by Siemens-Westinghouse units in 2003 (Unit 2) and 2004 (Unit 1). Commercial operation for SSES Unit 1 began on June 8, 1983 and for Unit 2 on February 12, 1985 (PPL 2005). The rated core thermal power for each unit will be 3,952 megawatts-thermal (MWt). This would increase the potential electrical output of each unit to approximately 1,300 megawatts-electrical (MWe); when NRC approves the Extended Power Uprate (Detamore 2004a, 2004b).

The nuclear steam supply system at SSES is typical of General Electric BWRs. The reactor core produces heat that boils water creating steam which, after drying, is routed to the turbines. The steam yields its energy to the turbines, which are connected to the electrical generator. SSES uses a BWR/4 reactor and a Mark II primary containment (PPL 2005).

The primary containment for each unit consists of a drywell, a steel structure that encloses the reactor vessel and related piping; a pressure suppression chamber containing a large volume of water; and a vent system that connects the drywell to the suppression chamber. The concrete reactor building, which houses the primary containment for both units, serves as a radiation shield and fulfills a secondary containment function.

The reactor fuel is uranium dioxide pellets sealed in Zircalloy-2 tubes. Fuel is enriched to no more than 5 percent, with an average burnup for the peak rod of up to 62,000 megawatt days per metric ton uranium (Fields 2004a).

The containment systems and their engineered safeguards are designed to ensure that offsite doses resulting from postulated accidents are well below the guidelines in 10 CFR 100.

3.1.2 COOLING AND AUXILIARY WATER SYSTEMS

At SSES, the Circulating Water and the Service Water Systems draw from the Susquehanna River and the Cooling Tower blowdown is discharged to the same river, downstream of the intake. Groundwater is withdrawn from five wells for domestic use and for other industrial purposes including seal water for circulating and service water pumps. The following subsections describe water systems at SSES.

3.1.2.1 Surface Water

SSES employs a closed-cycle heat dissipation system designed to remove waste heat from the Circulating Water System which cools the main condensers. The Circulating Water System includes the intake embayment, River Intake Structure, intake pumps, condensers, natural draft Cooling Towers, and an underground discharge pipe with a diffuser in the Susquehanna River. Warm circulating water from the Cooling Towers can be diverted to this intake structure in winter to prevent icing. This deicing system generally operates from November through March. Behind the two entrance chamber openings there is a skimmer wall, a bar screen, trash rack, and traveling screens to prevent large floating debris from clogging the intake.

The makeup water River Intake Structure is located on the west bank of the Susquehanna River (Figure 2.1-3 and 3.1-1). An earthen embankment extends 20 feet above the floodplain to elevation 517.7 feet above mean sea level, which is 1 foot above the maximum water elevation for the postulated Standard Project Flood (NRC 1981).

The intake structure consists of a steel superstructure above the operating floor and a reinforced concrete substructure extending into the rock below the level of the river bottom. The superstructure houses the makeup water pumps and associated equipment, including switchgear, automatic operating equipment for trash-handling screens, motor control centers, screen-wash strainers, and a debris-handling facility. The substructure contains two water entrance chambers (North and South bays) and each houses traveling screens and two pump chambers (NRC 1981).

Liquid effluents (including Cooling Tower blowdown, the spray pond overflow, and other liquid permitted effluents) are discharged to the Susquehanna River through a common discharge structure, approximately 600 feet downstream of the River Intake Structure (Figure 3.1-1). The discharge consists of a buried pipe leading to a submerged discharge structure/diffuser in the Susquehanna River. The diffuser pipe is 200 feet long; the last 120 feet has 72 four-inch portals designed to direct the discharge upward at a 45 degree angle facing downstream. The end of the pipe has a steel plate that can be removed for periodic cleaning of the diffuser (NRC 1981). The treated sewage plant effluent discharges to the Susquehanna River through a concrete outfall structure located between the river intake and discharge structures.

Susquehanna River water is drawn into the two intake bays (North and South) of the River Intake Structure, passes beneath the skimmer wall (in the intake structure) and then through 1 inch on-center vertical bar screens and 3/8-inch mesh traveling screens before entering the basin which houses four intake pumps, each with a pumping capacity of 13,500 gallons per minute (gpm). Prior to future Extended Power Upate (EPU), three of these pumps normally supply the makeup flow of 40,500 gpm and at certain times of the year, the fourth intake pump is rotated into service. EPU will however, increase the amount of time the fourth pump will be used.

The screen-wash system includes a low-pressure wash to release aquatic organisms and debris impinged on the traveling screens. The screen wash system is operated either automatically by differential pressure sensors or by a timer for periodic cleaning. The screen wash water and debris drain to a pit with debris removal equipment that collects material into a dumpster for offsite disposal. After passing through the screens, water is then pumped to the Cooling Tower basins via underground pipes (NRC 1981).

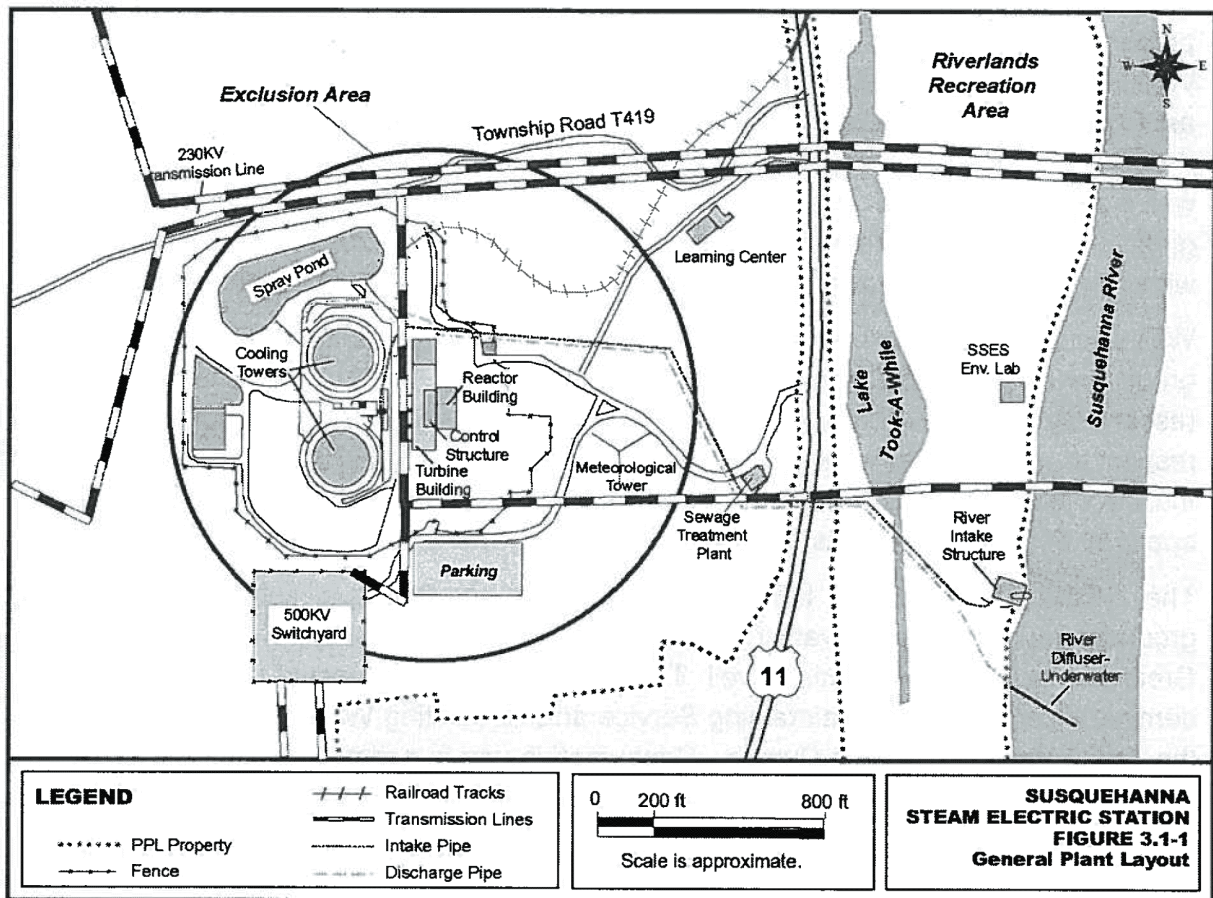
Water is withdrawn from the Cooling Tower basins by the Circulating Water System and is circulated through the main condensers, and returned to the Cooling Towers at the rate of 968,000 gpm (484,000 gpm for each tower). Also, the Service Water System withdraws water from the basins at a rate of approximately 54,000 gpm (27,000 gpm for each tower) for cooling various heat exchangers and equipment and returns the water to the basins (PPL 2005; PPL 2006). Each counterflow natural-draft Cooling Tower is 540 feet tall with a base diameter of 420 feet (NRC 1981). Cooling water evaporated (consumptive use) into the atmosphere is estimated to be 26,800 gpm pre-EPU and is expected to increase to 30,500 gpm at EPU conditions. The remaining water withdrawn from the river is discharged back to the river through the blowdown line. Blowdown is currently discharged at a rate of 10,800 gpm via the underground diffuser system located on the bottom of the Susquehanna River. Blowdown will be increased to about 11,200 gpm with the EPU (NRC 1981; Fields 2005).

Consumptive water use at SSES is regulated by the Susquehanna River Basin Commission (SRBC) in 18 CFR Part 803. Under SRBC's regulations, SSES must compensate for the consumptive use of water from the Susquehanna River. Consumptive use at the SSES is that portion of the water withdrawn from the river that evaporates into the atmosphere mainly through the Circulating Water System's two natural draft Cooling Towers. In 1986 a contract between the SRBC and PP&L provided for SSES's compliance with this requirement through PP&L sharing in the costs of modification and operation by the Army Corps of Engineers of the Cowanesque Lake Reservoir. In 1995 the SRBC issued a docket (Application 19950301) stating that it was approving consumptive use of 40 MGD (monthly average), not to exceed a daily use of 48 MGD at Susquehanna SES. PPL expects that consumptive use at Susquehanna SES will exceed the monthly average stated above by 4 MGD and the daily maximum is estimated to be around 48 MGD after the power uprates described herein are completed. PPL is discussing this matter with the SRBC.

In addition, there is an 8-acre lined concrete spray pond (Figure 3.1-1), containing 25 million gallons of water and it is the station's ultimate heat sink for the Engineered Safeguard Service Water System. This pond provides auxiliary cooling and supplies cooling water for the diesel generators and the Residual Heat Removal Service Water System during unit shutdowns. Makeup water for the spray pond is supplied by the River Water Makeup System (NRC 1981).

Finally, approved water treatment chemicals (e.g., sodium hypochlorite and sodium bromide, non-oxidizing biocides, scale inhibitors, etc.) are injected into the Circulating Water and Service Water Systems to minimize fouling in the pipes and condensers in accordance with NPDES permit requirements (PDEP 2005).

Figure 3.1-1. General Plant Layout



3.1.2.2 Groundwater Resources

SSES has five Public Water Supply (PWS) groundwater wells used for domestic water and for other industrial purposes that do not include condenser cooling: PWS 2400994, Site Water System (TW-1 and TW-2); PWS 2400999, Energy Information Center; PWS 2400995, Riverlands; and PWS 2400938, West Building (former Emergency Operations Facility).

The site's main production wells are TW-1 and TW-2 (PDWS 1989). Well TW-2 is the primary production well for the site's potable and sanitary systems and for plant use. Well TW-1 is 75 feet deep and contained within the same metered water supply system as TW-2, but is rarely used. Well TW-1 can yield 50 gpm (72,000 gallons per day). Well TW-2 is 75 feet deep and can yield 150 gpm (216,000 gpd). The initial average well system withdrawal was between 21 gpm (30,000 gpd) and 31.25 gpm (45,000 gpd). Metered flow data from July 1999 through June 2003 indicate Well TW-2 withdraws groundwater at an average rate of 65.4 gpm (94,000 gpd) (Fields 2004b).

Well system operation began in 1974 at the SSES prior to the SRBC establishing groundwater withdrawal regulations (effective July 13, 1978). The site well system (essentially well TW-2) today withdraws approximately 65.4 gpm (94,000 gpd). With respect to groundwater withdrawals initiated prior to July 13, 1978, any increase of more than 100,000 gpd above the withdrawal amount prior to July 13, 1978 is subject to approval of the SRBC. Thus, at SSES, approval by the SRBC is not required.

The SRBC also requires that any project that results in a consumptive use of groundwater (or surface water) exceeding 20,000 gpd is subject to their approval. Groundwater from production well TW-2 is used for domestic purposes, making demineralized water, for maintaining Service and Circulating Water pump seals, and for the Unit 2 Vacuum Priming Pumps. Consumptive use is estimated to be below 20,000 gpm with most groundwater mixing with surface water and discharged back to the river.

In addition to the site well system there are three nearby wells located at the SSES used for domestic purposes only. Consumptive use combined for all three of these nearby wells is estimated to be well below the SRBC's consumptive use approval requirement of 20,000 gpd. These three wells are:

A well to a depth of 100 feet is located at the Energy Information Center (PDWS 1985a) and produces water for potable and sanitary use for six employees and visitors to the facility. This well is capable of yielding groundwater at a rate of 15 gpm (21,600 gallons per day).

A well installed to a depth of 105 feet is located at the Riverlands Recreational Facility (PDWS 1985b) and provides potable and sanitary water for users of the recreational area from mid-April through October during daylight hours. The water system is not used during cold weather. This well is capable of yielding water at a rate of 30 gpm (43,200 gallons per day).

A fifth well is installed to a depth of 55 feet and is located at the West Building (PDWS 1985c). This well is capable of yielding 30 gpm (43,200 gallons per day). Well-water usage varies at the West Building. Fewer than 10 permanent staff are located at this training facility but as many as 50 individuals can be there when classes are being conducted.

3.1.3 TRANSMISSION FACILITIES

The FESs for construction and operation (AEC 1973; NRC 1981) identified three short 230-kilovolt ties in the vicinity of SSES, one longer 230 kilovolt line (Stanton-Susquehanna #2 line), and two longer 500 kilovolt lines (Sunbury-Susquehanna #2 and Susquehanna-Siegfried) that were built to connect SSES to the electric grid. The three short connections were to provide startup power for SSES from pre-existing 230-kilovolt lines in the immediate vicinity of the plant (Montour and Nanticoke) and to connect the Unit 1 output to the pre-existing 230-kilovolt Susquehanna Switchyard across the Susquehanna River. The Stanton-Susquehanna #2 line was built to 500 kilovolt standards, but was intended to initially operate at 230 kilovolts until Unit 2 became operational. Unit 2 has a new 500 kilovolt switchyard. The construction phase FES also identifies several pre-existing transmission lines that connected to the 230 kilovolt Susquehanna switchyard. These are the Stanton #1, Jenkins, Harwood, and Sunbury #1 lines.

After publication of the operating license FES, several changes were made to the transmission system; namely:

- The 230/500 kilovolt Stanton-Susquehanna #2 line was not changed to operate at 500 kilovolts as planned and remains at 230 kilovolts.
- The Nanticoke line was renamed the Mountain line. Through one of the short 230 kilovolt ties described in the FES, the Mountain line and the Montour line, currently provide power to the T-10 230 kilovolt switchyard, which provides startup power for SSES.

- The Susquehanna-Siegfried line was extended and terminated initially at the Wescosville substation instead of the Siegfried substation. It was ultimately extended to the Alburtis substation and was renamed the Susquehanna-Wescosville-Alburtis 500 kV line.
- A 230-kilovolt E. Palmerton line was constructed to connect to the Susquehanna 230-kilovolt Switchyard (line connects switchyards).

As a result of these system changes, the transmission lines of interest for this report are somewhat different than those described in the FES, as indicated below. Figure 2.1-1 includes the transmission system of interest.

- Short ties in the SSES vicinity – These lines identified in the FES as necessary to connect SSES to the 230-kilovolt electrical system are 2.3 miles long to connect the Montour and Mountain lines to the 230-kilovolt T-10 switchyard, 1.8 miles to connect the Stanton 230/500 kilovolt line to the 230-kilovolt switchyard, and 2.2 miles to connect the Unit 1 main transformer to the 230-kilovolt switchyard across the Susquehanna River. These lines are primarily in areas controlled by SSES and not accessible to the public; however, U.S. Highway 11, Pennsylvania State Highway 239, and other paved roads in the immediate plant vicinity are crossed by the short ties.
- Stanton-Susquehanna #2 230/500 kilovolt Line – Operating at 230 kilovolts, this single circuit runs generally northeast from SSES for approximately 30 miles in a 100- to 400-footwide corridor.
- Susquehanna-Wescosville-Alburtis Line – This 500-kilovolt line connects SSES with the Alburtis substation. It runs generally southeast for approximately 76 circuit miles in a corridor ranging from 100 to 350 feet wide.
- Sunbury-Susquehanna #2 Line – This 500-kilovolt line shares a corridor with the pre-existing Sunbury #1 line and runs west-southwest. The corridor is about 325 feet wide and approximately 44 miles long.

The pre-existing transmission lines are not within the scope of interest because they were not constructed for the specific purpose of connecting SSES to the transmission system. The E. Palmerton line is not included because it is not connected directly to SSES but to a pre-existing substation, and it was not identified in the FES for operation as necessary for connecting SSES to the transmission system.

In total, for the specific purpose of connecting SSES to the transmission system, owned and operated by PPL Electric Utilities has approximately 150 miles of corridor that occupy approximately 3,341 acres. The corridors pass through land that is primarily agricultural or forest land. The areas are mostly remote, with low population densities.

PP&L designed and constructed all SSES transmission lines in accordance with industry standards in effect that were current when the lines were built. Ongoing surveillance and maintenance of SSES-related transmission facilities by PPL Electric Utilities ensures continued conformance to design standards. These maintenance practices are described in Sections 2.4 and 4.13. Section 4.13 examines the conformance of the lines with the National Electrical Safety Code requirements on line clearance to limit shock from induced currents (IEEE 1997).

PPL Electric Utilities plans to maintain these transmission lines, which are integral to the larger transmission system, indefinitely. Except for the short ties, these transmission lines will remain a permanent part of the transmission system even after SSES is decommissioned.

3.2 REFURBISHMENT ACTIVITIES

NRC

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

"... The incremental aging management activities carried out to allow operation of a nuclear power plant beyond the original 40 year license term will be from one of two broad categories: ... and (2) major refurbishment or replacement actions, which usually occur fairly infrequently and possibly only once in the life of the plant for any given item...." NRC 1996

PPL Susquehanna has addressed refurbishment activities in this environmental report in accordance with NRC regulations and complementary information in the NRC GEIS for license renewal (NRC 1996). NRC requirements for the renewal of operating licenses for nuclear power plants include the preparation of an integrated plant assessment (IPA) (10 CFR 54.21). The IPA must identify and list systems, structures, and components subject to an aging management review. Items that are subject to aging and might require refurbishment include, for example, the reactor vessel piping, supports, and pump casings (see 10 CFR 54.21 for details), as well as items that are not subject to periodic replacement.

In turn, NRC regulations for implementing the National Environmental Policy Act require environmental reports to describe in detail and assess the environmental impacts of refurbishment activities such as planned modifications to systems, structures, and components or plant effluents [10 CFR 51.53(c)(2)]. Resource categories to be evaluated for impacts of refurbishment include terrestrial resources, threatened and endangered species, air quality, housing, public utilities and water supply, education, land use, transportation, and historic and archaeological resources.

The GEIS (NRC 1996) provides helpful information on the scope and preparation of refurbishment activities to be evaluated in this environmental report. It describes major refurbishment activities that utilities might perform for license renewal that would necessitate changing administrative control procedures and modifying the facility. The

GEIS analysis assumes that an applicant would begin any major refurbishment work shortly after NRC grants a renewed license and would complete the activities during five outages, including one major outage at the end of the 40th year of operation. The GEIS refers to this as the refurbishment period.

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

The SSES IPA that PPL Susquehanna conducted under 10 CFR 54 has not identified the need to undertake any major refurbishment or replacement actions to maintain the functionality of important systems, structures, and components during the SSES license renewal period, or other facility modifications associated with license renewal that would affect the environment or plant effluents. PPL Susquehanna has included the IPA as part of this application.

3.3 PROGRAMS AND ACTIVITIES FOR MANAGING THE EFFECTS OF AGING

NRC

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

“...The incremental aging management activities carried out to allow operation of a nuclear power plant beyond the original 40 year license term will be from one of two broad categories: (1) SMITTR actions, most of which are repeated at regular intervals” NRC 1996 (SMITTR is defined in NRC 1996 as surveillance, monitoring, inspections, testing, trending, and recordkeeping.)

The IPA required by 10 CFR 54.21 identifies the programs and inspections for managing aging effects at SSES. These programs are described in the Susquehanna Steam Electric Station License Renewal Application, Appendix B, Aging Management Programs and Activities. Other than implementation of the programs and inspections identified in the IPA, there are no planned modifications of SSES administrative control procedures associated with license renewal.

3.4 EMPLOYMENT

Current Workforce

SSES employs a nuclear-related permanent workforce of approximately 1,200 employees and up to an additional 260 contract and matrixed employees; this is within the range of 600 to 800 personnel per reactor unit estimated in the GEIS (NRC 1996). Approximately 89 percent of SSES's permanent employees live in Luzerne or Columbia Counties, Pennsylvania. The remaining 11 percent are distributed across 14 counties in Pennsylvania with numbers ranging from 1 to 37 employees per county. A very small percentage (less than one percent) of the workforce lives outside of Pennsylvania.

The SSES reactors are on 24-month refueling cycles with Units 1 and 2 refueling on alternate years. During refueling outages, site employment increases above the permanent workforce by as many as 1,400 workers for temporary (25 to 30 days) duty.

License Renewal Increment

Performing the license renewal activities would necessitate increasing SSES staff workload by some increment. The size of this increment would be a function of the schedule within which PPL Susquehanna must accomplish the work and the amount of work involved. Having determined that it would not undertake refurbishment (Section 3.2), PPL Susquehanna focused its analysis of license renewal employment increment on programs and activities for managing the effects of aging (Section 3.3).

The GEIS (NRC 1996, Section 2.6.2.7) assumes that NRC would renew a nuclear power plant license for a 20-year period. The GEIS further assumes that the utility would initiate surveillance, monitoring, inspection, testing, trending, and recordkeeping (SMITTR) activities at the time of issuance of the new license and would conduct license renewal SMITTR activities throughout the remaining life of the plant, sometimes during full-power operation, but mostly during normal refueling and the 5- and 10-year in-service refueling outages (NRC 1996).

PPL Susquehanna has determined that the GEIS scheduling assumptions are reasonably representative of SSES incremental license renewal workload scheduling. Many SSES license renewal SMITTR activities would have to be performed during outages. Although some SSES license renewal SMITTR activities would be one-time efforts, others would be recurring periodic activities that would continue for the life of the station.

The GEIS estimates that the most additional personnel needed to perform license renewal SMITTR activities would typically be 60 persons during the 3-month duration of

a 10-year in-service refueling. Having established this upper value for what would be a single event in 20 years, the GEIS uses this number as the expected number of additional permanent workers needed per unit attributable to license renewal. GEIS Section 4.7 uses this approach in order to "...provide a realistic upper bound to potential population-driven impacts..."

PPL Susquehanna expects that existing "surge" capabilities for routine activities, such as outages, will enable PPL Susquehanna to perform the increased SMITTR workload without adding SSES staff. It is estimated that at most, five non-outage employees may be needed. Therefore, PPL Susquehanna has no plans to add more than five non-outage employees to support SSES operations during the license renewal term. However, for the purposes of evaluating work-force related impacts in this environmental report only, PPL Susquehanna is assuming that SSES would require 60 additional permanent workers to perform all license renewal SMITTR activities.

Adding full-time employees to the plant workforce for the license renewal operating term would have the indirect effect of creating additional jobs and related population growth in the community. PPL Susquehanna has used an employment multiplier appropriate to Luzerne and Columbia Counties, Pennsylvania (2.9535) (Watson 2004), to calculate the indirect jobs in service industries that would be supported by the spending of the SSES workforce. The addition of 60 license renewal employees would generate approximately 117 indirect jobs in Luzerne or Columbia Counties. This number was calculated as follows: 60 (additional employees) $\times$ 2.9535 (regional multiplier) = 177 (total employees). Of these, 60 would be direct employees and 117 would be additional jobs created in the community.

3.5 REFERENCES

Note to reader: Some web pages cited in this document are no longer available, or are no longer available through the original URL addresses. Hard copies of cited web pages are available in PPL Susquehanna files. Some sites, for example the census data, cannot be accessed through their given URLs. The only way to access these pages is to follow queries on previous web pages. The complete URLs used by PPL Susquehanna have been given for these pages, even though they may not be directly accessible. Also, all references are specific to respective chapter.

AEC (U.S. Atomic Energy Commission). 1973. *Final Environmental Statement related to the Construction of Susquehanna Steam Electric Station Units 1 and 2*. Pennsylvania Power and Light Company. Docket Nos. 50-387 and 50-388. Directorate of Licensing. Washington D.C. June.

Detamore, M. B. 2004a. PLR-020: Extended Power Uprate (20%) for Susquehanna. Email to J. L. Oliver, Tetra Tech NUS, August 11, 2004.

Detamore, M. B. 2004b. PLR-020: Extended Power Uprate (20%) for Susquehanna. Email to J. L. Oliver, Tetra Tech NUS, August 16, 2004.

Fields, J. S. 2004a. "Transportation of Spent Fuel, enrichment and burnup rate for SSES fuel." Email to J. L. Oliver, Tetra Tech NUS, July 6, 2004.

Fields, J.S. 2004b. "Update Well Water Data." Email to Gary Gunter, Tetra Tech NUS. July 14, 2004.

Fields, J.S. 2005. "PLR-060: Review of TtNUS Responses Draft Environmental Report." Email to J. L. Oliver, Tetra Tech NUS, June 28, 2005.

IEEE (Institute of Electrical and Electronics Engineers). 1997. *National Electric Safety Code*. 1997 Edition. New York, New York.

NRC (U.S. Nuclear Regulatory Commission). 1981. *Final Environmental Statement related to the operation of Susquehanna Steam Electric Station*. Pennsylvania Power and Light Company and Allegheny Electric Cooperative, Inc. Dockets Nos. 50-387 and 50-388. Office of Nuclear Reactor Regulation. Washington, D.C. June.

NRC (U.S. Nuclear Regulatory Commission). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Office of Nuclear Regulatory Research. Washington DC. May.

PDEP (Pennsylvania Department of Environmental Protection). 2005. NPDES Permit No. PA0047325. *Authorization to Discharge under the National Pollutant Discharge Elimination System*. September.

PDWS (Pennsylvania Division of Water Supplies). 1985a. PWS 2400999. Brief Description Form for Energy Information Center Well, December 4, 1985.

PDWS (Pennsylvania Division of Water Supplies). 1985b. PWS 2400995. Brief Description Form for Riverland's Recreation Area Well, December 4, 1985.

PDWS (Pennsylvania Division of Water Supplies). 1985c. PWS 2400938. Brief Description Form for Emergency Operations Facility (West Building) Well, December 4, 1985.

PDWS (Pennsylvania Division of Water Supplies). 1989. PWS 2400994. Brief Description Form for Wells TW-1 and TW-2, February 18, 1989.

PPL. 2005. *Susquehanna Steam Electric Station Final Safety Analysis Report*. Revision 61, September.

SRBC (Susquehanna River Basin Commission). 2004. Cowanesque Reservoir Water Storage Project Information Sheet. SRBC Harrisburg, PA. Available online at http://www.srbc.net/docs/Cowanesque_Storage_project.pdf. Accessed December 16, 2004.

Watson, M. 2004. "RIMS II Multipliers for Luzerne and Columbia Counties, Pennsylvania." U. S. Department of Commerce. Economic and Statistics Administration. Bureau of Economic Analysis. Washington, D.C. Letter to E. N. Hill, TtNUS. August 6.

4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MITIGATING ACTIONS

NRC

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

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

The environmental report shall discuss the "...impact of the proposed action on the environment. Impacts shall be discussed in proportion to their significance...." 10 CFR 51.45(b)(1) as adopted by 10 CFR 51.53(c)(2)

"The information submitted...should not be confined to information supporting the proposed action but should also include adverse information." 10 CFR 51.45(e) as adopted by 10 CFR 51.53(c)(2)

Chapter 4 presents an assessment of the environmental consequences associated with the renewal of the Susquehanna Steam Electric Station (SSES) operating license. The U.S. Nuclear Regulatory Commission (NRC) has identified and analyzed 92 environmental issues that it considers to be associated with nuclear power plant license renewal and has designated the issues as Category 1, Category 2, or NA (not applicable). NRC designated an issue as Category 1 if, based on the result of its analysis, the following criteria were met:

- the environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic;
- a single significance level (i.e., small, moderate, or large) has been assigned to the impacts that would occur at any plant, regardless of which plant is being evaluated (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent-fuel disposal); and
- mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely to be not sufficiently beneficial to warrant implementation.

If the NRC analysis concluded that one or more of the Category 1 criteria could not be met, NRC designated the issue as Category 2. NRC requires plant-specific analyses for Category 2 issues.

Finally, NRC designated two issues as NA, signifying that the categorization and impact definitions do not apply to these issues.

NRC rules do not require analyses of Category 1 issues that NRC resolved using generic findings (10 CFR 51) as described in the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS) (NRC 1996a). An applicant may reference the generic findings or GEIS analyses for Category 1 issues. Attachment A of this report lists the 92 issues and identifies the environmental report section that addresses each issue.

CATEGORY 1 AND NA LICENSE RENEWAL ISSUES

NRC

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

"...[A]bsent new and significant information, the analyses for certain impacts codified by this rulemaking need only be incorporated by reference in an applicant's environmental report for license renewal..." (NRC 1996b, pg. 28483)

PPL Susquehanna has determined that seven of the 69 Category 1 issues do not apply to SSES because they are specific to design or operational features that are not found at the facility. Because PPL Susquehanna is not planning any refurbishment activities, seven additional Category 1 issues related to refurbishment do not apply. Attachment Table A-1 lists the 69 Category 1 issues, indicates whether or not each issue is applicable to SSES, and if inapplicable provides the PPL Susquehanna basis for this determination. Attachment Table A-1 also includes references to supporting analyses in the GEIS where appropriate.

PPL Susquehanna has reviewed the NRC findings at 10 CFR 51 (Table B-1) and has not identified any new and significant information that would make the NRC findings, with respect to Category 1 issues, inapplicable to SSES. Therefore, PPL Susquehanna adopts by reference the NRC findings for these Category 1 issues.

"NA" License Renewal Issues

NRC determined that its categorization and impact-finding definitions did not apply to Issues 60 and 92; however, PPL Susquehanna included these issues in Table A-1. NRC noted that applicants currently do not need to submit information on Issue 60, chronic effects from electromagnetic fields (10 CFR 51). For Issue 92, environmental justice, NRC does not require information from applicants, but noted that it will be addressed in individual license renewal reviews (10 CFR 51). PPL Susquehanna has included environmental justice demographic information in Section 2.6.2.

CATEGORY 2 LICENSE RENEWAL ISSUES

NRC

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

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

NRC designated 21 issues as Category 2. Sections 4.1 through 4.20 (section 4.17 addresses 2 issues) address the Category 2 issues, beginning with a statement of the issue. Six Category 2 issues apply to operational features that SSES does not have. In addition, four Category 2 issues apply only to refurbishment activities. If the issue does not apply to SSES, the section explains the basis for inapplicability.

For the 11 Category 2 issues that PPL Susquehanna has determined to be applicable to SSES, the appropriate sections contain the required analyses. These analyses include conclusions regarding the significance of the impacts relative to the renewal of the operating license for SSES and, if applicable, discuss potential mitigative alternatives to the extent required. PPL Susquehanna has identified the significance of the impacts associated with each issue as either small, moderate, or large, consistent with the criteria that NRC established in 10 CFR 51, Appendix B, Table B-1, Footnote 3 as follows:

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

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

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

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

4.1 WATER USE CONFLICTS (PLANTS WITH COOLING PONDS OR COOLING TOWERS USING MAKEUP WATER FROM A SMALL RIVER WITH LOW FLOW)

NRC

"If the applicant's plant utilizes cooling towers or cooling ponds and withdraws make-up water from a river whose annual flow rate is less than 3.15×10^{12} ft³ / year (9×10^{10} m³/year), an assessment of the impact of the proposed action on the flow of the river and related impacts on instream and riparian ecological communities must be provided. The applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow." 10 CFR 51.53(c)(3)(ii)(A)

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

The NRC made surface water use conflicts a Category 2 issue because consultations with regulatory agencies indicate that water use conflicts are already a concern at two closed-cycle plants and may be a problem in the future at other plants. In the GEIS, NRC notes two factors that may cause water use and availability issues to become important for some nuclear power plants that use Cooling Towers. First, some plants equipped with Cooling Towers are located on small rivers that are susceptible to droughts or competing water uses. Second, consumptive water loss associated with closed-cycle cooling systems may represent a substantial proportion of the flows in small rivers (NRC 1996a, Section 4.3.2.1).

As discussed in Section 3.1.2, SSES has a natural-draft Cooling Tower heat dissipation system. Circulated cooling water lost to Cooling Tower evaporation and blowdown is replaced by make-up water pumped from the Susquehanna River. Based on data from 1961 to 2002, the annual mean flow of the Susquehanna River at SSES is 4.6×10^{11} cubic feet per year (14,586 cfs) (Ecology III 2003), which means that the Susquehanna River meets the NRC definition of a small river. Therefore, this issue does apply to SSES.

With the Extended Power Uprate, SSES will pump river water to be used as make-up water for the Cooling Towers at an average rate of 42,300 gallons per minute (gpm)

(94 cfs) (NRC 1981; Fields 2005). With the Extended Power Uprate, Cooling Tower blowdown is returned to the river via National Pollutant Discharge Elimination System (NPDES) discharge at a rate of approximately 11,200 gpm (25 cfs) (NRC 1981; Fields 2005). A maximum daily total withdrawal of about 43,200 gpm was estimated at a wet bulb temperature of 77°F and a relative humidity of 65% (PPL 2006).

If one assumes a discharge to the Susquehanna River of 11,200 gpm (25 cfs) and an average withdrawal rate of approximately 42,300 gpm (94 cfs), then the net consumptive loss to the Susquehanna River is approximately 31,100 gpm (69 cfs). Consumptive use represents approximately 0.47 percent of the average river flow at SSES over the past 42 years. However, the Susquehanna River Basin has a consumptive water use regulation administered by the SRBC as described in Section 3.1.2 and SSES has met the requirements of this regulation by providing another source of water during low-flow conditions. PPL Susquehanna and SRBC entered into a contract for low-flow augmentation. Negotiations are ongoing with the SRBC for additional low-flow augmentation due to Extended Power Uprate. The increase in discharge from 10,800 gpm to 11,200 gpm should not have any adverse impacts on instream or riparian ecological communities. Using a discharge pipe on the bottom of the river readily disperses blowdown once in the river. Therefore, SSES has determined that this impact is SMALL and does not warrant further mitigation.

4.2 ENTRAINMENT OF FISH AND SHELLFISH IN EARLY LIFE STAGES

NRC

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

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

The issue of entrainment of fish and shellfish in early life stages does not apply to SSES because the station does not utilize once-through cooling or cooling pond heat dissipation systems.

4.3 IMPINGEMENT OF FISH AND SHELLFISH

NRC

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

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

The issue of impingement of fish and shellfish does not apply to SSES because the station does not utilize once-through cooling or cooling pond heat dissipation systems.

4.4 HEAT SHOCK

NRC

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

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

The issue of heat shock does not apply to SSES because the station does not utilize once-through cooling or cooling pond heat dissipation systems.

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

NRC

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

"...Plants that use more than 100 gpm may cause ground-water use conflicts with nearby ground-water users...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 33

NRC made this groundwater use conflict a Category 2 issue because overuse of an aquifer could exceed the natural recharge. Locally, a withdrawal rate of more than 100 gallons per minute (gpm) could create a cone of depression that could extend offsite. This could inhibit the withdrawal capacity of nearby offsite users.

As described in Section 3.1.2.2 (Groundwater Resources), the average groundwater use for Wells TW-1 (even though tied into SSES well water system it does not presently provide water) and TW-2 at SSES from July 1999 to June 2003 was 65.4 gpm. In addition, offsite buildings could use another 5.5 gpm. Therefore, the issue of groundwater use conflicts (plants using more than 100 gpm groundwater) does not apply.

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

NRC

"If the applicant's plant utilizes cooling towers or cooling ponds and withdraws make-up water from a river whose annual flow rate is less than 3.15×10^{12} ft³ / year...[t]he applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow." 10 CFR 51.53(3)(ii)(A)

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

NRC made this groundwater use conflict a Category 2 issue because surface water withdrawals from small rivers could adversely impact aquatic life, downstream users of the small river, and groundwater-aquifer recharge. This is a particular concern during low-flow conditions and could create a cumulative impact due to upstream consumptive use. Cooling Towers and cooling ponds lose flow by evaporation, which is necessary to cool the heated water before it is discharged to the environment.

The issue of groundwater use conflicts applies because SSES withdraws makeup water from a small river, the Susquehanna River, which has an annual flow of 4.6×10^{11} cubic feet per year (14,586 cfs) at the SSES intake location (Ecology III 2003). As discussed in Section 3.1.2, SSES has a natural-draft Cooling Tower heat dissipation system. Circulated cooling water lost to Cooling Tower evaporation is replaced by make-up water pumped from the Susquehanna River.

During low flow (drought) conditions surface water is released from the U.S. Army Corps of Engineers Cowanesque Reservoir in coordination with the SRBC to replace station consumptive use water. As stated in Section 3.1.2, PPL is in compliance with SRBC low flow augmentation regulations.

Given the Susquehanna River flow and the fact that the site area is not located in a recharge area for any aquifer (see Section 2.3), SSES concludes that impacts of withdrawing water from the river on the alluvial aquifer would be SMALL and that mitigation measures would not be warranted. In addition, should increases in groundwater usage occur, procedures are in place via the SRBC regulations to

compensate for this usage and PPL Susquehanna would comply with those requirements.

4.7 GROUNDWATER USE CONFLICTS (PLANTS USING RANNEY WELLS)

NRC

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

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

NRC made this groundwater use conflict a Category 2 issue because large quantities of groundwater withdrawn from Ranney wells could degrade groundwater quality at river sites by induced infiltration of poor-quality river water into an aquifer.

The issue of groundwater use conflicts does not apply to SSES because the plant does not use Ranney wells. As Section 3.1.2 describes, SSES uses a closed cycle cooling system with Cooling Towers that removes make-up water from the Susquehanna River and discharges blowdown to the Susquehanna River.

4.8 **DEGRADATION OF GROUNDWATER QUALITY**

NRC

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

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

NRC made degradation of groundwater quality a Category 2 issue because evaporation from closed-cycle cooling ponds concentrates dissolved solids in the water and settles suspended solids. In turn, seepage into the water table aquifer could degrade groundwater quality.

The issue of groundwater degradation does not apply to SSES because the plant does not use cooling ponds. As Section 3.1.2 describes, SSES uses a closed cycle cooling system with Cooling Towers that withdraws make-up water from the Susquehanna River and discharges blowdown to the Susquehanna River.

4.9 IMPACTS OF REFURBISHMENT ON TERRESTRIAL RESOURCES

NRC

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

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

"...If no important resources would be affected, the impacts would be considered minor and of small significance. If important resources could be affected by refurbishment activities, the impacts would be potentially significant..." NRC 1996a

NRC made impacts to terrestrial resources from refurbishment a Category 2 issue, because the significance of ecological impacts cannot be determined without considering site- and project-specific details (NRC 1996a). Aspects of the site and project to be ascertained are: (1) the identification of important ecological resources, (2) the nature of refurbishment activities, and (3) the extent of impacts to plant and animal habitats.

The issue of impacts of refurbishment on terrestrial resources is not applicable to SSES because, as discussed in Section 3.2, PPL Susquehanna has no plans for refurbishment or other license-renewal-related construction activities at SSES.

4.10 THREATENED OR ENDANGERED SPECIES

NRC

"Additionally, the applicant shall assess the impact of the proposed action on threatened or endangered species in accordance with the Endangered Species Act." 10 CFR 51.53(c)(3)(ii)(E)

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

NRC made impacts to threatened and endangered species a Category 2 issue because the status of many species is being reviewed, and site-specific assessment is required to determine whether any identified species could be affected by refurbishment activities or continued plant operations through the renewal period. In addition, compliance with the Endangered Species Act requires consultation with the appropriate federal agency (NRC 1996a, Sections 3.9 and 4.1).

Section 2.2 of this Environmental Report describes the aquatic communities of the Susquehanna River. Section 2.4 describes important terrestrial habitats at SSES and along the associated transmission corridors. Section 2.5 discusses threatened or endangered species that may occur in the vicinity of SSES or its associated transmission corridors.

Except as discussed in Section 2.5, PPL Susquehanna is not aware of any threatened or endangered species that could occur at SSES or along the associated transmission corridors. Current operation of SSES and vegetation management practices along the transmission line rights-of-way do not adversely affect any listed species or its habitat (see Section 2.5). Furthermore, plant operations and transmission line maintenance practices are not expected to change significantly during the license renewal term. Therefore, no adverse impacts to threatened or endangered terrestrial species from current or future operations are anticipated.

PPL Susquehanna wrote the Pennsylvania Department of Conservation and Natural Resources, the Pennsylvania Game Commission, the Pennsylvania Fish and Boat Commission, and the U.S. Fish and Wildlife Service requesting information on any listed

species or critical habitats that might occur on the SSES site or along the associated transmission corridors, with particular emphasis on species that might be adversely affected by continued operation over the license renewal period. Agency responses are provided in Attachment B and indicate that license renewal is unlikely to affect any listed species.

As discussed in Section 3.2, PPL Susquehanna has no plans to conduct refurbishment activities at SSES during the license renewal term. Therefore, there would be no refurbishment-related impacts to special-status species and no further analysis of refurbishment-related impacts is applicable. Furthermore, because PPL Susquehanna has no plans to alter current operations, and resource agencies contacted by PPL Susquehanna evidenced no serious concerns about license renewal impacts, PPL Susquehanna concludes that impacts to threatened or endangered species from license renewal would be SMALL and do not warrant mitigation. License renewal of SSES is not expected to result in taking of any threatened or endangered species. Renewal of licenses is not likely to jeopardize the continued existence for any threatened or endangered species or result in the destruction or adverse modifications of any critical habitat.

4.11 AIR QUALITY DURING REFURBISHMENT (NON-ATTAINMENT AREAS)

NRC

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

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

NRC made impacts to air quality during refurbishment a Category 2 issue because vehicle exhaust emissions could be cause for some concern, and a general conclusion about the significance of the potential impact could not be drawn without considering the compliance status of each site and the number of workers expected to be employed during an outage (NRC 1996a). Information needed would include: (1) the attainment status of the plant-site area, and (2) the number of additional vehicles as a result of refurbishment activities.

Air quality during refurbishment is not applicable to SSES because, as discussed in Section 3.2, PPL Susquehanna has no plans for refurbishment at SSES.

4.12 MICROBIOLOGICAL ORGANISMS

NRC

"If the applicant's plant uses a cooling pond, lake, or canal or discharges into a river having an annual average flowrate of less than 3.15×10^{12} ft³/year (9×10^{10} m³/year), an assessment of the impact of the proposed action on public health from thermophilic organisms in the affected water must be provided." 10 CFR 51.53(c)(3)(ii)(G)

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

Due to the lack of sufficient data from facilities using cooling ponds, lakes, or canals or discharging to small rivers, NRC designated impacts on public health from thermophilic organisms a Category 2 issue. Information to be determined is: (1) whether the plant discharges to a small river, and (2) whether discharge characteristics (particularly temperature) are favorable to the survival of thermophilic organisms.

This issue is applicable to SSES because the plant discharges to the Susquehanna River, which has an average flow rate of 4.25×10^{11} to 4.83×10^{11} cubic feet per year at U.S. Geological Survey gaging stations up- and downstream of the station (USGS 2004). It is also relevant because the Susquehanna River in the vicinity of SSES is used by the public for recreation, including boating and fishing.

Organisms of concern include the enteric pathogens *Salmonella* and *Shigella*, the *Pseudomonas aeruginosa* bacterium, thermophilic Actinomycetes ("fungi"), the many species of *Legionella* bacteria, and pathogenic strains of the free-living *Naegleria* amoeba.

Bacteria pathogenic to humans have evolved to survive in the digestive tracts of mammals and accordingly have optimum temperatures of around 99°F (Joklik and Smith 1972, pg. 65). Many of these pathogenic microorganisms (e.g., *Pseudomonas*, *Salmonella*, and *Shigella*) are ubiquitous in nature, occurring in the digestive tracts of wild mammals and birds (and thus in natural waters), but are usually only a problem when the host is immunologically compromised. Thermophilic bacteria generally occur at temperatures from 77°F to 176°F, with maximum growth at 122°F to 140°F (Joklik and Smith 1972).

SSES uses two natural draft Cooling Towers to transfer waste heat from the Circulating Water System which cools the main condensers to the atmosphere (see Section 3.1.2 for detailed description of condenser cooling system). Thermal modeling conducted for the FES for operation of SSES indicated that outside of a small (less than one acre) mixing zone, the station's discharge would have a modest (0.5 to 2.0°F) effect on downstream river temperature in summer (NRC 1981, Table 4.1). The SSES NPDES permit does not require monitoring of blowdown or discharge temperatures, but temperatures measured at the Bell Bend monitoring station immediately downstream of the station's discharge to the Susquehanna River are typically indistinguishable from those measured upstream of the plant's intake. The highest temperatures at the station upstream of the plants intake (site SSES) were 21°C (69.8°F) in 2000 (August 24), 26°C (78.8°F) in 2001 (August 16), 25°C (77°F) in 2002 (June 26), 3.5°C (74.3°F) in 2003 (August 27), and 22.5°C (72.5°F) in 2004 (June 24) (Ecology III 2001, 2002, 2003, 2004, 2005). The highest temperature measured over the same period at the Bell Bend monitoring station, which is downstream of SSES, was 26°C (78.8°F).

Water at these temperatures could, in theory, allow limited survival of thermophilic microorganisms, but are well below the optimal temperature range for growth and reproduction of thermophilic microorganisms.

Another factor controlling the survival and growth of thermophilic microorganisms in the Susquehanna River is the disinfection of SSES sewage treatment plant effluent. This reduces the likelihood that a seed source or inoculant will be introduced into the Susquehanna River via the SSES discharge. Wastewater, whether from domestic sewage or industrial sources, is frequently a source of pathogens in natural waters.

Fecal coliform bacteria are regarded as indicators of other pathogenic microorganisms, and are the organisms normally monitored by state health agencies. The present NPDES permit for SSES requires monitoring of fecal coliforms in sewage treatment plant effluent. Samples are collected once per month for fecal coliform analysis and other parameters. The SSES NPDES permit calls for "effective disinfection" to control disease-producing organisms during the swimming season (May 1 through September 30) and imposes a limit of 200 fecal coliform cells (geometric average value) per 100 ml sample. The NPDES permit also stipulates that no more than 10 percent of samples tested may contain 1,000 cells.

Given the thermal characteristics of the Susquehanna River at the SSES thermal discharge and disinfection of sewage treatment plant effluent, PPL Susquehanna does not expect station operations to stimulate growth or reproduction of thermophilic microorganisms.

PP&L collected samples of water (from condenser cooling systems), sludge (from condensers and Cooling Tower basins), and air (from inside Cooling Towers) from six power generating stations and a steam heating plant in 1980 and tested them for free-living amoebas and *Legionella* bacteria (Fields 1982). A sample from the condenser at a (fossil-fueled) plant contained significant concentrations of *Naegleria fowleri*, and several generating stations (not SSES) had small concentrations of *Naegleria* that may or may not have been pathogenic forms. *Legionella pneumophila* was found in all condenser cooling systems sampled except SSES Unit 1. Concentrations of *Legionella* were similar to those found in nature. As a result of these surveys, PP&L distributed information to its employees regarding possible health effects of thermophilic pathogens in cooling water systems and instituted a number of requirements and procedures related to safe practices and safety equipment in areas that could harbor pathogens.

PPL Susquehanna has written the Bureau of Water Supply Management of the Pennsylvania Department of Environmental Protection (DEP), requesting information on any studies that may have been conducted on thermophilic microorganisms in the Susquehanna River and any concerns Pennsylvania DEP may have relative to these organisms. Copies of the correspondence are included in Attachment C of this environmental report. PPL Susquehanna is not aware of reported cases of illness caused by *Naegleria* or *Legionella* at, in the vicinity, or downstream of the plant. Therefore, PPL Susquehanna concludes that the impact of thermophilic organisms is SMALL and does not warrant mitigation, particularly since there is no known swimming in the area.

4.13 ELECTRIC SHOCK FROM TRANSMISSION-LINE-INDUCED CURRENTS

NRC

The environmental report must contain an assessment of the impact of the proposed action on the potential shock hazard from transmission lines "...[i]f the applicant's transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the National Electric Safety Code for preventing electric shock from induced currents..." 10 CFR 51.53(c)(3)(ii)(H)

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

NRC made impacts of electric shock from transmission lines a Category 2 issue because, without a review of each plant's transmission line conformance with the National Electrical Safety Code (NESC) criteria (IEEE 1997), NRC could not determine the significance of the electric shock potential.

In the case of SSES, PPL Susquehanna reported a generic induced current analysis for the 500 kilovolt lines in Amendments 4 and 5 of the original licensing environmental report (PP&L undated; PP&L 1976). The results of these analyses were used by NRC in the Final Environmental Statement for operation (NRC 1981). In its environmental report amendments, PP&L committed to designing and constructing the 500-kilovolt lines to meet the induced current requirements of the NESC. Indeed, the subsequent construction drawings reference the FES regarding line clearance specifications. However, these analyses were performed for a generic 500-kilovolt line, and the truck size assumed was much smaller than might be expected on highways today. Additionally, there was no induced current analysis of the short 230-kilovolt connections near the plant. Therefore, this section provides an analysis of the PPL Electric Utilities' transmission lines' conformance with the NESC standard. The analysis is based on computer modeling of induced current under the line.

Objects located near transmission lines can become electrically charged due to their immersion in the lines' electric field. This charge results in a current that flows through

the object to the ground. The current is called “induced” because there is no direct connection between the line and the object. The induced current can also flow to the ground through the body of a person who touches the object. An object that is insulated from the ground can actually store an electrical charge, becoming what is called “capacitively charged.” A person standing on the ground and touching a vehicle or a fence receives an electrical shock due to the sudden discharge of the capacitive charge through the person’s body to the ground. After the initial discharge, a steady-state current can develop, the magnitude of which depends on several factors, including the following:

- the strength of the electric field which, in turn, depends on the voltage of the transmission line as well as its height and geometry
- the size of the object on the ground
- the extent to which the object is grounded.

In 1977, the NESC adopted a provision that describes how to establish minimum vertical clearances to the ground for electric lines having voltages exceeding 98-kilovolt alternating current to ground.¹ The clearance must limit the induced current² due to electrostatic effects to 5 milliamperes if the largest anticipated truck, vehicle, or equipment were short-circuited to ground. By way of comparison, the setting of ground fault circuit interrupters used in residential wiring (special breakers for outside circuits or those with outlets around water pipes) is 4 to 6 milliamperes.

As described in Section 3.1.3, there are two 500-kilovolt lines, one 230-kilovolt line designed to 500-kilovolt standards, and three short 230-kilovolt connections specifically constructed to distribute power from SSES to the electric grid. PPL Susquehanna’s analysis of these transmission lines began by identifying all road crossing and selecting the lowest clearance locations for analysis. These limiting cases represent locations along the line where the potential for current-induced shock would be greatest. Once the limiting cases were identified, PPL Susquehanna calculated the electric field strength for the transmission line at that location, then calculated the induced current. Had the limiting cases’ induced current exceeded the NESC limit, additional analyses would have been performed to identify all locations with potential to exceed the limit.

PPL Susquehanna calculated electric field strength and induced current using a computer code called ACDCLINE, produced by the Electric Power Research Institute. The results of this computer program have been field-verified through actual electric

¹ Part 2, Rules 232C1c and 232D3c.

² The NESC and the GEIS use the phrase “steady-state current,” whereas 10 CFR 51.53(c)(3)(ii)(H) uses the phrase “induced current.” The phrases mean the same here.

field measurements by several utilities. The input parameters included design features of the limiting-case scenario and the NESC requirement that line sag be determined at 120°F conductor temperature. For analysis purposes, the maximum vehicle size under the lines is considered to be a tractor-trailer of 8 feet wide, 12 feet average height, and 65 feet long.

The analysis determined that there are no locations under the transmission line that have the capacity to induce more than 5 milliamperes in a vehicle parked beneath the line (TtNUS 2004). The analytical results for each line's limiting case are presented in Table 4.13-1.

PPL Electric Utilities and other owners and operators of the transmission lines conduct surveillance and maintenance to assure that design ground clearances will not change. These procedures include routine inspection by aircraft on a regular basis. The aerial patrols of all corridors include checks for encroachments, broken conductors, broken or leaning structures, and signs of burnt trees, any of which would be evidence of clearance problems. Ground inspections include examination for clearance at questionable locations, integrity of structures, and surveillance for dead or diseased trees that might fall on the transmission line. Problems noted during any inspection are brought to the attention of the appropriate organizations for corrective action.

PPL Susquehanna's assessment under 10 CFR 51 concludes that electric shock is of SMALL significance for the SSES transmission lines because the magnitude of the induced currents do not exceed the NESC standard. Mitigation measures are not warranted because there is adequate clearance between energized conductors and the ground. PPL Susquehanna's conclusions on this issue would remain valid into the future, provided there are no changes in line use, voltage, and maintenance practices and no changes in land use under the line.

Table 4.13-1. Results of Induced Current Analysis.

Transmission Line	Voltage (kV)	Limiting Case Induced Current (milliamperes)
Susquehanna-Wescosville-Alburtis	500	3.7
Sunbury- Susquehanna #2	500	3.1
Stanton- Susquehanna #2	230 ¹	3.8
Short connections near plant	230	3.8

1. This transmission line was designed to operate at 500 kilovolts, but it has always operated at 230 kilovolts. The analysis was performed for 500-kilovolt operation.

4.14 HOUSING IMPACTS

NRC

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

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

"...[S]mall impacts result when no discernible change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and no housing construction or conversion occurs...." (NRC 1996a, Section 4.7.1.1, pp. 4-101 to 4-102)

NRC made housing impacts a Category 2 issue, because impact magnitude depends on local conditions that the NRC could not predict for all plants at the time of GEIS publication (NRC 1996a). Local conditions that need to be ascertained are: (1) population categorization as small, medium, or high, and (2) applicability of growth control measures.

Refurbishment activities and continued operations could result in housing impacts as a result of increased staffing. As described in Section 3.2, PPL Susquehanna has identified no refurbishment-related activities required for extended operations. PPL Susquehanna concludes that there would be no refurbishment-related impacts to area housing and no analysis is therefore required. The following discussion focuses on impacts of continued operations on local housing availability, and the assumption that SSES would add up to 60 additional license-term employees. As described in Section 3.4, this assumption is for purposes of analysis only.

As described in Section 2.6, SSES is located in a high population area. As noted in Section 2.8, the area of interest is not subject to growth control measures that limit housing development. In 10 CFR 51, Subpart A, Appendix B, Table B-1, NRC concluded that impacts to housing are expected to be of small significance at plants located in "high" population areas where growth control measures are not in effect. Therefore, PPL Susquehanna expects housing impacts to be small.

This conclusion is supported by the following site-specific housing analysis. The maximum impact to area housing is calculated using the following assumptions: (1) all direct and indirect jobs would be filled by in-migrating residents; (2) the residential distribution of new residents would be similar to current worker distribution; and (3) each new job created (direct and indirect) represents one housing unit. As described in Section 3.4, PPL Susquehanna estimate of 60 license renewal employees could generate the demand for 177 housing units (60 direct and 117 indirect jobs). In an area which has a population within a 50-mile radius of 1,684,794 and an average of 2.42 persons per household (USCB 2000), suggesting the existence of approximately 696,196 housing units, it is reasonable to conclude that this demand would not create a discernible change in housing availability, rental rates or housing values, or spur housing construction or conversion. PPL Susquehanna concludes that impacts to housing availability resulting from station-related population growth would be SMALL and would not warrant mitigation.

4.15 PUBLIC UTILITIES: PUBLIC WATER SUPPLY AVAILABILITY

NRC

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

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

"Impacts on public utility services are considered small if little or no change occurs in the ability to respond to the level of demand and thus there is no need to add capital facilities. Impacts are considered moderate if overtaxing of facilities during peak demand periods occurs. Impacts are considered large if existing service levels (such as quality of water and sewage treatment) are substantially degraded and additional capacity is needed to meet ongoing demands for services." (NRC 1996a, Section 3.7.4.5, pg. 3-19)

NRC made public utility impacts a Category 2 issue because an increased problem with water availability, resulting from pre-existing water shortages, could occur in conjunction with plant demand and plant-related population growth (NRC 1996a). Local information needed includes: (1) a description of water shortages experienced in the area, and (2) an assessment of the public water supply system's available capacity.

NRC's analysis of impacts to the public water supply system considered both plant demand and plant-related population growth demands on local water resources. As Section 3.4 indicates, PPL Susquehanna analyzes a 60-person increase in SSES employment attributable to license renewal. Section 2.6 describes the SSES regional demography. Section 2.9.1 describes the public water supply systems in the area, their permitted capacities, and current demands. As discussed in Section 3.2, no refurbishment is planned for SSES and refurbishment impacts are therefore not expected. Accordingly, the following discussion focuses on impacts of continued operations on local public utilities, and the assumption that SSES would add up to 60 additional license-term employees.

SSES does not use water from a municipal system and plant groundwater usage during the renewed license period of operations would be considered small (Section 4.5).

Further, no increase in plant demand is projected. Therefore, PPL Susquehanna does not expect SSES operations to have an effect on local water supplies.

The impact to the local water supply systems from plant-related population growth can be determined by calculating the amount of water that would be required by these individuals. The average American uses about 90 gallons per day for personal use (EPA 2003). As described in Section 3.4, SSES's estimate of 60 license renewal employees could generate a total of 177 new jobs, which could result in a population increase of 428 in the area (177 jobs multiplied by 2.42, which is the average number of persons per household in the area [USCB 2000]). Using this consumption rate, the plant-related population increase could require an additional 38,520 gallons per day (428 people multiplied by 90 gallons per day) in an area where the excess public water supply capacity is approximately 2.9 million gallons per day from the Columbia County suppliers alone and 2.2 million gallons per day for Luzerne County suppliers. Of the 10 major water suppliers in Luzerne and Columbia Counties, there is none for which demand exceeds supply. If it is assumed that this increase in population is distributed across Luzerne and Columbia Counties, consistent with current employee trends, the increase in water demand would not create shortages in capacity of the water supply systems in these communities. (See Section 2.9.1 for a discussion of these systems). PPL Susquehanna concludes that impacts resulting from plant-related population growth to public water supplies would be SMALL, requiring no additional capacity and not warranting mitigation.

4.16 EDUCATION IMPACTS FROM REFURBISHMENT

NRC

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

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

"...[S]mall impacts are associated with project-related enrollment increases of 3 percent or less. Impacts are considered small if there is no change in the school systems' abilities to provide educational services and if no additional teaching staff or classroom space is needed. Moderate impacts are associated with 4 to 8 percent increases in enrollment, and if a school system must increase its teaching staff or classroom space even slightly to preserve its pre-project level of service.... Large impacts are associated with enrollment increases greater than 8 percent...." NRC 1996a, Section 3.7.4.1

NRC made refurbishment-related impacts to education a Category 2 issue because site- and project-specific factors determine the significance of impacts (NRC 1996a). Local factors to be ascertained include: (1) project-related enrollment increases and (2) status of the student/teacher ratio.

The issue of impacts to the local education system due to refurbishment is not applicable to SSES because, as Section 3.2 discusses, PPL Susquehanna has identified no refurbishment needs at SSES.

4.17 OFFSITE LAND USE

4.17.1 Offsite Land Use - Refurbishment

NRC

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

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

"...[I]f plant-related population growth is less than 5 percent of the study area's total population, off-site land-use changes would be small, especially if the study area has established patterns of residential and commercial development, a population density of at least 60 persons per square mile, and at least one urban area with a population of 100,000 or more within 50 miles...." (NRC 1996a, Section 3.7.5)

This issue is not applicable to SSES because, as Section 3.2 discusses, PPL Susquehanna has no plans for refurbishment at SSES.

4.17.2 Offsite Land Use – License Renewal Term

NRC

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

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

"...[I]f plant-related population growth is less than five percent of the study area's total population, off-site land-use changes would be small..." (NRC 1996a, Section 3.7.5)

"If the plant's tax payments are projected to be small, relative to the community's total revenue, new tax-driven land-use changes during the plant's license renewal term would be small, especially where the community has pre-established patterns of development and has provided adequate public services to support and guide development." (NRC 1996a, Section 4.7.4.1)

NRC made impacts to offsite land use during the license renewal term a Category 2 issue because land-use changes may be perceived as beneficial by some community members and adverse by others. Therefore, NRC could not assess the potential significance of site-specific offsite land-use impacts (NRC 1996a, Section 4.7.4.1). Site-specific factors to be considered in an assessment of new tax-driven land-use impacts include: (1) the size of plant-related population growth compared to the area's total population, (2) the size of the plant's tax payments relative to the community's total revenue, (3) the nature of the community's existing land-use pattern, and (4) the extent to which the community already has public services in place to support and guide development.

The GEIS presents an analysis of offsite land use for the renewal term that is characterized by two components: population-driven and tax-driven impacts (NRC 1996a).

Population-Related Impacts

Based on the GEIS case-study analysis, NRC concluded that all new population-driven land-use changes during the license renewal term at all nuclear plants would be small.

Population growth caused by license renewal would represent a much smaller percentage of the local area's total population than the percentage presented by operations-related growth (NRC 1996a).

Tax-Revenue-Related Impacts

NRC has determined that the significance of tax payments as a source of local government revenue would be large if the payments are greater than 20 percent of revenue, moderate if the payments are between 10 and 20 percent of revenue, and small if the payments are less than 10 percent of revenue (NRC 1996a).

NRC defined the magnitude of land-use changes as follows (NRC 1996a):

SMALL - very little new development and minimal changes to an area's land-use pattern.

MODERATE - considerable new development and some changes to land-use pattern.

LARGE - large-scale new development and major changes in land-use pattern.

NRC further determined that, if a plant's tax payments are projected to be small relative to the community's total revenue, new tax-driven land-use changes would be small, especially where the community has pre-established patterns of development and has provided adequate public services to support and guide development.

Table 2.7-1 provides a comparison of total tax payments made by SSES to Luzerne County and the Berwick Area School District, Luzerne County's annual property tax revenues, and the Berwick Area School District's annual revenues. For the five-year period from 2000 through 2004, SSES's tax payments to Luzerne County represented between 1.8 and 2.4 percent of the County's total annual property tax revenues. Using NRC's criteria, SSES's tax payments are of small significance to Luzerne County. For the five-year period from 2000 through 2004, SSES's tax payments to the Berwick Area School District represented approximately 5.5 to 6.9 percent of the School District's total revenues. Using NRC's criteria, SSES's tax payments are of small significance to the Berwick Area School District. For the period 2001 through 2004, SSES's tax payments to Salem Township represented 50.3 to 53.9 percent of the township's total revenues. However, the population and land use in Salem Township has not changed significantly during this period, indicating that the tax revenues are not leading to land use impacts. Discontinuing the current level of tax revenues on the other hand would likely have a significant adverse economic impact on the jurisdiction. Using NRC's criteria, SSES's tax payments are of large significance to the township.

Neither Luzerne nor Columbia Counties have growth control measures and planners suggest that, if needed, remediating constrained land would offer additional space for potential growth.

As described in Section 3.2, PPL Susquehanna does not anticipate refurbishment or license renewal-related construction during the license renewal period. Therefore, PPL Susquehanna does not anticipate any increase in the assessed value of SSES due to refurbishment-related improvements, or any related tax-increase-driven changes to offsite land-use and development patterns.

PPL Susquehanna concludes that the land-use impact would be SMALL and therefore, mitigation is not warranted.

4.18 TRANSPORTATION

NRC

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

"...Transportation impacts...are generally expected to be of small significance. However, the increase in traffic associated with additional workers and the local road and traffic control conditions may lead to impacts of moderate or large significance at some sites...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 70

Small impacts would be associated with U.S. Transportation Research Board Level of Service A, having the following condition: "...Free flow of the traffic stream; users are unaffected by the presence of others." and Level of Service B, having the following condition: "...Stable flow in which the freedom to select speed is unaffected but the freedom to maneuver is slightly diminished...." (NRC 1996a, Section 3.7.4.2)

NRC made impacts to transportation a Category 2 issue, because impact significance is determined primarily by road conditions existing at the time of license renewal, which NRC could not forecast for all facilities (NRC 1996a). Local road conditions to be ascertained are: (1) level of service conditions, and (2) incremental increases in traffic associated with refurbishment activities and license renewal staff.

As described in Section 3.2, no major refurbishment is planned and no refurbishment impacts to local transportation are therefore anticipated. Accordingly, the following discussion focuses on impacts of continued operations on transportation, and the assumption that SSES would add up to 60 additional license-term employees.

PPL Susquehanna workforce includes approximately 1,200 permanent and 260 contract employees. On a 24-month cycle (Units 1 and 2 refueling on alternate years), as many as 1,400 additional workers join the permanent workforce during the refueling outages with concomitant increases in traffic on the local roads. PPL Susquehanna projection of 60 additional employees associated with license renewal for SSES represents a 5 percent increase in the current number of permanent employees and an even smaller percentage of employee's present onsite during refueling outages. Given these employment projections and the average number of vehicles per day currently using the

roads surrounding SSES, PPL Susquehanna concludes that impacts to transportation would be SMALL and mitigation would not be warranted.

4.19 HISTORIC AND ARCHAEOLOGICAL RESOURCES

NRC

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

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

"Sites are considered to have small impacts to historic and archaeological resources if (1) the State Historic Preservation Officer (SHPO) identifies no significant resources on or near the site; or (2) the SHPO identifies (or has previously identified) significant historic resources but determines they would not be affected by plant refurbishment, transmission lines, and license-renewal term operations and there are no complaints from the affected public about altered historic character; and (3) if the conditions associated with moderate impacts do not occur." (NRC 1996a, Section 3.7.7)

NRC made impacts to historic and archaeological resources a Category 2 issue, because determinations of impacts to historic and archaeological resources are site-specific in nature and the National Historic Preservation Act mandates that impacts must be determined through consultation with the State Historic Preservation Officer (NRC 1996a).

In the construction FES, the AEC concluded that the construction of the SSES would have no effect on any national historical landmarks and reported that Mr. Ira F. Smith, Archeologist at the William Penn Museum, and Mr. William J. Wewer, Executive Director of the Pennsylvania Historical and Museum Commission and State Liaison Officer for Historical Preservation, stated that the SSES project would not adversely impact any known archaeological or historical resources of value (AEC 1973).

In the FES for operation of the SSES, the NRC concluded that direct impacts of the Station's operation on cultural resource sites would be expected to be minimal if known prehistoric sites were protected by a well-designed mitigation/avoidance program, and if

care was exercised to recognize and protect cultural resources discovered during operational activities involving disruption of topsoil or vegetation (NRC 1981). PPL Susquehanna Environmental Inspection Plan (CH-ER-314) requires annual inspections of identified archaeological sites to ensure they remain undisturbed.

As discussed in Section 3.2, PPL Susquehanna has no refurbishment plans and no refurbishment-related impacts are anticipated. PPL Susquehanna is not aware of any additional historic or archaeological resources that have been affected, to date, by SSES operations, including the operation and maintenance of transmission lines. Because PPL Susquehanna has no plans to construct additional facilities at SSES during the license renewal term and because PPL Susquehanna maintains land disturbing standard operating procedures, PPL Susquehanna concludes that operation of these generation and transmission facilities over the license renewal term would not impact cultural resources; hence, mitigation would not be warranted. This conclusion is consistent with results of the correspondence between PPL Susquehanna and the Pennsylvania Historical and Museum Commission, Bureau for Historic Preservation Office (See Attachment D).

4.20 SEVERE ACCIDENT MITIGATION ALTERNATIVES (SAMA)

NRC

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

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

Section 4.20 summarizes PPL Susquehanna's analysis of alternative ways to mitigate the impacts of severe accidents. Attachment E provides a detailed description of the severe accident mitigation alternatives (SAMA) analysis.

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

NRC concluded in its license renewal rulemaking that the unmitigated environmental impacts from severe accidents met its Category 1 criteria. However, NRC made consideration of mitigation alternatives a Category 2 issue because not all plants had completed ongoing regulatory programs related to mitigation (e.g., individual plant examinations and accident management). Site-specific information to be presented in the license renewal environmental report includes: (1) potential SAMAs; (2) benefits, costs, and net value of implementing potential SAMAs; and (3) sensitivity of analysis to changes in key underlying assumptions.

Susquehanna Steam Electric Station (SSES) maintains a probabilistic risk assessment (PRA) model to use in evaluating the most significant risks of core damage and the

resulting radiological release from the containment structures. For the SAMA analysis, SSES used the PRA model output as input to an NRC-approved methodology that calculates economic costs and dose to the public from hypothesized releases from the containment structure into the environment. Then, using NRC regulatory analysis techniques, SSES calculated the monetary value of the unmitigated severe accident risk. The result represents the monetary value of the base risk of dose to the public and worker, offsite and onsite economic costs, and replacement power. This value became a cost/benefit-screening tool for potential SAMAs; a SAMA whose cost of implementation exceeded the base risk value could be rejected as being not cost-beneficial. The following list summarizes the steps of this process:

- SSES PRA Model – Use the SSES Internal Events PRA model as the basis for the analysis (Section E.2). Incorporate External Events contributions based on available quantitative information as described in Section E.5.1.8.
- Level 3 PRA Analysis – Use SSES Level 1 and 2 Internal Events PRA output and site-specific meteorology, demographic, land use, and emergency response data as input in performing a Level 3 PRA using the MELCOR Accident Consequences Code System Version 2 (MACCS2) (Section E.3). Incorporate External Events contributions as described in Section E.5.1.8.
- Baseline Risk Monetization – Use NRC regulatory analysis techniques, calculate the monetary value of the unmitigated SSES severe accident risk. This becomes the maximum averted cost-risk that is possible (Section E.4).
- Phase I SAMA Analysis – Identify potential SAMA candidates based on the SSES PRA, IPE, IPEEE, and documentation from the industry and the NRC. Screen out Phase I SAMA candidates that are not applicable to the SSES design or are of low benefit in boiling water reactors, candidates that have already been implemented at SSES or whose benefits have been achieved at SSES using other means, and candidates whose estimated implementation cost exceeds the maximum averted cost-risk (Section E.5).
- Phase II SAMA Analysis – Calculate the risk reduction attributable to each remaining SAMA candidate and compare it to a more detailed cost analysis to identify any net cost benefit. PRA insights are also used to screen SAMA candidates in this phase (Section E.6).
- Uncertainty Analysis – Evaluate how changes in the SAMA analysis assumptions might affect the cost/benefit evaluation (Section E.7).

Using this process, SSES incorporated industry, NRC, and plant-specific information to create a list of 14 SAMAs for consideration. SSES analyzed this list and screened out SAMAs that would not apply to the SSES design, that SSES had already implemented, or that would achieve results that SSES had already achieved at the site by other

means. SSES used the cost estimates for the remaining SAMAs and compared them with the maximum averted cost-risk value to screen out SAMAs that would not be cost-beneficial. Eleven candidate SAMAs remained for further consideration.

SSES calculated the risk reduction that would be attributable to each candidate SAMA (assuming SAMA implementation) and re-quantified the cost-risk value. The difference between the base cost-risk value and the SAMA-reduced cost-risk value became the averted cost-risk, or the value of implementing the SAMA. SSES used the cost estimates for implementing each SAMA and repeated the cost/benefit comparison using the SAMA specific averted cost-risk. Two SAMAs were initially found to be cost beneficial for SSES:

- SAMA 2a: Improve Cross-Tie Capability Between 4kV AC Emergency Buses (A-D, B-C)
- SAMA 6: Procure Spare 480V AC Portable Station Generator

The 4kV AC emergency bus cross-tie between the "A" and "D" or "B" and "C" buses (SAMA 2a) is a cost beneficial enhancement at Susquehanna. While SSES already has the "E" EDG to compensate for primary EDG failures, the largest contributor to site risk is still the LOOP initiating event. For a moderate cost of implementation, a means of further reducing LOOP risk could be added to the site.

SAMA 6 is also identified as a cost beneficial change; however, common cause failure of the additional generator is not currently included in the analysis. If common cause failures are included and if SAMA 2a is implemented, the benefit of this SAMA would be reduced. Because of these mitigating factors, this SAMA is not recommended for implementation.

SSES performed three additional analyses to evaluate how the SAMA analysis would change if certain key parameters were changed. The results of the uncertainty analysis indicate that use of the 95th percentile PRA results would suggest that three additional SAMAs are cost beneficial for SSES:

- SAMA 2b: Improve Cross-Tie Capability Between 4kV AC Emergency Buses (A-B-C-D)
- SAMA 3: Proceduralize Staggered RPV Depressurization When Fire Protection System Injection is the Only Available Makeup Source
- SAMA 5: Auto Align 480V AC Portable Station Generator

The expanded 4kV AC cross-tie (SAMA 2b) would allow any given EDG the capability to power any particular 4kV AC emergency bus. While the cost of implementation is greater than the monetary equivalent of the associated risk reduction based on the best

estimate results, the sensitivity case shows that SAMA 2b is a borderline case and that it could be considered as a means of reducing plant risk. However, if lower cost SAMA 2a is implemented, most of the cross-tie benefit would be obtained and the further changes required to implement SAMA 2b would not be cost beneficial. This judgement is based on the difference in averted cost risk-shown for the two SAMAs in Section E.7.2. SAMA 2b yields an additional benefit of only \$20,000 for an additional cost input of \$728,000. This SAMA is not recommended for consideration.

SAMA 3 provides a means of ensuring that injection with the Fire Main can prevent core damage when it is the only available injection source. As this SAMA only requires procedure changes and supporting analysis to support the use of an existing injection system, this low cost SAMA should be considered for implementation.

SAMA 5 only becomes cost effective by about 7.5 percent of its cost of implementation when the 95th percentile PRA results are used. While this SAMA could be considered cost beneficial, SAMAs 2a and 3 yield larger cost benefit margins and should be considered for implementation before SAMA 5.

In conclusion, the benefits of revising the operational strategies in place at SSES and/or implementing hardware modifications can be evaluated without the insight from a risk-based analysis. Use of the PRA in conjunction with cost benefit analysis methodologies has, however, provided an enhanced understanding of the effects of the proposed changes relative to the cost of implementation and projected impact on a much larger future population. The results of this study indicate that of the identified potential improvements that can be made at SSES, a few are cost beneficial based on the methodology applied however, none of the SAMAs are related to plant aging. Therefore, they are not required modifications for the License Renewal Period.

4.21 REFERENCES

Note to reader: Some web pages cited in this document are no longer available, or are no longer available through the original URL addresses. Hard copies of cited web pages are available in PPL Susquehanna files. Some sites, for example the census data, cannot be accessed through their given URLs. The only way to access these pages is to follow queries on previous web pages. The complete URLs used by PPL Susquehanna have been given for these pages, even though they may not be directly accessible. Also, all references are specific to respective chapter.

AEC (U.S. Atomic Energy Commission). 1973. *Final Environmental Statement related to construction of Susquehanna Steam Electric Station, Units 1 and 2*. Pennsylvania Power and Light Company. Docket Nos. 50-387 and 50-388. Directorate of Licensing. Washington, D.C. June.

Ecology III. 2001. *Environmental Studies in the Vicinity of the Susquehanna Steam Electric Station 2000: Water Quality and Fishes*. Prepared by Ecology III, Inc., Berwick, Pennsylvania, for PPL Susquehanna, LLC. May.

Ecology III. 2002. *Environmental Studies in the Vicinity of the Susquehanna Steam Electric Station 2001: Water Quality and Fishes*. Prepared by Ecology III, Inc., Berwick, Pennsylvania, for PPL Susquehanna, LLC. June.

Ecology III. 2003. *Environmental Studies in the Vicinity of the Susquehanna Steam Electric Station 2002: Water Quality and Fishes*. Prepared by Ecology III, Inc., Berwick, Pennsylvania, for PPL Susquehanna, LLC. August.

Ecology III. 2004. *Environmental Studies in the Vicinity of the Susquehanna Steam Electric Station 2002: Water Quality and Fishes*. Prepared by Ecology III, Inc., Berwick, Pennsylvania, for PPL Susquehanna, LLC. December.

Ecology III. 2005. *Environmental Studies in the Vicinity of the Susquehanna Steam Electric Station 2002: Water Quality and Fishes*. Prepared by Ecology III, Inc., Berwick, Pennsylvania, for PPL Susquehanna, LLC. June.

EPA (United States Environmental Protection Agency). 2003. *Water on Tap: What You Need to Know*. EPA 816-K-03-007. Office of Water. Washington, DC.

Fields, J. S. 1982. Pathogens in Condenser Cooling Systems: A Health Concern. Pennsylvania Power & Light Co. January.

Fields, J.S. 2005. "PLR-060: Review of TtNUS Responses Draft Environmental Report." Email to J. L. Oliver, Tetra Tech NUS, June 28, 2005.

- IEEE (Institute of Electrical and Electronic Engineers). 1997. *National Electrical Safety Code*, 1997 Edition. New York, New York.
- Joklik, W. K. and D. T. Smith. 1972. *Microbiology*. 15th Edition. Meredith Corporation. New York.
- NRC (U.S. Nuclear Regulatory Commission). 1981. *Final Environmental Statement related to the Operation of Susquehanna Steam Electric Station*. Pennsylvania Power and Light Company and Allegheny Electric Cooperative, Inc. Dockets Nos. 50-387 and 50-388. Office of Nuclear Reactor Regulation. Washington, D.C. June.
- NRC (U.S. Nuclear Regulatory Commission). 1996a. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* Volumes 1 and 2. NUREG-1437. Washington, DC. May.
- NRC (U.S. Nuclear Regulatory Commission). 1996b. "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses." Federal Register, Volume 61, Number 109. June 5.
- PPL. 2006. Condenser and Circulating Water System EPU Evaluation and Task Report. EC-PUPC-20605. March.
- PP&L (Pennsylvania Power & Light Company). undated. Susquehanna Steam Electric Station, Applicant's Environmental Report, Revised July 1972, Amendment No. 4. Pennsylvania Power & Light Company, Allentown, Pennsylvania.
- PP&L (Pennsylvania Power & Light Company). 1976. Susquehanna Steam Electric Station, Applicant's Environmental Report, Revised July 1972, Amendment No. 5. Pennsylvania Power & Light Company, Allentown, Pennsylvania. July.
- TtNUS (Tetra Tech NUS). 2004. Calculation Package for Susquehanna Transmission Lines Induced Current Analysis. Tetra Tech NUS, Aiken, South Carolina. September 3.
- USCB (U.S. Census Bureau). 2000. "Pennsylvania Quickfacts. Columbia County, Pennsylvania." Available online at <http://quickfacts.census.gov/>. Accessed July 22, 2004.
- USGS (U.S. Geological Survey). 2004. Water Resources Data: Pennsylvania: Water Year 2003. Volume 2. Susquehanna and Potomac River Basins. Water-Data Report PA-03-2.

5.0 ASSESSMENT OF NEW AND SIGNIFICANT INFORMATION

NRC

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

5.1 DESCRIPTION OF PROCESS

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

While NRC regulations do not require an applicant's environmental report to contain analyses of the impacts of those environmental issues that have been generically resolved (10 CFR 51.53(c)(3)(i)), the regulations do require that an applicant identify any new and significant information of which the applicant is aware (10 CFR 51.53(c)(3)(iv)). The purpose of this requirement is to alert the NRC staff to such information so that the staff can determine whether to seek the Commission's approval to waive or suspend application of the Rule with respect to the affected generic analysis. The NRC has explicitly indicated, however, that an applicant is not required to perform a site-specific validation of GEIS conclusions (NUREG-1529, *Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response* (May 1996), page C9-13, Concern Number NEP.015).

PPL Susquehanna assumes new and significant information would be the following:

- Information that identifies a significant environmental issue not covered in the GEIS and codified in the regulations, or
- Information that was not covered in the GEIS analyses and which leads to an impact finding different from that codified in the regulation.

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

regulations. CEQ guidance provides that federal agencies should prepare environmental impact statements for actions that would significantly affect the environment (40 CFR 1502.3), to focus on significant environmental issues (40 CFR 1502.1), and to eliminate from detailed study issues that are not significant (40 CFR 1501.7(a)(3)). The CEQ guidance includes a definition of “significantly” that requires consideration of the context of the action, and the intensity or severity of the impact(s) (40 CFR 1508.27). PPL Susquehanna assumes that moderate or large impacts, as defined by the NRC, would be significant. Section 4.0 presents the NRC definitions of “moderate” and “large” impacts.

PPL Susquehanna has implemented a process to identify new and significant information as part of its preparation of this environmental report for SSES. PPL Susquehanna is aware of no new and significant information regarding the environmental impacts of SSES license renewal.

The SSES Environmental Protection Plan (EPP) and tiered departmental procedures govern review of environmental issues. Changes in plant design, operation, or tests and experiments with potential for environmental impact are reviewed in accordance with established procedures and responsibilities to ensure that such activities do not involve an unreviewed environmental question or require changes to the EPP. The environmental impacts of license renewal were evaluated prior to submittal of the license application. Established procedures and responsibilities ensure that any new and significant information related to renewal of the SSES licenses will be identified, reviewed, and addressed.

6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

6.1 LICENSE RENEWAL IMPACTS

PPL Susquehanna has reviewed the environmental impacts of renewing the SSES operating licenses and has concluded that impacts would be small and would not require mitigation. This environmental report documents the basis for PPL Susquehanna's conclusion. Chapter 4 incorporates by reference NRC findings for the 55 Category 1 issues that apply to SSES, all of which have impacts that are small (Table A-1). The rest of Chapter 4 analyzes Category 2 issues, all of which are either not applicable or have impacts that are small. Table 6.1-1 identifies the impacts that SSES license renewal would have on resources associated with Category 2 issues.

Table 6.1-1. Environmental Impacts Related to License Renewal at SSES.

No.	Category 2 Issue	Environmental Impact
Surface Water Quality, Hydrology, and Use (for all plants)		
13	Water use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)	Small. SSES consumptive average water use is approximately 0.47 percent of average river flow. PPL Susquehanna complies with the Susquehanna River Basin Commission's Standards for Surface Water Withdrawals in 18 CFR 803.23.
Aquatic Ecology (for plants with once-through or cooling pond heat dissipation systems)		
25	Entrainment of fish and shellfish in early life stages	None. This issue does not apply because SSES does not use a once-through or cooling pond heat dissipation system.
26	Impingement of fish and shellfish	None. This issue does not apply because SSES does not use a once-through or cooling pond heat dissipation system.
27	Heat shock	None. This issue does not apply because SSES does not use a once-through or cooling pond heat dissipation system.
Groundwater Use and Quality		
33	Groundwater use conflicts (potable and service water, and dewatering; plants that use > 100 gpm)	None. This issue does not apply because SSES uses less than 100 gallons of groundwater per minute.
34	Groundwater use conflicts (plants using cooling towers or cooling ponds and withdrawing makeup water from a small river)	Small. SSES is not located in any aquifer recharge area.
35	Groundwater use conflicts (Ranney wells)	None. This issue does not apply because SSES does not use Ranney wells.
39	Groundwater quality degradation (cooling ponds at inland sites)	None. This issue does not apply because SSES does not use cooling ponds.
Terrestrial Resources		
40	Refurbishment impacts	None. No impacts are expected because SSES has no plans to undertake refurbishment.
Threatened or Endangered Species		
49	Threatened or endangered species	Small. Bald eagles are common on the Susquehanna River during some seasons of the year. Other protected bird species are occasionally observed at SSES, but none nest on the site. The transmission lines cross counties that have known populations of protected species but PPL Susquehanna has not identified any observances of these species in the corridors.

**Table 6.1-1. Environmental Impacts Related to License Renewal at SSES
(Continued).**

No.	Category 2 Issue	Environmental Impact
Air Quality		
50	Air quality during refurbishment (non-attainment and maintenance areas)	None. No impacts are expected because SSES has no plans to undertake refurbishment.
Human Health		
57	Microbiological organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river)	Small. The low temperatures in the Susquehanna River, and the disinfection at the sewage treatment facility do not support the propagation of pathological microbes.
59	Electromagnetic fields, acute effects (electric shock)	Small. The largest modeled induced current under the SSES lines is substantially less than the 5-milliampere limit. Therefore, the SSES transmission lines conform to the National Electrical Safety Code provisions for preventing electric shock from induced current.
Socioeconomics		
63	Housing impacts	Small. The conceptual addition of 177 direct/indirect jobs would not noticeably affect a housing market of approximately 700,000 housing units.
65	Public services: public utilities	Small. Water suppliers in Luzerne and Columbia Counties have excess capacity. The conceptual addition of 177 direct/ indirect jobs would not adversely affect the available water supply.
66	Public services: education (refurbishment)	None. No impacts are expected because SSES has no plans to undertake refurbishment.
68	Offsite land use (refurbishment)	None. No impacts are expected because SSES has no plans to undertake refurbishment.
69	Offsite land use (license renewal term)	Small. No plant-induced changes to offsite land use are expected from license renewal because SSES taxes are less than 10 percent of total tax revenues to the school district and Luzerne County. There are no growth control measures that would limit growth. SSES pays 54 percent of the total taxes to Salem township; however land use in the township remains unchanged, indicating that the taxes do not affect land use.
70	Public services: transportation	Small. The addition of 60 employees would not noticeably increase traffic or adversely affect level of service in the vicinity of SSES.
71	Historic and archaeological resources	Small. Continued operation of SSES would not require construction at the site. Therefore, license renewal would have little or no effect on historic or archaeological resources.
Postulated Accidents		
76	Severe accidents	Small. The benefit/cost analysis identified no severe accident mitigation alternatives that would avert public risk.

6.2 MITIGATION

NRC

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

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

Impacts of license renewal are small and would not require mitigation. Current operations include monitoring activities that would continue during the license renewal term. PPL Susquehanna performs routine monitoring to ensure the safety of workers, the public, and the environment. These activities include the radiological environmental monitoring program, air quality emissions monitoring, and effluent chemistry monitoring. These monitoring programs ensure that the plant's permitted emissions and discharges are within regulatory limits and any unusual or off-normal emissions/discharges would be quickly detected, mitigating potential impacts.

6.3 UNAVOIDABLE ADVERSE IMPACTS

NRC

The environmental report shall discuss any "...adverse environmental effects which cannot be avoided should the proposal be implemented..."
10 CFR 51.45(b)(2) as adopted by 10 CFR 51.53(c)(2).

This environmental report adopts by reference NRC findings for applicable Category 1 issues, including discussions of any unavoidable adverse impacts (Table A-1). PPL Susquehanna examined 21 Category 2 issues and identified the following unavoidable adverse impacts of license renewal:

- The Cooling Towers and their vapor plumes are visible from offsite. This visual impact will continue during the license renewal term.
- Procedures for the disposal of sanitary, chemical, and radioactive wastes are intended to reduce adverse impacts from these sources to acceptably low levels. A small impact will occur as long as the plant is in operation. Solid radioactive wastes are a product of plant operations and long-term disposal of these materials must be considered.
- Operation of SSES results in a very small increase in radioactivity in the air and water. However, fluctuations in natural background radiation are expected to exceed the small incremental increase in dose to the local population. Operation of SSES also creates a very low probability of accidental radiation exposure to inhabitants of the area.
- Operations of SSES results in consumptive use of Susquehanna River water. By law, PPL Susquehanna is required to have plans for low-flow augmentation during drought conditions.
- Limited numbers of adult and juvenile fish are impinged on the traveling screens at the cooling water River Intake Structure.
- Very small numbers of larval fish are entrained at the cooling water River Intake Structure.

6.4 IRREVERSIBLE AND IRRETRIEVABLE RESOURCE COMMITMENTS

NRC

The environmental report shall discuss any "...irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented..." 10 CFR 51.45(b)(5) as adopted by 10 CFR 51.53(c)(2)

Continued operation of SSES for the license renewal term will result in irreversible and irretrievable resource commitments, including the following:

- Nuclear fuel, which is used in the reactor and is converted to radioactive waste;
- Land required to dispose of spent nuclear fuel offsite, low-level radioactive wastes generated as a result of plant operations; and sanitary wastes generated from normal industrial operations;
- The onsite dry spent fuel storage area will need to be expanded if offsite disposal is not available;
- Elemental materials that will become radioactive; and
- Materials used for the normal industrial operations of the plant that cannot be recovered or recycled or that are consumed or reduced to unrecoverable forms.

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

NRC

The environmental report shall discuss the "...relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity..." 10 CFR 51.45(b)(4) as adopted by 10 CFR 51.53(c)(2)

The current balance between short-term use and long-term productivity at the SSES site was established with the decision to convert approximately 450 acres of farmland and woodland to industrial use. The FESs related to construction (AEC 1973) and operation (NRC 1981) evaluated the impacts of constructing and operating SSES. Natural resources that would be subjected to short-term use include land and water. The plant site and the area surrounding it are largely undeveloped. Approximately 450 acres of the 2,355-acre site are devoted to the production of electrical energy. This includes the area occupied by SSES facilities (buildings, parking lots, roadways) and landscaped areas around the facilities. Transmission line construction required about 4,900 acres of land that resulted in the alteration of natural wildlife habitats.

Although SSES consumes water from the Susquehanna River, the impacts are minor and would cease once the reactors cease operation. The productivity of the aquatic community in the Susquehanna River in the vicinity of SSES is not affected by the water use.

After decommissioning, most environmental disturbances would cease and restoration of the natural habitat could occur. Thus, the "trade-off" between the production of electricity and changes in the local environment is reversible to some extent.

Experience with other experimental, developmental, and commercial nuclear plants has demonstrated the feasibility of decommissioning and dismantling such plants sufficiently to restore a site to its former use. The degree of dismantlement will take into account the intended new use of the site and a balance among health and safety considerations, salvage values, and environmental impact. However, decisions on the ultimate disposition of these lands have not yet been made. Continued operation for an additional 20 years would not increase the short-term productivity impacts described here.

6.6 REFERENCES

AEC (Atomic Energy Commission). 1973. Final Environmental Statement Related to the Construction of Susquehanna Steam Electric Station Units 1 and 2, Pennsylvania Power and Light Company. Docket Nos. 50-387 and 50-388. June.

NRC (U.S. Nuclear Regulatory Commission). 1981. Final Environmental Statement related to the operation of Susquehanna Steam Electric Station Units 1 and 2, Pennsylvania Power and Light Company. Dockets Nos. 50-387 and 50-388. Office of Nuclear Reactor Regulation. Washington, D.C. June.

7.0 ALTERNATIVES TO THE PROPOSED ACTION

NRC

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

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

"While many methods are available for generating electricity, and a huge number of combinations or mixes can be assimilated to meet a defined generating requirement, such expansive consideration would be too unwieldy to perform given the purposes of this analysis. Therefore, NRC has determined that a reasonable set of alternatives should be limited to analysis of single, discrete electric generation sources and only electric generation sources that are technically feasible and commercially viable..." (NRC 1996a).

"...The consideration of alternative energy sources in individual license renewal reviews will consider those alternatives that are reasonable for the region, including power purchases from outside the applicant's service area...." (NRC 1996b).

Chapter 7 evaluates alternatives to SSES license renewal. The chapter identifies actions that PPL Susquehanna might take, and associated environmental impacts, if the U.S. Nuclear Regulatory Commission (NRC) does not renew the plant's operating licenses. The chapter also addresses actions that PPL Susquehanna has considered, but would not take, and identifies bases for determining that such actions would be unreasonable.

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

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

PPL Susquehanna has determined that the environmental report would support NRC decision making as long as the document provides sufficient information to clearly indicate whether an alternative would have a smaller, comparable, or greater environmental impact than the proposed action. Providing additional detail or analysis serves no function if it only brings to light additional adverse impacts of alternatives to license renewal. This approach is consistent with regulations of the Council on Environmental Quality, which provide that the consideration of alternatives (including the proposed action) should enable reviewers to evaluate their comparative merits (40 CFR 1500-1508). PPL Susquehanna judges that Chapter 7 provides sufficient detail about alternatives to establish the basis for necessary comparisons to the Chapter 4 discussion of impacts from the proposed action.

In characterizing environmental impacts from alternatives, PPL Susquehanna has used the same definitions of “small,” “moderate,” and “large” that are presented in the introduction to Chapter 4.

7.1 NO-ACTION ALTERNATIVE

PPL Susquehanna uses “no-action alternative” to refer to a scenario in which NRC does not renew the SSES operating licenses. Components of this alternative include replacing the generating capacity of SSES and decommissioning the facility, as described below.

SSES provides approximately 18 terawatt-hours of electricity and approximately 2,500 megawatts of base-load electrical capacity to residents and other consumers in the mid-Atlantic region (PPL 2004). PPL Susquehanna judges that any alternative would be unreasonable if it did not include replacing the capacity of SSES. Replacement could be accomplished by (1) building new generating base-load capacity, (2) purchasing power from the wholesale market, or (3) reducing power requirements through demand reduction. Section 7.2.1 describes each of these possibilities in detail, and Section 7.2.2 describes environmental impacts from feasible alternatives.

The Generic Environmental Impact Statement (GEIS) (NRC 1996a, pg. 7-1) defines decommissioning as the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits release of the property for unrestricted use and termination of the license. NRC-evaluated decommissioning options include immediate decontamination and dismantlement, and safe storage of the stabilized and defueled facility for a period of time, followed by additional decontamination and dismantlement. Regardless of the option chosen, decommissioning must be completed within a 60-year period. Under the no-action alternative, PPL Susquehanna would continue operating SSES until the existing licenses expire, then initiate decommissioning activities in accordance with NRC requirements. The GEIS describes decommissioning activities based on an evaluation of a larger reactor (the “reference” boiling-water reactor is the 1,155-megawatt electric [MWe] Energy Northwest’s Columbia Plant). This description is applicable to decommissioning activities that PPL Susquehanna would conduct at SSES.

As the GEIS notes, NRC has evaluated environmental impacts from decommissioning. NRC-evaluated impacts include impacts of occupational and public radiation dose; impacts of waste management; impacts to air and water quality; and ecological, economic, and socioeconomic impacts. NRC indicated in the *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities; Supplement 1* (NRC 2002a, Section 4.3.8) that the environmental effects of greatest concern (i.e., radiation dose and releases to the environment) are substantially less than the same effects resulting from reactor operations. PPL Susquehanna adopts by reference the NRC conclusions regarding environmental impacts of decommissioning.

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

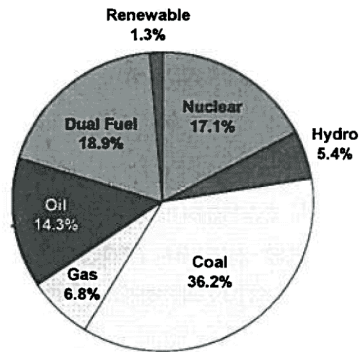
PPL Susquehanna concludes that the decommissioning impacts under the no-action alternative would not be substantially different from those occurring following license renewal, as identified in the GEIS (NRC 1996a) and in the decommissioning generic environmental impact statement (NRC 2002a). These impacts would be temporary and would occur at the same time as the impacts from meeting system generating needs.

7.2 ALTERNATIVES THAT MEET SYSTEM GENERATING NEEDS

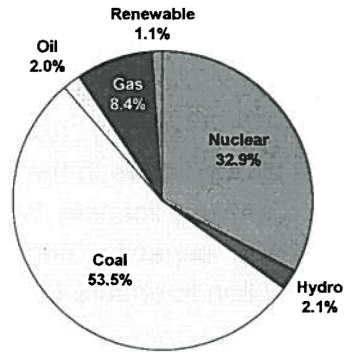
SSES will have a net capacity of 2,510 MWe (approximate) when the NRC approves the Extended Power Uprate for which PPL Susquehanna has applied. In 2003 SSES generated approximately 18 terawatt-hours of electricity (PPL 2004). This power, equivalent to the energy used by approximately 1.8 million residents, would be unavailable to customers in the event the SSES operating licenses are not renewed. If the SSES operating licenses were not renewed, PPL companies would need to build new generating capacity, purchase power, or reduce power requirements through demand reduction to ensure it meets the electric power requirements of its customers.

The power consumed in Pennsylvania is not limited to electricity generated within the Commonwealth. Pennsylvania relies on electricity drawn from the PJM Interconnection, a regional network that pools power generated in Pennsylvania, New Jersey, Maryland, and all or parts of Delaware, Ohio, Virginia, West Virginia and the District of Columbia. One consequence of the network is that electric power consumers in Pennsylvania are not specifically dependent on electricity generated within the Commonwealth. The current mix of power generation options within the PJM region is one indicator of what PPL Susquehanna considers to be feasible alternatives. In 2003, electric generators connected to the PJM network had a total generating capacity of 76,664 MWe (PJM 2004a). This capacity includes units fueled by coal (36.2 percent), dual-fired (i.e., gas and oil; 18.9 percent), nuclear (17.1 percent), oil (14.3 percent), gas (6.8 percent), hydroelectric (5.4 percent), and renewable (1.3 percent). In 2003, the electric industry in the PJM region provided 348.7 terawatt-hours of electricity (PJM 2004b). Utilization of generating capacity in the PJM region was dominated by coal (53.5 percent), followed by nuclear (32.9 percent), gas (8.4 percent), hydroelectric (2.1 percent), oil (2.0 percent) and renewable (1.1 percent) (PJM 2004c). Figures 7.2-1 and 7.2-2 illustrate the electric industry generating capacity and utilization, respectively, for the PJM region.

Comparison of generating capacity with actual utilization of this capacity indicates that coal and nuclear are used by PJM substantially more relative to their PJM capacity than either oil-fired or gas-fired generation. This condition reflects the relatively low fuel cost and baseload suitability for nuclear power and coal-fired plants, and relatively higher use of gas- and oil-fired units to meet peak loads. Comparison of capability and utilization for petroleum and gas-fired facilities indicates a strong preference of gas firing over oil firing, indicative of higher cost and greater air emissions associated with oil firing. Energy production from hydroelectric sources is similarly preferred from a



**Figure 7.2-1. PJM Regional
Generating Capacity by
Fuel Type, 2003**



**Figure 7.2-2. PJM Regional
Generation by Fuel
Type, 2003**

cost standpoint, but capacity is limited and utilization can vary substantially depending on water availability.

7.2.1 Alternatives Considered

Technology Choices

For the purposes of this environmental report, PPL Susquehanna conducted evaluations of alternative generating technologies to identify candidate technologies that would be capable of replacing the net base-load capacity (2,510 MWe) of the nuclear units at SSES.

Based on these evaluations, it was determined that feasible new plant systems to replace the capacity of the SSES nuclear units are limited to pulverized-coal and gas-fired combined-cycle units for base-load operation. This conclusion is borne out by the generation utilization information presented above that identifies coal as the most heavily utilized non-nuclear generating technology in the region. PPL Susquehanna would use gas as the primary fuel in its combined-cycle turbines because of the economic and environmental advantages of gas over oil. Manufacturers now have large standard sizes of combined-cycle gas turbines that are economically attractive and suitable for high-capacity base-load operation. For the purposes of the SSES license renewal environmental report, PPL Susquehanna has limited its analysis of new generating capacity alternatives to the technologies it considers feasible: pulverized

coal- and gas-fired units. PPL Susquehanna chose to evaluate combined-cycle turbines in lieu of simple-cycle turbines because the combined-cycle option is more economical. The benefits of lower operating costs for the combined-cycle option outweigh its higher capital costs.

Mixture

NRC indicated in the GEIS that, while many methods are available for generating electricity and a huge number of combinations or mixes can be assimilated to meet system needs, such expansive consideration would be too unwieldy, given the purposes of the alternatives analysis. Therefore, NRC determined that a reasonable set of alternatives should be limited to the analysis of single discrete electrical generation sources and only those electric generation technologies that are technically reasonable and commercially viable (NRC 1996a, pg. 8-1). Consistent with the NRC determination, PPL Susquehanna has not evaluated mixes of generating sources. The impacts from coal- and gas-fired generation presented in this chapter would bound the impacts from any generation mixture of the two technologies.

Effects of Restructuring

Nationally, the electric power industry has been undergoing a transition from a regulated industry to a competitive market environment. Efforts to deregulate the electric utility industry began with passage of the National Energy Policy Act of 1992. Provisions of this act required electric utilities to allow open access to their transmission lines and encouraged development of a competitive wholesale market for electricity. The Act did not mandate competition in the retail market, leaving that decision to the states (NEI 2000). Over the past few years, states within the PJM region have transitioned to competitive wholesale and retail markets.

In 1996, Pennsylvania enacted the "Electricity Generation Customer Choice and Competition Act" (Act). Provisions of the Act opened Pennsylvania's retail electric power market to competition. The Pennsylvania Public Utility Commission (PPUC) provides strategic direction and policy guidance for oversight of the electric power industry in the Commonwealth, including the restructuring initiative (Pennsylvania General Assembly 1996).

In 2004, Pennsylvania adopted the Alternative Energy Portfolio Standards Act (AEPS), which requires all suppliers selling retail electricity in Pennsylvania (retail electric suppliers) to include alternative energy sources in the mix of energy that they sell. Eligible resources may be located anywhere within the PJM region (Pennsylvania General Assembly 2004).

The AEPS established two tiers of alternative energy sources and set minimum requirements for each tier. By 2007 at least 1.5 percent of the electricity sold by a retail electric supplier must come from Tier I sources. Tier I sources include wind, solar photovoltaic energy, low-impact hydropower, geothermal sources, biologically-derived methane gas, fuel cells, biomass, and coal mine methane. The Tier I percentage increases by 0.5 percent each year, and by the year 2020, at least 8 percent of the retail electric energy sold in Pennsylvania must be generated from Tier I sources. The AEPS also requires that a very small percentage of Tier I generation be from solar photovoltaic technologies.

In addition, a certain percentage of electricity sold by retail electric suppliers must be generated from Tier II alternative energy sources. Tier II sources include energy derived from waste coal, distributed generation systems, demand side management (DSM), large-scale hydropower, municipal solid waste generation, utilizing the byproducts of pulping or wood-manufacturing processes, and integrated combined coal gasification technology. The AEPS requires 4.2 percent of energy sold each year through 2009 to be generated using Tier II resources. The percentage increases incrementally until the year 2020 when at least 10 percent of the retail electric energy sold in Pennsylvania must be supplied from Tier II sources.

As mentioned above, the AEPS includes provisions for DSM measures to reduce electricity demand within the Commonwealth. Eligible measures include energy efficiency measures undertaken by residential, commercial, institutional, or governmental customers; load management and demand response approaches that shift electric load from periods of higher to lower demand; and the reuse of energy from exhaust gases or other manufacturing by-products or useful thermal energy for electricity production by industrial and manufacturing customers. These measures also enable electricity customers to benefit from the energy credit market created by the portfolio standard. Retail customers who reduce their electricity demand through energy efficiency and load management, or who generate electricity by reusing energy, will earn alternative energy credits that they can sell to utility companies (Pennsylvania General Assembly 2004).

Alternatives

The following sections present fossil-fuel-fired generation (Section 7.2.1.1) and purchased power (Section 7.2.1.2) as reasonable alternatives to license renewal. Section 7.2.1.3 discusses reduced demand and presents the basis for concluding that it is not a reasonable alternative to license renewal. Section 7.2.1.4 discusses other

alternatives that PPL Susquehanna has determined are not reasonable and PPL Susquehanna bases for these determinations.

7.2.1.1 Construct and Operate Fossil-Fuel-Fired Generation

PPL Susquehanna analyzed locating hypothetical new coal- and gas-fired units at the existing SSES site and at an undetermined green field site. PPL Susquehanna concluded that SSES is the preferred site for new construction because this approach would minimize environmental impacts by building on previously disturbed land and by making the most use possible of existing facilities, such as transmission lines, roads and parking areas, office buildings, and components of the cooling system. Locating hypothetical units at the existing site has, therefore, been applied to the coal- and gas-fired units.

For comparability, PPL Susquehanna selected gas- and coal-fired units of equal electric power capacity. One unit with a net capacity of 2,510 MWe could be assumed to replace the 2,510-MWe SSES net capacity. However, PPL Susquehanna's experience indicates that, although custom size units can be built, using standardized sizes is more economical. For example, standard-sized units include a gas-fired combined-cycle plant of 600 MWe net capacity. Four of these standard-sized units would have 2,400 MWe net capacity. For comparability, PPL Susquehanna set the net power of the coal-fired units equal to the gas-fired plants (2,400 MWe). Although this provides less capacity than the existing unit, it ensures against overestimating environmental impacts from the alternatives. The shortfall in capacity could be replaced by other methods (see Mixture in Section 7.2.1).

It must be emphasized, however, that these are hypothetical scenarios. PPL Susquehanna does not have plans for such construction at SSES.

Gas-Fired Generation

For purposes of this analysis, PPL Susquehanna assumed development of a modern natural gas-fired combined-cycle plant with design characteristics similar to those being developed elsewhere in the PJM region, and with a generating capacity similar to SSES. The Fairless Energy Works, a two unit plant in Bucks County, Pennsylvania that has a net generating capacity of 1,200 MWe, meets these general criteria (Power Engineering 2003). Four units similar to the units at the Fairless Energy Works would meet the criteria for replacing SSES capacity. Therefore, PPL Susquehanna used characteristics of this plant and other relevant resources in defining the SSES gas-fired alternative. PPL Susquehanna assumes that the representative plant would be located at the SSES site, which offers potential advantages of existing infrastructure

(e.g., cooling water system, transmission, roads, and technical and administrative support facilities). Table 7.2-1 presents the basic gas-fired alternative characteristics.

Coal-Fired Generation

NRC has routinely evaluated coal-fired generation alternatives for nuclear plant license renewal. In the Supplemental GEIS for McGuire Nuclear Station (NRC 2002b), NRC analyzed 2,400 MWe of coal-fired generation capacity. PPL Susquehanna has reviewed the NRC analysis, considers it to be sound, and notes that it analyzed the same generating capacity, 2,400 MWe, discussed in this analysis. In defining the SSES coal-fired alternative, PPL Susquehanna has used site- and Pennsylvania-specific input and has applied the NRC analysis, where appropriate.

Table 7.2-2 presents the basic coal-fired alternative emission control characteristics. PPL Susquehanna based its emission control technology and percent control assumptions on alternatives that the U.S. Environmental Protection Agency has identified as being available for minimizing emissions (EPA 1998a). PPL Susquehanna assumes that the representative plant would be located at the SSES site, which offers potential advantages of existing infrastructure (e.g., cooling water system, transmission, roads, and technical and administrative support facilities). For the purposes of analysis, PPL Susquehanna has assumed that coal and lime (calcium oxide) would be delivered via an existing rail spur to SSES.

Table 7.2-1. Gas-Fired Alternative

Characteristic	Basis
Unit size = 600 MWe ISO rating net. ^a	Manufacturer's standard size gas-fired combined-cycle plant that is ≤ SSES net capacity - 2,510 MWe
Unit size = 624 MWe ISO rating gross ^a Combined cycle consisting of two 172 MWe combustion turbines and one 256 MWe heat recovery steam generator (HRSG) ^b	Calculated based on 4 percent onsite power
Number of units = 4	Assumed
Fuel type = natural gas	Assumed
Fuel heating value = 1,027 Btu/ft ³	2002 value for gas used in Pennsylvania (EIA 2004a)
Fuel SO _x content = 0.0034 lb/MMBtu	EPA 2000, Table 3.1-2a
NO _x control = selective catalytic reduction (SCR) with steam/water injection	Best available for minimizing NO _x emissions (EPA 2000)
Fuel NO _x content = 0.0109 lb/MMBtu	Typical for large SCR-controlled gas fired units with water injection (EPA 2000)
Fuel CO content = 0.00226 lb/MMBtu	Typical for large SCR-controlled gas fired units (EPA 2000)
Fuel PM ₁₀ content = 0.0019 lb/MMBtu	EPA 2000, Table 3.1-2a
Heat rate = 6,040 Btu/kWh	(Chase and Kehoe 2000)
Capacity factor = 0.85	Assumed based on performance of modern plants

a. The difference between "net" and "gross" is electricity consumed onsite.

b. The HRSG does not contribute to air emissions.

Btu = British thermal unit

ft³ = cubic foot

ISO rating = International Standards Organization rating at standard atmospheric conditions of 59°F, 60 percent relative humidity, and 14.696 pounds of atmospheric pressure per square inch

kWh = kilowatt hour

MM = million

MWe = megawatt electrical

NO_x = nitrogen oxides

PM₁₀ = particulates having diameter of 10 microns or less

≤ = less than or equal to

Table 7.2-2. Coal-Fired Alternative

Characteristic	Basis
Unit size = 600 MWe ISO rating net ^a	Calculated to be $\leq$ SSES net capacity – 2,510 MWe
Unit size = 636 MWe ISO rating gross ^a	Calculated based on 6 percent onsite power
Number of units = 4	Assumed
Boiler type = tangentially fired, dry-bottom	Minimizes nitrogen oxides emissions (EPA 1998a)
Fuel type = bituminous, pulverized coal	Typical for coal used in Pennsylvania
Fuel heating value = 11,782 Btu/lb	2002 value for coal used in Pennsylvania (EIA 2004a)
Fuel ash content by weight = 8.96 percent	2001 value for coal used in Pennsylvania (EIA 2004b)
Fuel sulfur content by weight = 1.90 percent	2002 value for coal used in Pennsylvania (EIA 2004a)
Uncontrolled NO _x emission = 10 lb/ton	Typical for pulverized coal, tangentially fired, dry-bottom, NSPS (EPA 1998a)
Uncontrolled CO emission = 0.5 lb/ton	Typical for pulverized coal, tangentially fired, dry-bottom, NSPS (EPA 1998a)
Heat rate = 10,200 Btu/kWh	Typical for coal-fired, single-cycle steam turbines (EIA 2002)
Capacity factor = 0.85	Typical for large coal-fired units
NO _x control = low NO _x burners, overfire air and selective catalytic reduction (95 percent reduction)	Best available and widely demonstrated for minimizing NO _x emissions (EPA 1998a)
Particulate control = fabric filters (baghouse-99.9 percent removal efficiency)	Best available for minimizing particulate emissions (EPA 1998a)
SO _x control = Wet scrubber - lime (95 percent removal efficiency)	Best available for minimizing SO _x emissions (EPA 1998a)

a. The difference between "net" and "gross" is electricity consumed onsite.

Btu = British thermal unit

ISO rating = International Standards Organization rating at standard atmospheric conditions of 59°F, 60 percent relative humidity, and 14.696 pounds of atmospheric pressure per square inch

kWh = kilowatt hour

NSPS = New Source Performance Standard

lb = pound

MWe = megawatt electrical

NO_x = nitrogen oxides

SO_x = oxides of sulfur

$\leq$ = less than or equal to

7.2.1.2 Purchase Power

PPL Susquehanna has evaluated conventional and prospective power supply options that could be reasonably implemented before the existing SSES licenses expire. As noted in Section 7.2.1, electric industry restructuring initiatives in the Commonwealth of Pennsylvania and other states in the PJM region are designed to promote competition in energy supply markets by facilitating participation by non-utility suppliers. PJM has implemented market rules to appropriately anticipate and meet electricity demands in the resulting wholesale electricity market. As an additional facet of this restructuring effort, retail customers in the region now may choose among any company with electric generation to supply their power, resulting in uncertainty with regard to future PPL Susquehanna load obligations. In view of these conditions, PPL Susquehanna assumes for purposes of this analysis that adequate supplies of electricity would be available, and that purchased power would be a reasonable alternative to meet the Station's load requirements in the event the existing operating licenses for SSES are not renewed.

The source of this purchased power may reasonably include new generating facilities developed elsewhere in the Commonwealth, or neighboring states in the PJM region. The technologies that would be used to generate this purchased power are similarly speculative. PPL Susquehanna assumes that the generating technology used to produce purchased power would be one of those that NRC analyzed in the GEIS. For this reason, PPL Susquehanna is adopting by reference the GEIS description of the alternative generating technologies as representative of the purchase power alternative. Of these technologies, facilities fueled by coal and combined-cycle facilities fueled by natural gas are the most cost effective for providing base-load capacity.

PPL Susquehanna anticipates that additional transmission infrastructure would be needed in the event purchased power must replace SSES capacity. From a local perspective, loss of the SSES could result in a load pocket that would require construction of new transmission lines to ensure local system stability. From a regional perspective, PJM's interconnected transmission system is highly reliable, and the market-driven process for generation addition in the region is expected to have a positive impact on overall system reliability.

7.2.1.3 Demand Side Management

As discussed in Section 7.2.1, Pennsylvania has adopted Alternative Energy Portfolio Standards (AEPS) that include provisions for market-based DSM measures to reduce electricity demand within the Commonwealth.

Prior to adopting the AEPS, Pennsylvania had developed through individual settlements with the Commonwealth's major distribution companies, a comprehensive program to promote and advance DSM in the retail electric market. The Pennsylvania Sustainable Energy Board worked in partnership with regional sustainable energy boards, other commonwealth agencies, electric utilities, business organizations and environmental organizations to develop and implement "tools" to save energy. Pennsylvania's DSM offerings under this program ranged from load curtailment incentives during periods of peak demand to rebates and financial incentives for commercial, industrial, and residential customers for installation of energy-efficient appliances and equipment to educational programs and demonstration projects (PSEB 2004).

Since 1997, Pennsylvania's DSM programs have saved Pennsylvania residents and businesses over 56 terawatt-hours in avoided electricity use, and additional demand reductions are projected to result from these efforts (Pinero 2001). However, it is expected that projected energy efficiencies would be anticipated by the market. As a practical matter, it would be impossible to increase those energy savings by an additional 2,510 MWe to replace SSES generating capability. For these reasons, PPL Susquehanna does not consider energy conservation to represent a reasonable alternative to renewal of the SSES operating licenses.

7.2.1.4 Other Alternatives

This section identifies alternatives that PPL Susquehanna has determined are not reasonable and the PPL Susquehanna bases for these determinations. PPL Susquehanna accounted for the fact that SSES is a base-load generator and that any feasible alternative to SSES would also need to be able to generate base-load power. For the purposes of analysis PPL Susquehanna assumed that the states of Pennsylvania, New Jersey and Maryland comprise PJM region. In performing this evaluation, PPL Susquehanna relied heavily upon NRC's GEIS (NRC 1996a).

Wind

Wind power, by itself, is not suitable for large base-load generation. As discussed in Section 8.3.1 of the GEIS, wind has a high degree of intermittence, and average annual capacity factors for wind plants are relatively low (less than 30 percent). Wind power, in conjunction with energy storage mechanisms, might serve as a means of providing base-load power. However, current energy storage technologies are too expensive for wind power to serve as a large base-load generator.

Based on American Wind Energy Association estimates (AWEA 2002), the PJM region has the technical potential (the upper limit of renewable electricity production and

capacity that could be brought online, without regard to cost, market acceptability, or market constraints) for roughly 6,658 MWe of installed wind power capacity. The full exploitation of wind energy is constrained by a variety of factors including land availability and land-use patterns, surface topography, infrastructure constraints, environmental constraints, wind turbine capacity factor, wind turbine availability, and grid availability. When these constraints on wind energy development are considered the achievable wind energy potential is expected to fall in the range of 10-30 percent of technical potential estimates or 665-1,995 MWe. By the end of 2004 a total of 129 MWe of wind energy had been developed in PJM region. Projected new capacity in various stages of review within the PJM region includes an additional 226 MWe of wind energy (DOE 2004a).

Wind farms, the most economical wind option, generally consist of 10-50 turbines in the 1-3 MWe range. Estimates based on existing installations indicate that a utility-scale wind farm would occupy about 50 acres per MWe of installed capacity (McGowan & Connors 2000). Therefore, replacement of SSES generating capacity (2,510 MWe net) with wind power, even assuming ideal wind conditions, would require dedication of about 196 square miles. Based on the amount of land needed to replace SSES, the wind alternative would require a large green field site, which would result in a large environmental impact. Additionally, wind plants have aesthetic impacts, generate noise, and harm birds.

The scale of this technology is too small to directly replace a power plant of the size of SSES, capacity factors are low (30 to 40 percent), and the land requirement (196 square miles) is large. Therefore, PPL Susquehanna has concluded that wind power is not a reasonable alternative to SSES license renewal.

Solar

By its nature, solar power is intermittent. In conjunction with energy storage mechanisms, solar power might serve as a means of providing base-load power. However, current energy storage technologies are too expensive to permit solar power to serve as a large base-load generator. Even without storage capacity, solar power technologies (photovoltaic and thermal) cannot currently compete with conventional fossil-fueled technologies in grid-connected applications, due to high costs per kilowatt of capacity (NRC 1996a).

Solar power is not a technically feasible alternative for baseload capacity in the PJM region. The PJM region receives 2.8 to 3.9 kilowatt hours of solar radiation per square meter per day, compared with 5 to 7.2 kilowatt hours per square meter per day in areas

of the West, such as California, which are most promising for solar technologies (NRC 1996a).

Estimates based on existing installations indicate that utility-scale plants would occupy about 7.4 acres per MWe for photovoltaic and 4.9 acres per MWe for solar thermal systems (DOE 2004b). Utility-scale solar plants have only been used in regions, such as the western U.S., that receive high concentrations (5 to 7.2 kilowatt hours per square meter per day) of solar radiation. PPL Susquehanna believes that a utility-scale solar plant located in the PJM region, which receives 2.8 to 3.9 kilowatt hours of solar radiation per square meter per day, would occupy about 16.4 acres per MWe for photovoltaic and 10.9 acres per MWe for solar thermal systems. Therefore, replacement of SSES generating capacity with solar power would require dedication of about 64 square miles for photovoltaic and 43 square miles for solar thermal systems. Neither type of solar electric system would fit at the SSES site, and both would have large environmental impacts at a green field site.

PPL Susquehanna has concluded that, due to the high cost, limited availability of sufficient incident solar radiation, and amount of land needed (approximately 43 to 64 square miles), solar power is not a reasonable alternative to SSES license renewal.

Hydropower

A portion (about 4,150 MWe) of utility generating capacity in the PJM region is hydroelectric (PJM 2004a). As the GEIS points out in Section 8.3.4, hydropower's percentage of United States generating capacity is expected to decline because hydroelectric facilities have become difficult to site as a result of public concern over flooding, destruction of natural habitat, and alteration of natural river courses. A small number of hydropower projects, the largest of which is 10 MWe, are being considered in the PJM region (FERC 2005). These small hydropower projects could not replace the 2510 MWe generated at SSES. According to the U.S. Hydropower Resource Assessment (INEEL 1998), there are no remaining sites in the PJM region that would be environmentally suitable for a large hydroelectric facility.

The GEIS estimates land use of 1,600 square miles per 1,000 MWe for hydroelectric power. Based on this estimate, replacement of SSES generating capacity would require flooding approximately 4,020 square miles, resulting in a large impact on land use. Further, operation of a hydroelectric facility would alter aquatic habitats above and below the dam, which would impact existing aquatic communities.

PPL Susquehanna has concluded that, due to the lack of suitable sites in the PJM region for a large hydroelectric facility and the amount of land needed (approximately

4,020 square miles), hydropower is not a reasonable alternative to SSES license renewal.

Geothermal

As illustrated by Figure 8.4 in the GEIS (NRC 1996a), geothermal plants might be located in the western continental United States, Alaska, and Hawaii, where hydrothermal reservoirs are prevalent. However, because there are no high-temperature geothermal sites in PJM region, PPL Susquehanna concludes that geothermal is not a reasonable alternative to SSES license renewal.

Wood Energy

As discussed in the GEIS (NRC 1996a), the use of wood waste to generate electricity is largely limited to those states with significant wood resources. The pulp, paper, and paperboard industries in states with adequate wood resources generate electric power by consuming wood and wood waste for energy, benefiting from the use of waste materials that could otherwise represent a disposal problem. According to the U.S. Department of Energy, Pennsylvania is the only state in the PJM region that is considered to have adequate wood resources (Walsh et al. 2000). However, the largest wood waste power plants are 40 to 50 MWe in size.

Further, as discussed in Section 8.3.6 of the GEIS (NRC 1996a), construction of a wood-fired plant would have an environmental impact that would be similar to that for a coal-fired plant, although facilities using wood waste for fuel would be built on smaller scales. Like coal-fired plants, wood-waste plants require large areas for fuel storage, processing, and waste (i.e., ash) disposal. Additionally, operation of wood-fired plants has environmental impacts, including impacts on the aquatic environment and air. Wood has a low heat content that makes it unattractive for base-load applications. It is also difficult to handle and has high transportation costs.

While some wood resources are available in the PJM region, PPL Susquehanna has concluded that, due to the lack of an environmental advantage, low heat content, handling difficulties, and high transportation costs, wood energy is not a reasonable alternative to SSES license renewal.

Municipal Solid Waste

As discussed in Section 8.3.7 of the GEIS (NRC 1996a), the initial capital costs for municipal solid waste plants are greater than for comparable steam turbine technology at wood-waste facilities. This is due to the need for specialized waste separation and handling equipment.

The decision to burn municipal solid waste to generate energy is usually driven by the need for an alternative to landfills, rather than by energy considerations. The use of landfills as a waste disposal option is likely to increase in the near term; however, it is unlikely that many landfills will begin converting waste to energy because of unfavorable economics.

Estimates in the GEIS suggest that the overall level of construction impacts from a waste-fired plant should be approximately the same as that for a coal-fired plant. Additionally, waste-fired plants have the same or greater operational impacts (including impacts on the aquatic environment, air, and waste disposal). Some of these impacts would be moderate, but still larger than the environmental effects of SSES license renewal.

PPL Susquehanna has concluded that, due to the high costs and lack of environmental advantages, burning municipal solid waste to generate electricity is not a reasonable alternative to SSES license renewal.

Other Biomass-Derived Fuels

In addition to wood and municipal solid waste fuels, there are several other concepts for fueling electric generators, including burning energy crops, converting crops to a liquid fuel such as ethanol (ethanol is primarily used as a gasoline additive), and gasifying energy crops (including wood waste). As discussed in the GEIS, none of these technologies has progressed to the point of being competitive on a large scale or of being reliable enough to replace a base-load plant such as SSES.

Further, estimates in the GEIS suggest that the overall level of construction impacts from a crop-fired plant should be approximately the same as that for a wood-fired plant. Additionally, crop-fired plants would have similar operational impacts (including impacts on the aquatic environment and air). These systems also have large impacts on land use, due to the acreage needed to grow the energy crops.

PPL Susquehanna has concluded that, due to the high costs and lack of environmental advantage, burning other biomass-derived fuels is not a reasonable alternative to SSES license renewal.

Petroleum

The PJM region has several petroleum (oil)-fired power plants; however, they produce less than 2 percent of the total power generated in the region (PJM 2004c). From 1993 to 2002, utilities in the PJM region reduced the amount of power produced by oil-fired generating plants by about 46 percent (EIA 2004a). Oil-fired operation is more expensive than nuclear or coal-fired operation, and future increases in petroleum prices

are expected to make oil-fired generation increasingly more expensive than coal-fired generation.

Also, construction and operation of an oil-fired plant would have environmental impacts. For example, Section 8.3.11 of the GEIS (NRC 1996a) estimates that construction of a 1,000-MWe oil-fired plant would require about 120 acres. Additionally, operation of oil-fired plants would have environmental impacts (including impacts on the aquatic environment and air) that would be similar to those from a coal-fired plant.

PPL Susquehanna has concluded that, due to the high costs and lack of obvious environmental advantage, oil-fired generation is not a reasonable alternative to SSES license renewal.

Fuel Cells

Fuel cell power plants are in the initial stages of commercialization. While more than 650 large stationary fuel cell systems have been built and operated worldwide, the global stationary fuel cell electricity generating capacity in 2003 was only 125 MWe. In addition, the largest stationary fuel cell power plant is only 11 MWe (Fuel Cell Today 2003). Recent estimates suggest that a company would have to produce about 100 MWe of fuel cell stacks annually to achieve a price of \$1,000 to \$1,500 per kilowatt (Kenergy 2000). However, the production capability of the largest stationery fuel cell manufacturer is 50 MWe per year (CSFCC 2002). PPL Susquehanna judges that this technology has not matured sufficiently to support production for a facility the size of SSES. PPL Susquehanna has concluded that, due to cost and production limitations, fuel cell technology is not a reasonable alternative to SSES license renewal.

Advanced Nuclear Reactor

Increased interest in the development of advanced nuclear power plants has been expressed recently by members of both industry and government. However, PPL Susquehanna has no plans to construct a new nuclear power plant, and considers it unlikely that a replacement for SSES could be planned, licensed, constructed, and on line by the time the existing operating licenses expire.

Delayed Retirement

As the NRC noted in the GEIS (NRC 1996a, Section 8.3.13), extending the lives of existing non-nuclear generating plants beyond the time they were originally scheduled to be retired represents another potential alternative to license renewal. PPL Generation will retire two 140 MWe coal-fired units at the Martins Creek plant in September 2007. PPL will also retire two small diesel generators rated 2 and 3 MWe respectively in September 2007. The delayed retirement of the above generation

sources could not replace the 2510 MWe generated at SSES. The PJM region has a younger generation fleet than the nation as a whole and relatively little generation has been retired in the region since the onset of competitive markets. This trend is likely to continue, and PPL Susquehanna is not aware of opportunities for delayed retirement that may be available to other energy suppliers in the region. For these reasons, the delayed retirement of non-nuclear generating units is not considered a reasonable alternative to SSES license renewal.

7.2.2 Environmental Impacts of Alternatives

This section evaluates the environmental impacts of alternatives that PPL Susquehanna has determined to be reasonable alternatives to SSES license renewal: gas-fired generation, coal-fired generation, and purchased power.

7.2.2.1 Gas-Fired Generation

NRC evaluated environmental impacts from gas-fired generation alternatives in the GEIS, focusing on combined-cycle plants. Section 7.2.1.1 presents PPL Susquehanna's reasons for defining the gas-fired generation alternative as a combined-cycle plant on the SSES site. Land-use impacts from gas-fired units on SSES would be less than those from the existing plant. Reduced land requirements, due to a smaller facility footprint, would reduce impacts to ecological, aesthetic, and cultural resources. A smaller workforce could have adverse socioeconomic impacts. Human health effects associated with air emissions would be of concern. Aquatic biota losses due to cooling water withdrawals would be offset by the concurrent shutdown of the nuclear generators.

In the Supplemental GEIS for McGuire Nuclear Station (NRC 2002b) NRC evaluated the environmental impacts of constructing and operating five 482 MWe combined-cycle gas-fired units as an alternative to a nuclear power plant license renewal. This analysis is for a generating capacity similar to the SSES gas-fired alternatives analysis, because PPL Susquehanna would install 2,400 MWe of net power. PPL Susquehanna has adopted the NRC analysis with necessary Pennsylvania- and PPL Susquehanna-specific modifications noted.

Air Quality

Natural gas is a relatively clean-burning fossil fuel that primarily emits nitrogen oxides (NO_x), a regulated pollutant, during combustion. A natural gas-fired plant would also emit small quantities of sulfur oxides (SO_x), particulate matter, and carbon monoxide, all of which are regulated pollutants. Control technology for gas-fired turbines focuses on

NO_x emissions. PPL Susquehanna estimates the gas-fired alternative emissions to be as follows:

SO_x = 191 tons per year

NO_x = 612 tons per year

Carbon monoxide = 127 tons per year

Filterable Particulates = 107 tons per year (all particulates are PM₁₀)

Table 7.2-3 shows how PPL Susquehanna calculated these emissions.

In 2002, Pennsylvania was ranked 2nd nationally in sulfur dioxide (SO₂) emissions and 6th nationally in NO_x emissions from electric power plants (EIA 2004a). The ranking was based on quantity emitted. For example, the electric power plants in only 1 state emitted more SO₂ than those located in Pennsylvania. The acid rain requirements of the Clean Air Act Amendments capped the nation's SO₂ emissions from power plants. Each company with fossil-fuel-fired units was allocated SO₂ allowances. To be in compliance with the Act, the companies must hold enough allowances to cover their annual SO₂ emissions. PPL Susquehanna would need to obtain SO₂ credits to operate a fossil-fuel-burning plant at the SSES site. In 1998, the EPA promulgated the NO_x SIP (State Implementation Plan) Call regulation that required 22 states, including Pennsylvania, to reduce their NO_x emissions by over 30 percent to address regional transport of ground-level ozone across state lines (EPA 1998b). To operate a fossil-fuel-fired plant at the SSES site, PPL Susquehanna would need to obtain enough NO_x credits to cover annual emissions either from the set-aside pool or by buying NO_x credits from other sources. Additionally, because all Pennsylvania is treated as a nonattainment area for ozone a fossil-fuel plant would need to obtain NO_x emission reduction credits in the amount of 1.15 tons of NO_x for every ton of NO_x emitted.

NO_x effects on ozone levels, SO₂ allowances, and NO_x credits could all be issues of concern for gas-fired combustion. While gas-fired turbine emissions are less than coal-fired boiler emissions, the emissions are still substantial. PPL Susquehanna concludes that emissions from the gas-fired alternative at SSES would noticeably alter local air quality, but would not cause or contribute to violations of National Air Quality Standards. Air quality impacts would therefore be moderate.

Waste Management

The solid waste generated from this type of facility would be minimal. The only noteworthy waste would be from spent SCR catalyst used for NO_x control. The SCR process for a 2400 MWe plant would generate approximately 1500 ft³ of spent catalyst

Table 7.2-3. Air Emissions from Gas-Fired Alternative

Parameter	Calculation	Result
Annual gas consumption	$4 \text{ units} \times \frac{624 \text{ MW}}{\text{unit}} \times \frac{6,040 \text{ Btu}}{\text{kW} \times \text{hr}} \times \frac{1,000 \text{ kW}}{\text{MW}} \times 0.85 \times \frac{\text{ft}^3}{1,027 \text{ Btu}} \times \frac{24 \text{ hr}}{\text{day}} \times \frac{365 \text{ day}}{\text{yr}}$	109,303,509,873 ft ³ of gas per year
Annual Btu input	$\frac{109,303,509,873 \text{ ft}^3}{\text{yr}} \times \frac{1,027 \text{ Btu}}{\text{ft}^3} \times \frac{\text{MMBtu}}{10^6 \text{ Btu}}$	112,254,705 MMBtu per year
SO _x ^a	$\frac{0.0034 \text{ lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{112,254,705 \text{ MMBtu}}{\text{yr}}$	191 tons SO _x per year
NO _x ^b	$\frac{0.0109 \text{ lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{112,254,705 \text{ MMBtu}}{\text{yr}}$	612 tons NO _x per year
CO ^b	$\frac{0.00226 \text{ lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{112,254,705 \text{ MMBtu}}{\text{yr}}$	127 tons CO per year
TSP ^a	$\frac{0.0019 \text{ lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{112,254,705 \text{ MMBtu}}{\text{yr}}$	107 tons TSP per year
PM ₁₀ ^a	$\frac{107 \text{ tons TSP}}{\text{yr}}$	107 tons PM ₁₀ per year

a. EPA 2000, Table 3.1-1.

b. EPA 2000, Table 3.1-2.

CO = carbon monoxide

NO_x = oxides of nitrogen

PM₁₀ = particulates having diameter of 10 microns or less

SO_x = oxides of sulfur

TSP = total suspended particulates

per year (NRC 2002b). PPL Susquehanna concludes that gas-fired generation waste management impacts would be small.

Other Impacts

The ability to construct the gas-fired alternative on the existing SSES site would reduce construction-related impacts. A new gas pipeline would be required for the four gas turbine generators in this alternative. To the extent practicable, PPL Susquehanna would route the pipeline along existing, previously disturbed, right-of-way to minimize impacts. Approximately 2 miles of new pipeline construction would be required to connect SSES to an existing 24-inch pipeline just north of the plant. A 16-inch diameter pipeline would necessitate a 50-foot-wide corridor, resulting in the disturbance of as much as 12 acres. This new construction may also necessitate an upgrade of the State-wide pipeline network. PPL Susquehanna estimates that 160 acres would be needed for a plant site; this much previously disturbed acreage is available at SSES, reducing loss of terrestrial habitat. Aesthetic impacts, erosion and sedimentation, fugitive dust, and construction debris impacts would be noticeable but small. PPL Susquehanna estimates a peak construction workforce of 1,043 so socioeconomic impacts of construction would be small. However, PPL Susquehanna estimates a workforce of 88 for gas operations. The reduction in work force would result in adverse socioeconomic impacts. PPL Susquehanna judges these impacts would be moderate and would be mitigated by the site's proximity to several large metropolitan areas.

Impacts to aquatic resources and water quality would be similar to, but smaller than the impacts of SSES, due to the plant's use of the existing cooling water system that withdraws from and discharges to the Susquehanna River, and would be offset by the concurrent shutdown of SSES. The additional stacks and boilers would increase the visual impact of the existing site. Impacts to cultural resources would be unlikely, due to the previously disturbed nature of the site.

PPL Susquehanna judges that other construction and operation impacts would be small. In most cases, the impacts would be detectable, but they would not destabilize any important attribute of the resource involved. Due to the minor nature of these other impacts, mitigation would not be warranted beyond that previously mentioned.

7.2.2.2 Coal-Fired Generation

NRC evaluated environmental impacts from coal-fired generation alternatives in the GEIS (NRC 1996a). NRC concluded that construction impacts could be substantial, due in part to the large land area required (which can result in natural habitat loss) and the large workforce needed. NRC pointed out that siting a new coal-fired plant where

an existing nuclear plant is located would reduce many construction impacts. NRC identified major adverse impacts from operations as human health concerns associated with air emissions, waste generation, and losses of aquatic biota due to cooling water withdrawals and discharges.

The coal-fired alternative that PPL Susquehanna has defined in Section 7.2.1.1 would be located at SSES.

Air Quality

A coal-fired plant would emit SO₂, NO_x, particulate matter, and carbon monoxide, all of which are regulated pollutants. As Section 7.2.1.1 indicates, PPL Susquehanna has assumed a plant design that would minimize air emissions through a combination of boiler technology and post-combustion pollutant removal. PPL Susquehanna estimates the coal-fired alternative emissions to be as follows:

SO₂ = 14,800 tons per year

NO_x = 2,050 tons per year

Carbon monoxide = 2,050 tons per year

Particulates:

Total suspended particulates = 367 tons per year

PM₁₀ (particulates having a diameter of less than 10 microns) = 84 tons per year

Table 7.2-4 shows how PPL Susquehanna calculated these emissions.

The Section 7.2.2.1 discussion of regional air quality is applicable to the coal-fired generation alternative. In addition, NRC noted in the GEIS that adverse human health effects from coal combustion have led to important federal legislation in recent years and that public health risks, such as cancer and emphysema, have been associated with coal combustion. NRC also mentioned global warming and acid rain as potential impacts. PPL Susquehanna concludes that federal legislation and large-scale concerns, such as global warming and acid rain, are indications of concerns about destabilizing important attributes of air resources. However, SO₂ emission allowances, NO_x credits, low NO_x burners, overfire air, fabric filters or electrostatic precipitators, and scrubbers are regulatorily-imposed mitigation measures. As such, PPL Susquehanna concludes that the coal-fired alternative would have moderate impacts on air quality; the impacts would be noticeable and greater than those of the gas-fired alternative, but would not destabilize air quality in the area.

Table 7.2-4. Air Emissions from Coal-Fired Alternative

Parameter	Calculation	Result
Annual coal consumption	$4 \text{ unit} \times \frac{636 \text{ MW}}{\text{unit}} \times \frac{10,200 \text{ Btu}}{\text{kW} \times \text{hr}} \times \frac{1,000 \text{ kW}}{\text{MW}} \times \frac{\text{lb}}{11,782 \text{ Btu}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times 0.85 \times \frac{24 \text{ hr}}{\text{day}} \times \frac{365 \text{ day}}{\text{yr}}$	8,199,574 tons of coal per year
SO _x ^{a,c}	$\frac{38 \times 1.9 \text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{100 - 95}{100} \times \frac{8,199,574 \text{ tons}}{\text{yr}}$	14,800 tons SO _x per year
NO _x ^{b,c}	$\frac{10 \text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{100 - 95}{100} \times \frac{8,199,574 \text{ tons}}{\text{yr}}$	2,050 tons NO _x per year
CO ^c	$\frac{0.5 \text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{8,199,574 \text{ tons}}{\text{yr}}$	2,050 tons CO per year
TSP ^d	$\frac{10 \times 8.96 \text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{100 - 99.9}{100} \times \frac{8,199,574 \text{ tons}}{\text{yr}}$	367 tons TSP per year
PM ₁₀ ^d	$\frac{2.3 \times 8.96 \text{ lb}}{\text{ton}} \times \frac{\text{ton}}{2,000 \text{ lb}} \times \frac{100 - 99.9}{100} \times \frac{8,199,574 \text{ tons}}{\text{yr}}$	84 tons PM ₁₀ per year

a. EPA 1998a, Table 1.1-1.

b. EPA 1998a, Table 1.1-2.

c. EPA 1998a, Table 1.1-3.

d. EPA 1998a, Table 1.1-4.

CO = carbon monoxide

NO_x = oxides of nitrogen

PM₁₀ = particulates having diameter less than 10 microns

SO_x = oxides of sulfur

TSP = total suspended particulates

Waste Management

PPL Susquehanna concurs with the GEIS assessment that the coal-fired alternative would generate substantial solid waste. The coal-fired plant would annually consume approximately 8,200,000 tons of coal having an ash content of 8.96 percent (Tables 7.2-4 and 7.2-2, respectively). After combustion, 90 percent of this ash, approximately 661,000 tons per year, would be marketed for beneficial reuse. The remaining ash, approximately 73,000 tons per year, would be collected and disposed of onsite. In addition, approximately 808,000 tons of scrubber sludge would be disposed of onsite each year (based on annual lime usage of nearly 273,000 tons). PPL Susquehanna estimates that ash and scrubber waste disposal over a 40-year plant life would require approximately 386 acres (a square area with sides of approximately 4,103 feet). Table 7.2-5 shows how PPL Susquehanna calculated ash and scrubber waste volumes. While only half this waste volume and acreage would be attributable to the 20-year license renewal period alternative, the total numbers are pertinent as a cumulative impact.

PPL Susquehanna judges that, with proper siting coupled with current waste management and monitoring practices, waste disposal would not destabilize any resources. There would be space within the SSES property for this disposal. After closure of the waste site and revegetation, the land would be available for other uses. For these reasons, PPL Susquehanna judges that waste disposal for the coal-fired alternative would have moderate impacts; the impacts of increased waste disposal would be noticeable, but would not destabilize any important resource, and further mitigation would be unwarranted.

Other Impacts

PPL Susquehanna estimates that construction of the powerblock and coal storage area would affect 686 acres of land and associated terrestrial habitat. Because most of this construction would be on previously cleared land, impacts at the SSES site would be small to moderate but would be somewhat less than the impacts of using a green field site. Upgrades to an existing rail spur, approximately 1 mile in length, would be required for coal and lime deliveries under this alternative. Visual impacts would be consistent with the industrial nature of the site. As with any large construction project, some erosion and sedimentation and fugitive dust emissions could be anticipated, but would be minimized by using best management practices. Debris from clearing and grubbing could be disposed of onsite. PPL Susquehanna estimates a peak construction work force of 1,600. Socioeconomic impacts from the construction workforce would be

Table 7.2-5. Solid Waste from Coal-Fired Alternative

Parameter	Calculation	Result
Annual SO _x generated ^a	$\frac{8,199,574 \text{ ton coal}}{\text{yr}} \times \frac{1.9 \text{ ton S}}{100 \text{ ton coal}} \times \frac{64.1 \text{ ton SO}_2}{32.1 \text{ ton S}}$	311,428 tons of SO _x per year
Annual SO _x removed	$\frac{311,428 \text{ ton SO}_x}{\text{yr}} \times \frac{95}{100}$	295,857 tons of SO _x per year
Annual ash generated	$\frac{8,199,574 \text{ ton coal}}{\text{yr}} \times \frac{8.96 \text{ ton ash}}{100 \text{ ton coal}} \times \frac{99.9}{100}$	733,947 tons of ash per year
Annual ash recycled	$\frac{733,947 \text{ ton ash}}{\text{yr}} \times \frac{90}{100}$	660,552 tons of ash recycled per year
Annual lime consumption ^b	$\frac{311,428 \text{ ton SO}_2}{\text{yr}} \times \frac{56.1 \text{ ton CaO}}{64.1 \text{ ton SO}_2}$	272,561 tons of CaO per year
Calcium sulfate ^c	$\frac{295,857 \text{ ton SO}_2}{\text{yr}} \times \frac{172 \text{ ton CaSO}_4 \cdot 2\text{H}_2\text{O}}{64.1 \text{ ton SO}_2}$	793,875 tons of CaSO ₄ •2H ₂ O per year
Annual scrubber waste ^d	$\frac{272,561 \text{ ton CaO}}{\text{yr}} \times \frac{100 - 95}{100} + 793,875 \text{ ton CaSO}_4 \cdot 2\text{H}_2\text{O}$	807,503 tons of scrubber waste per year
Total volume of scrubber waste ^e	$\frac{807,503 \text{ ton}}{\text{yr}} \times 40 \text{ yr} \times \frac{2,000 \text{ lb}}{\text{ton}} \times \frac{\text{ft}^3}{144.8 \text{ lb}}$	446,232,920 ft ³ of scrubber waste
Total volume of ash ^f	$\frac{733,947 \text{ ton}}{\text{yr}} \times 40 \text{ yr} \times \frac{2,000 \text{ lb}}{\text{ton}} \times \frac{\text{ft}^3}{100 \text{ lb}}$	587,157,728 ft ³ of ash
Total volume of solid waste	$446,232,920 \text{ ft}^3 + 587,157,728 \text{ ft}^3 \times \frac{100 - 90}{100}$	504,948,693 ft ³ of solid waste
Waste pile area (acres)	$\frac{504,948,693 \text{ ft}^3}{30 \text{ ft}} \times \frac{\text{acre}}{43,560 \text{ ft}^2}$	386 acres of solid waste
Waste pile area (ft x ft square)	$\sqrt{(504,948,693 \text{ ft}^3 / 30 \text{ ft})}$	4,103 feet by feet square of solid waste

Based on annual coal consumption of 8,199,574 tons per year (Table 7.2-4).

- a. Calculations assume 100 percent combustion of coal.
 - b. Lime consumption is based on total SO₂ generated.
 - c. Calcium sulfate generation is based on total SO₂ removed.
 - d. Total scrubber waste includes scrubbing media carryover.
 - e. Density of CaSO₄•2H₂O is 144.8 lb/ft³.
 - f. Density of coal bottom ash is 100 lb/ft³ (FHA 2000).
- S = sulfur
SO_x = oxides of sulfur
CaO = calcium oxide (lime)
CaSO₄•2H₂O = calcium sulfate dihydrate

minimal, because worker relocation would not be expected, due to the site's proximity to several large metropolitan areas. PPL Susquehanna estimates an operational workforce of 197 for the coal-fired alternative. The reduction in workforce would result in adverse socioeconomic impacts. PPL Susquehanna judges these impacts would be small, due to SSES's proximity to large metropolitan areas.

Impacts to aquatic resources and water quality would be similar to impacts of SSES, due to the plant's use of the existing cooling water system that withdraws from and discharges to the Susquehanna River, and would be offset by the concurrent shutdown of SSES. The additional stacks, boilers, and rail deliveries would increase the visual impact of the existing site. Impacts to cultural resources would be unlikely, due to the previously disturbed nature of the site.

PPL Susquehanna judges that other construction and operation impacts would be small. In most cases, the impacts would be detectable, but they would not destabilize any important attribute of the resource involved. Due to the minor nature of these other impacts, mitigation would not be warranted beyond that previously mentioned.

7.2.2.3 Purchased Power

As discussed in Section 7.2.1.2, PPL Susquehanna assumes that the generating technology used under the purchased power alternative would be one of those that NRC analyzed in the GEIS. PPL Susquehanna is also adopting by reference the NRC analysis of the environmental impacts from those technologies. Under the purchased power alternative, therefore, environmental impacts would still occur, but they would likely originate from a power plant located elsewhere in the PJM region. PPL Susquehanna judges that imports from outside the PJM region would not be required.

The purchased power alternative would include constructing up to 50 miles of high-voltage (i.e., 345- or 500-kilovolt) transmission lines to get power from the remote locations in the PJM region to the PPL Electric Utilities' service area. PPL Susquehanna judges most of the transmission lines could be routed along existing rights-of-way. PPL Susquehanna assumes that the environmental impacts of transmission line construction would be moderate. As indicated in the introduction to Section 7.2.1.1, the environmental impacts of construction and operation of new coal- or gas-fired generating capacity for purchased power at a previously undisturbed green field site would exceed those of a coal- or gas-fired alternative located on the SSES site.

7.3 REFERENCES

Note to reader: Some web pages cited in this document are no longer available, or are no longer available through the original URL addresses. Hard copies of cited web pages are available in PPL Susquehanna files. Some sites, for example the census data, cannot be accessed through their given URLs. The only way to access these pages is to follow queries on previous web pages. The complete URLs used by PPL Susquehanna have been given for these pages, even though they may not be directly accessible. Also, all references are specific to respective chapter.

AWEA (American Wind Energy Association). 2002. "Inventory of State Incentives For Wind Energy in the U.S. A State By State Survey." September. Available at <http://www.awea.org/pubs/inventory.html>. Accessed July 19, 2004.

Chase, D.L and Kehoe, P.T. 2000. *GE Combined-Cycle Product Line and Performance*. GER-3574G. GE Power Systems, Schenectady, NY. October.

CSFCC (California Stationary Fuel Cell Collaborative). 2002. "White Paper Summary of Interviews with Stationary Fuel Cell Manufacturers." Available at <http://stationaryfuelcells.org/Index.htm>. Accessed December 23, 2003.

DOE (U.S. Department of Energy). 2004a. Installed U.S. Wind Capacity. Office of Energy Efficiency and Renewable Energy. Available at http://www.eere.energy.gov/windandhydro/windpoweringamerica/wind_installed_capacity.asp. Accessed February 3, 2005.

DOE (U.S. Department of Energy). 2004b. "PV FAQs - How much land will PV need to supply our electricity?". DOE/GO-102004-1835. Office of Energy Efficiency and Renewable Energy Washington, DC. February. Available at http://www.nrel.gov/ncpv/pdfs/land_faq.pdf. Accessed February 3, 2005.

EIA (Energy Information Administration). 2002. *Electric Power Annual 2000, Volume II*. DOE/EIA-0348(00)/2. November. Available at <http://www.eia.doe.gov/cneaf/electricity/epav2/epav2.pdf>. Accessed December 2, 2002.

EIA (Energy Information Administration). 2004a. *State Electricity Profiles 2002*. DOE/EIA-0348(01)/2. January. Available at http://www.eia.doe.gov/cneaf/electricity/st_profiles/e_profiles_sum.html. Accessed July 28, 2004.

EIA (Energy Information Administration). 2004b. *Cost and Quality of Fuels for Electric Utility Plants 2001*. DOE/EIA-0191(01). March. Available at http://www.eia.doe.gov/cneaf/electricity/cq/cq_sum.html. Accessed July 28, 2004.

- EPA (U.S. Environmental Protection Agency). 1998a. Air Pollutant Emission Factors. Vol. 1, Stationary Point Sources and Area Sources. Section 1.1, "Bituminous and Subbituminous Coal Combustion." AP-42. September. Available at <http://www.epa.gov/ttn/chief/ap42c1.html>. Accessed July 26, 2001.
- EPA (U.S. Environmental Protection Agency). 1998b. Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone. Federal Register. Vol. 63, No. 207. October 27.
- EPA (U.S. Environmental Protection Agency). 2000. Air Pollutant Emission Factors. Vol. 1, Stationary Point Sources and Area Sources. Section 3.1, "Stationary Gas Turbines." AP-42. April. Available at <http://www.epa.gov/ttn/chief/ap42c3.html>. Accessed July 26, 2001.
- FERC (Federal Energy Regulatory Commission). 2005. "Outstanding Preliminary Permits As of 01/19/2005." Available at <http://www.ferc.gov/industries/hydropower/gen-info/pre-permits.pdf>. Accessed April 7, 2005.
- FHA (Federal Highway Administration). 2000. "User Guidelines for Waste and Byproduct Materials in Pavement Construction." Available at <http://fhrc.gov/hnr20/recycle/waste/pubs.htm>. Accessed December 3, 2002.
- Fuel Cell Today. 2003. "Fuel Cells Market Survey: Large Stationary Applications." Available at <http://www.fuelcelltoday.com>. Accessed on September 7, 2004.
- INEEL (Idaho National Engineering and Environmental Laboratory). 1998. *U.S. Hydropower Resource Assessment Final Report*. DOE/ID-10430.2. Available at <http://hydropower.inel.gov/resourceassessment/pdfs/doeid-10430.pdf>. Accessed July 19, 2004.
- Kenergy Corporation. 2000. "Fuel Cell Technology – Its Role in the 21st Century." Commercial & Industrial News 4th Quarter 2000. Available at <http://www.kenergycorp.com/ci/cinews/qtr4ci2000/technology.htm>. Accessed on June 19, 2002.
- McGowan, J.G. and S. Connors. 2000. Windpower: A Turn of the Century Review. *Annual Review of Energy and the Environment*, Volume 25, pages 147-197.
- NEI (Nuclear Energy Institute). 2000. "Restructuring the U.S. Electric Power Industry." Available at <http://www.nei.org/doc.asp?catnum=3&catid=277>. Accessed December 12, 2000.

- NRC (U.S. Nuclear Regulatory Commission). 1996a. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Volumes 1 and 2. NUREG 1437. Washington, DC. May.
- NRC (U.S. Nuclear Regulatory Commission). 1996b. Supplementary Information to Final Rule. Federal Register. Vol. 61, No. 244. December 18.
- NRC (U.S. Nuclear Regulatory Commission). 2002a. Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities; Supplement 1; Regarding the Decommissioning of Nuclear Power Reactors. NUREG-0586 Supplement 1. Washington, DC. November.
- NRC (U.S. Nuclear Regulatory Commission). 2002b. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding McGuire Nuclear Station, Units 1 and 2*. NUREG-1437, Supplement 8, Final. Office of Nuclear Reactor Regulation. Washington, DC. December.
- Pinero, E. 2001. Testimony Summary: The House Committee on Energy and Commerce, Subcommittee on Energy and Air Quality Hearing, March 14, 2001. Available at <http://www.house.gov/commerce/hearings/0314201-94/Pinero127.htm>. Accessed August 13, 2004.
- PJM (PJM Interconnection, LLC). 2004a. "2003 PJM (Eastern and Western Region) Capacity by Fuel Type." April 22, 2004. Available at <http://www.pjm.com/services/system-performance/downloads/capacity-by-fuel-type-2003.pdf>. Accessed July 9, 2004.
- PJM (PJM Interconnection, LLC). 2004b. "2003 PJM Annual Report - The Wave of Continuous Improvement." Available at <http://www.pjm.com/about/downloads/pjm-web.pdf>. Accessed July 9, 2004.
- PJM (PJM Interconnection, LLC). 2004c. "PJM Regional Average Disclosure Label for 2003. March 1, 2004." Available at <http://www.pjm.com/committees/working-groups/gats/download/2003-gats-discloure-label.pdf>. Accessed July 9, 2004.
- PPL. 2004. "PPL's Susquehanna Nuclear Plant Sets Generation Record." January 9, 2004. Available at http://www1.pplweb.com/newsapp/news_releases.articleview?p_artid=2321. Accessed August 11, 2004.
- Pennsylvania General Assembly. 1996. House Bill No. 1509, Electricity Generation Customer Choice and Competition Act, as Amended. Available at <http://www.puc.state.pa.us/electric/pdf/HB1509P4282.pdf>. Accessed August 6, 2004.

- Pennsylvania General Assembly. 2004. Senate Bill No. 1030, Alternative Energy Portfolio Standards Act, as Amended. Available at <http://www2.legis.state.pa.us/WU01/LI/BI/BT/2003/0/SB1030P1973.pdf>. Accessed April 7, 2005.
- PSEB (Pennsylvania Sustainable Energy Board). 2004. "Pennsylvania Sustainable Energy Board 2003 Annual Report." May 11, 2004. Available at http://www.puc.state.pa.us/electric/electric_index.aspx. Accessed August 6, 2004.
- Power Engineering 2003. "Pennsylvania Issues Final Environmental Permits for Fairless Energy Works". Available at http://pepei.pennnet.com/articles/article_display.cfm?Section=ONART&Category=ENVIR&PUBLICATION_ID=6&ARTICLE_ID=189657. Accessed March 31, 2005.
- Walsh M. E., R. L. Perlack, A. Turhollow, D. de la Torre Ugarte, D. A. Becker, R. L. Graham, S. E. Slinsky, and D. E. Ray. 2000. "Biomass Feedstock Availability in the United States: 1999 State Level Analysis." Oak Ridge National Laboratory. Oak Ridge, TN. April 30, 1999. Updated January, 2000. Available at <http://bioenergy.ornl.gov/resourcedata/index.html>. Accessed July 28, 2004.

8.0 COMPARISON OF ENVIRONMENTAL IMPACT OF LICENSE RENEWAL WITH THE ALTERNATIVES

NRC

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

Chapter 4 analyzes environmental impacts of SSES license renewal and Chapter 7 analyzes impacts from renewal alternatives. Table 8.0-1 summarizes environmental impacts of the proposed action (license renewal) and the alternatives, for comparison purposes. The environmental impacts compared in Table 8.0-1 are those that are either Category 2 issues for the proposed action or are issues that the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS) (NRC 1996) identified as major considerations in an alternatives analysis. For example, although the U. S. Nuclear Regulatory Commission (NRC) concluded that air quality impacts from the proposed action would be small (Category 1), the GEIS identified major human health concerns associated with air emissions from alternatives (Section 7.2.2). Therefore, Table 8.0-1 compares air impacts from the proposed action to the alternatives. Table 8.0-2 is a more detailed comparison of the alternatives.

Table 8.0-1. Impacts Comparison Summary.

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

SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE - Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource. 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3.

Table 8.0-2. Impacts Comparison Detail.

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Alternative Descriptions				
SSES license renewal for 20 years, followed by decommissioning	Decommissioning following expiration of current SSES license. Adopting by reference, as bounding SSES decommissioning, GEIS description (NRC 1996, Section 7.1)	New construction at the SSES site.	New construction at the SSES site.	Would involve construction of new generation capacity in the PJM region. Adopting by reference GEIS description of alternate technologies (Section 7.2.1.2)
		Upgrade 1 mile of existing rail spur.	Construct 2 miles of gas pipeline in a 50-foot-wide corridor, disturbing up to 12 acres. May require upgrades to existing 24-inch pipelines.	
		Use existing switchyard and transmission lines	Use existing switchyard and transmission lines	Construct up to 50 miles of transmission lines
		Four 600-MW (net) tangentially-fired, dry bottom units; capacity factor 0.85	Four 600-MW (net) combined-cycle units (two 172-MW combustion turbines, one 256-MW heat recovery steam generators); capacity factor 0.85	

Table 8.0-2. Impacts Comparison Detail (Continued).

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
		Existing SSES intake/ discharge canal system	Existing SSES intake/ discharge canal system	
		Pulverized bituminous coal, 11,782 Btu/lb; 10,200 Btu/kWh; 8.96% ash; 1.90% sulfur; 10 lb/ton nitrogen oxides; 8,199,574 tons coal/yr	Natural gas, 1,027 Btu/ft ³ ; 6,040 Btu/kWh; 0.0034 lb sulfur/MMBtu; 0.0109 lb NO _x /MMBtu; 109,303,509,873 ft ³ gas/yr	
		Low NO _x burners, overfire air and selective catalytic reduction (95% NO _x reduction efficiency).	Selective catalytic reduction with steam/water injection	
		Wet scrubber – lime/limestone desulfurization system (95% SO _x removal efficiency); 272,561 tons lime/yr Fabric filters or electrostatic precipitators (99.9% particulate removal efficiency)		

Table 8.0-2. Impacts Comparison Detail (Continued).

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
1,200 permanent and 160 long-term contract workers		197 workers (Section 7.2.2.2)	88 workers (Section 7.2.2.1)	
Land Use Impacts				
SMALL – Adopting by reference Category 1 issue findings (Attachment A, Table A-1, Issues 52, 53)	SMALL – Not an impact evaluated by GEIS (NRC 1996)	MODERATE – 686 acres required for the powerblock and associated facilities; 195 acres for ash disposal (Section 7.2.2.2).	SMALL to MODERATE – 160 acres for facility at SSES location; 12 acres for pipeline (Section 7.2.2.1). New gas pipeline would be built to connect with existing gas pipeline corridor.	MODERATE – most transmission facilities could be constructed along existing transmission corridors (Section 7.2.2.3). Adopting by reference GEIS description of land use impacts from alternate technologies (NRC 1996)
Water Quality Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table A-1, Issues 3, 6, 7-11 and 32). Two Category 2 groundwater issues apply (Section 4.1, Issue 13; and Section 4.6, Issue 34). Three Category 2 groundwater issues don't apply (Section 4.5, Issue 33; Section 4.7, Issue 35; and Section 4.8, Issue 39).	SMALL – Adopting by reference Category 1 issue finding (Table A-1, Issue 89).	SMALL – Construction impacts minimized by use of best management practices. Operational impacts minimized by use of the existing cooling towers that withdraw make-up water from the Susquehanna River. (Section 7.2.2.2)	SMALL – Reduced cooling water demands, inherent in combined-cycle design (Section 7.2.2.1)	SMALL to MODERATE – Adopting by reference GEIS description of water quality impacts from alternate technologies (NRC 1996)

Table 8.0-2. Impacts Comparison Detail (Continued).

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Air Quality Impacts				
SMALL – Adopting by reference Category 1 issue finding (Table A-1, Issue 51). Category 2 issue not applicable (Section 4.11, Issue 50).	SMALL – Adopting by reference Category 1 issue findings (Table A-1, Issue 88)	MODERATE – 14,800 tons SOx/yr 2,050 tons NOx/yr 2,050 tons CO/yr 367 tons TSP/yr 84 tons PM-10/yr (Section 7.2.2.2)	MODERATE – 191 tons SOx/yr 612 tons NOx/yr 127 tons CO/yr 107 tons PM-10/yr ^a (Section 7.2.2.1)	SMALL to MODERATE – Adopting by reference GEIS description of air quality impacts from alternate technologies (NRC 1996)
Ecological Resource Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table A-1, Issues 15-24,28-30, 41-43, and 45-48). Four Category 2 issues not applicable (Section 4.2, Issue 25; Section 4.3, Issue 26; Section 4.4, Issue 27; and Section 4.9, Issue 40).	SMALL – Adopting by reference Category 1 issue finding (Table A-1, Issue 90)	MODERATE – 386 acres of former woodland could be required for ash/sludge disposal over 20-year license renewal term. (Section 7.2.2.2)	SMALL – Construction of 2 miles of pipeline could alter the terrestrial habitat. (Section 7.2.2.1)	SMALL to MODERATE – Adopting by reference GEIS description of ecological resource impacts from alternate technologies (NRC 1996)

Table 8.0-2. Impacts Comparison Detail (Continued).

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Threatened or Endangered Species Impacts				
SMALL – No threatened or endangered species are known residents at the site or along the transmission corridors. (Section 4.10, Issue 49)	SMALL – Not an impact evaluated by GEIS (NRC 1996)	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats
Human Health Impacts				
SMALL – Adopting by reference Category 1 issues (Table A-1, Issues 56, 58, 61, 62). One Category 2 issue does apply (Section 4.12, Issue 57). Risk due to transmission-line induced currents minimal due to conformance with consensus code (Section 4.13, Issue 59)	SMALL – Adopting by reference Category 1 issue finding (Table A-1, Issue 86)	MODERATE – Adopting by reference GEIS conclusion that risks such as cancer and emphysema from emissions are likely (NRC 1996)	SMALL – Adopting by reference GEIS conclusion that some risk of cancer and emphysema exists from emissions (NRC 1996)	SMALL to MODERATE – Adopting by reference GEIS description of human health impacts from alternate technologies (NRC 1996)

Table 8.0-2. Impacts Comparison Detail (Continued).

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Socioeconomic Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table A-1, Issues 64, 67). Two Category 2 issues are not applicable (Section 4.16, Issue 66 and Section 4.17.1, Issue 68). Location in high population area with no growth controls minimizes potential for housing impacts. Section 4.14, Issue 63). Plant property tax payment represents 6 to 7 percent of county's total tax revenues (Section 4.17.2, Issue 69). Capacity of public water supply and transportation infrastructure minimizes potential for related impacts (Section 4.15, Issue 65 and Section 4.18, Issue 70)	SMALL – Adopting by reference Category 1 issue finding (Table A-1, Issue 91)	SMALL – Reduction in permanent work force at SSES could adversely affect surrounding counties, but would be mitigated by SSES's proximity to several metropolitan areas (Section 7.2.2.2).	SMALL to MODERATE – Reduction in permanent work force at SSES could adversely affect surrounding counties, but would be mitigated by SSES's proximity to several metropolitan areas (Section 7.2.2.1)	SMALL to MODERATE – Adopting by reference GEIS description of socioeconomic impacts from alternate technologies (NRC 1996)

Table 8.0-2. Impacts Comparison Detail (Continued).

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Waste Management Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table A-1, Issues 77-85)	SMALL – Adopting by reference Category 1 issue finding (Table A-1, Issue 87)	MODERATE – 73,000 tons of coal ash and 808,000 tons of scrubber sludge annually would require 193 acres over 20-year license renewal term. Industrial waste generated annually (Section 7.2.2.2)	SMALL – Approximately 1,500 ft ³ spent SCR catalyst per year (Section 7.2.2.1)	SMALL to MODERATE – Adopting by reference GEIS description of waste management impacts from alternate technologies (NRC 1996)
Aesthetic Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table A-1, Issues 73, 74)	SMALL – Not an impact evaluated by GEIS (NRC 1996)	SMALL to MODERATE – The coal-fired power blocks and the exhaust stacks would be visible from a moderate offsite distance (Section 7.2.2.2)	SMALL– Steam turbines and stacks would create visual impacts comparable to those from existing SSES facilities (Section 7.2.2.1)	SMALL to MODERATE – Adopting by reference GEIS description of aesthetic impacts from alternate technologies (NRC 1996)

Table 8.0-2. Impacts Comparison Detail (Continued).

Proposed Action (License Renewal)	Base (Decommissioning)	No-Action Alternatives		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Cultural Resource Impacts				
SMALL – SHPO consultation minimizes potential for impact (Section 4.19, Issue 71)	SMALL – Not an impact evaluated by GEIS (NRC 1996)	SMALL – Impacts to cultural resources would be unlikely due to developed nature of the site (Section 7.2.2.2)	SMALL – 12 acres of pipeline construction in previously disturbed soil would be unlikely to affect cultural resources (Section 7.2.2.1)	SMALL – Adopting by reference GEIS description of cultural resource impacts from alternate technologies (NRC 1996)

SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE - Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource. (10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3).

a. All TSP for gas-fired alternative is PM-10.

Btu = British thermal unit

ft³ = cubic foot

gal = gallon

GEIS = Generic Environmental Impact Statement (NRC 1996)

kWh = kilowatt hour

lb = pound

MM = million

MW = megawatt

NOx = nitrogen oxide

PJM = regional electric distribution network

PM-10 = particulates having diameter less than 10 microns

SHPO = State Historic Preservation Officer

SOx = sulfur dioxide

TSP = total suspended particulates

yr = year

8.1 REFERENCES

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

9.0 STATUS OF COMPLIANCE

9.1 PROPOSED ACTION

NRC

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

9.1.1 GENERAL

Table 9.1-1 lists environmental authorizations that PPL Susquehanna has obtained for current SSES operations. In this context, PPL Susquehanna uses "authorizations" to include any permits, licenses, approvals, or other entitlements. PPL Susquehanna expects to continue renewing these authorizations during the current license period and through the U.S. Nuclear Regulatory Commission (NRC) license renewal period. Because the NRC regulatory focus is prospective Table 9.1-1 does not include authorizations that PPL Susquehanna obtained for past activities that did not include continuing obligations.

Preparatory to applying for renewal of the SSES license to operate, PPL Susquehanna conducted an assessment to identify any new and significant environmental information (Chapter 5). The assessment included interviews with PPL Susquehanna subject experts, review of SSES environmental documentation, and communication with state and federal environmental protection agencies. Based on this assessment, PPL Susquehanna concludes that SSES is in compliance with applicable environmental standards and requirements.

Table 9.1-2 lists additional environmental authorizations and consultations related to NRC renewal of the SSES license to operate. As indicated, PPL Susquehanna anticipates needing relatively few such authorizations and consultations. Sections 9.1.2 through 9.1.5 discuss some of these items in more detail.

Table 9.1-1. Environmental Authorizations for Current SSES Operations.

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Covered
Federal and State Requirements					
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011, et seq.), 10 CFR 50.10	License to operate	NPF-14 NPF-22	Issued: 7/17/1982 Expires: 7/17/2022 Issued: 3/23/1984 Expires: 3/23/2024	Operation of SSES Unit 1 Operation of SSES Unit 2
U.S. Department of Transportation	49 USC 5108	Registration	0615065500290Q	Issued: 6/15/06 Expires: 6/30/09	Hazardous materials shipments
U.S. Environmental Protection Agency	40 CFR Part 68	Risk Management Program	EPA Facility ID # 1000 0004 9128	Issued: 6/15/04 Expires: 6/15/09	Hydrogen Tank Farm
U.S. Army Corps of Engineers	Section 10 of River and harbor Act of 1899 (33 U.S.C. 403)	Water Obstruction & Encroachment Permit Joint Permit	CENAB-OP-RPA 200300823-12	Issued: 2/15/2006 Expires: 6/30/2006	Maintenance dredging in front of the River Intake Structure and Cleaning the Cooling Tower blowdown discharge diffuser pipe
Pennsylvania Department of Environmental Protection	Pennsylvania Public Laws 834, 204, 851, 1987, etc.	Water Obstruction & Encroachment Permit Joint Permit	PASPGP-2 E40-195	Issued: 2/15/2006 Expires: 6/30/2006	[Same as COE permit]

Table 9.1-1. Environmental Authorizations for Current SSES Operations. (Continued)

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Covered
Federal and State Requirements					
U.S. Army Corps of Engineers	Section 10 of River and Harbor Act of 1899 (33 U.S.C. 403)	Water Obstruction & Encroachment Permit Joint Permit	CENAB-OP-RR 87-1767-4	Issued: 8/31/88 Expired: 12/31/90	Boat Ramp Env. Lab; can perform routine maintenance
Pennsylvania Department of Environmental Protection	Pennsylvania Public Laws 834, 204, 851, 1987, etc.	Water Obstruction & Encroachment Permit Joint Permit	E40-192	Issued: 8/31/88 Expired: 12/31/90	Boat Ramp Env. Lab; can perform routine maintenance
U.S. Army Corps of Engineers	Section 10 of River and Harbor Act of 1899 (33 U.S.C. 403)	Water Obstruction & Encroachment Permit Joint Permit	PASPGP-2 E40-609 APS No. 457878	Issued: 12/19/02 Expired: 12/19/05	Work in wetlands
Pennsylvania Department of Environmental Protection	Title 25 Chapter 105, Dam Safety and Waterway Management	Water Obstruction & Encroachment Permit Joint Permit	PASPGP-2: E40-609 APS No. 457878	Issued: 12/19/02 Expired: 12/19/05	Work in wetlands

Table 9.1-1. Environmental Authorizations for Current SSES Operations. (Continued)

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Covered
Federal and State Requirements					
Pennsylvania Department of Environmental Protection	Clean Water Act (33 USC 1251 et seq.), PA Title 25 Chapter 92, National Pollutant Discharge Elimination System Permit	National Pollutant Discharge Elimination System Permit	PA-0047325	Issued: 9/1/2005 Expires: 8/31/2010	Industrial wastewater discharges to Susquehanna River
Pennsylvania Department of Environmental Protection	Clean Air Act (42 USC 7401 et seq), PA Title 25 Chapter 127, Construction, Modification, Reactivation and Operation of Sources	Operating Permit	40-00027	Issued: 11/24/2003 Expires: 11/24/2008	All air emission sources at SSES

Table 9.1-1. Environmental Authorizations for Current SSES Operations. (Continued)

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Covered
Federal and State Requirements					
Pennsylvania Department of Environmental Protection	Clean Water Act (33 USC 1251 et seq.); Clean Air Act (42 USC 7401 et seq.); Resource Conservation and Recovery Act (42 USC 6901 et seq.); PA Title 245, Administration of the Storage Tank and Spill Prevention Program	Registration or certificate	40-10748-008A	Issued: 4/4/2006 Expires: 4/4/2007	Used diesel oil tank "A"
Pennsylvania Department of Environmental Protection	same	Registration or certificate	40-10748-011A	Issued: 4/4/2006 Expires: 4/4/2007	Unit 1 condensate demineralizer sulfuric acid storage tank
Pennsylvania Department of Environmental Protection	same	Registration or Certificate	40-10748-012A	Issued: 4/4/2006 Expires: 4/4/2007	Unit 1 condensate demineralizer sodium hydroxide storage tank
Pennsylvania Department of Environmental Protection	same	Registration or certificate	40-10748-020A	Issued: 4/4/2006 Expires: 4/4/2007	Raw water treatment alum storage tank

Table 9.1-1. Environmental Authorizations for Current SSES Operations. (Continued)

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Covered
Federal and State Requirements					
Pennsylvania Department of Environmental Protection	same	Registration or certificate	40-10748-019A	Issued: 4/4/2006 Expires: 4/4/2007	Raw water treatment sodium hypochlorite storage tank
Pennsylvania Department of Environmental Protection	same	Registration or certificate	40-10748-025A	Issued: 4/4/2006 Expires: 4/4/2007	Sodium bisulfite
Pennsylvania Department of Environmental Protection	same	Registration or certificate	40-10748-023A	Issued: 4/4/2006 Expires: 4/4/2007	Sodium hypochlorite
Pennsylvania Department of Environmental Protection	same	Registration or certificate	40-10748-024A	Issued: 4/4/2006 Expires: 4/4/2007	Sodium hypochlorite
Pennsylvania Department of Environmental Protection	same	Registration or certificate	40-10748-016	Issued: 4/4/2006 Expires: 4/4/2007	Unit 1 batch lube oil tank
Pennsylvania Department of Environmental Protection	same	Registration or certificate	40-10748-017	Issued: 4/4/2006 Expires: 4/4/2007	Unit 2 batch lube oil tank

Table 9.1-1. Environmental Authorizations for Current SSES Operations. (Continued)

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Covered
Federal and State Requirements					
Pennsylvania Department of Environmental Protection	same	Registration or certificate	40-10748-018	Issued: 4/4/2006 Expires: 4/4/2007	Fuel farm gasoline tank
Pennsylvania Department of Environmental Protection	same	Registration or certificate	40-10748-019	Issued: 4/4/2006 Expires: 4/4/2007	Fuel farm diesel fuel tank
Pennsylvania Department of Environmental Protection	PA Title 25 Chapter 109, Safe Drinking Water	Public Water Supply Brief Description Form	ID 2400994 Site Well System (Wells TW1 & TW2)	Issued: 2/17/89 Expires: N/A	Well registration continues indefinitely unless there are upgrades
Pennsylvania Department of Environmental Protection	PA Title 25 Chapter 109, Safe Drinking Water	Public Water Supply Brief Description Form	ID 2400995 Riverlands Recreation Area	Issued: 12/4/85 Expires: N/A	Well registration continues indefinitely unless there are upgrades
Pennsylvania Department of Environmental Protection	PA Title 25 Chapter 109, Safe Drinking Water	Public Water Supply Brief Description Form	ID 2400999 Energy Information Center	Issued: 12/4/85 Expires: N/A	Well registration continues indefinitely unless there are upgrades
Pennsylvania Department of Environmental Protection	PA Title 25 Chapter 109, Safe Drinking Water	Public Water Supply Brief Description Form	ID 2400938 West Building (formerly Emergency Operations Facility)	Issued: 12/4/85 Expires: N/A	Well registration continues indefinitely unless there are upgrades

Table 9.1-1. Environmental Authorizations for Current SSES Operations. (Continued)

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Covered
Federal and State Requirements					
Pennsylvania Department of Environmental Protection	Section 3010 of Resource Conservation and Recovery Act	Acknowledgement of notification of Hazardous Waste Activity	PAD000765883	Issued: 8/9/2000 Expires: N/A	Hazardous waste
Pennsylvania Fish and Boat Commission	Chapter 29 of the Fish and Boat Code, Act 1980- 175 amended	Scientific Collecting Permit	008 Type III (R) 007 Type III (R)	Issued: 3/28/2005 Expires: 12/31/2005	Collect fish, epilithic algae, zooplankton, macroinvertebrate, amphibians, reptiles
Susquehanna River Basin Commission	Regulation 18 CFR 803 for Consumptive use	Approval for Consumptive use water	Application 19950301	Issued: 3/9/1995 Expires: N/A	Low flow augmentation
South Carolina Department of Health and Environmental Control – Division of Waste Management	South Carolina Radioactive Waste Transportation and Disposal Act (Act No. 429)	South Carolina Radioactive Waste Transport Permit	0162-37-05	Issued: 11/18/05 Expires: 12/31/06	Transportation of radioactive waste into the State of South Carolina

Table 9.1-1. Environmental Authorizations for Current SSES Operations. (Continued)

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Covered
Federal and State Requirements					
State of Tennessee Department of Environment and Conservation Division of Radiological Health	Tennessee Department of Environment and Conservation Rule 1200-2-10.32	Tennessee Radioactive Waste License-for-Delivery	T-PA001-L05	Issued: 1/1/06 Expires: 12/31/06	Transportation of radioactive waste into the State of Tennessee
Commonwealth of Virginia Department of Emergency Management	Virginia Code, Title 44, Chapter 3.3, Section 44-143.30	Commonwealth of Virginia Radioactive Waste Transport Registration	PS-S-013107	Issued : 1/13/05 Expires: 1/31/07	Registration to transport hazardous radioactive materials in the State of Virginia

Table 9.1-2. Environmental Authorizations for SSES License Renewal^a

Agency	Authority	Requirement	Remarks
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011 et seq.)	License renewal	Environmental Report submitted in support of license renewal application
U.S. Fish and Wildlife Service (FWS)	Endangered Species Act Section 7 (16 USC 1536)	Consultation	Requires federal agency issuing a license to consult with the FWS (Attachment B)
Pennsylvania Department of Environmental Protection	Clean Water Act Section 401 (33 USC 1341)	Certification	State issuance of NPDES permit (Attachment F) constitutes 401 certification (Section 9.1.4)
Pennsylvania Historical and Museum Commission	National Historic Preservation Act Section 106 (16 USC 470f)	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with State Historic Preservation Officer (SHPO). SHPO must concur that license renewal will not affect any sites listed or eligible for listing (Attachment D)

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

9.1.2 THREATENED OR ENDANGERED SPECIES

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

Although not required of an applicant by federal law or NRC regulation, PPL Susquehanna has chosen to invite comment from federal and state agencies regarding potential effects that SSES license renewal might have. Attachment B includes copies

of PPL Susquehanna correspondence with FWS, Pennsylvania Department of Conservation and Natural Resources, the Pennsylvania Game Commission, and the Pennsylvania Fish and Boat Commission. The FWS responded that license renewal will not adversely affect federally listed and proposed endangered and threatened species as long as tree-cutting activities follow specific guidelines to protect the endangered Indiana bat. The Pennsylvania Department of Conservation and Natural Resources provided a list of special status plants, terrestrial invertebrates, and natural communities in the vicinity of the transmission lines and indicated that no impact is likely from this project. The Pennsylvania Game Commission responded that license renewal will not adversely impact any special status species recognized by the Game Commission. The Pennsylvania Fish and Boat Commission responded that no adverse impacts are expected from license renewal.

9.1.3 HISTORIC PRESERVATION

Section 106 of the National Historic Preservation Act (16 USC 470 et seq.) requires federal agencies having the authority to license any undertaking to, prior to issuing the license, take into account the effect of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. Council regulations provide for the State Historic Preservation Officer (SHPO) to have a consulting role (35 CFR 800.2). Although not required of an applicant by federal law or NRC regulation, PPL Susquehanna has chosen to invite comment by the Pennsylvania SHPO. Attachment D contains a copy of PPL Susquehanna's letter to the Pennsylvania SHPO and the SHPO's response agreeing that license renewal will have no adverse effect on significant cultural resources within the project area.

9.1.4 WATER QUALITY (401) CERTIFICATION

Federal Clean Water Act Section 401 can require an applicant for a federal license to conduct an activity that might result in a discharge into navigable waters to provide the licensing agency a certification from the state that the discharge will comply with applicable Clean Water Act requirements (33 USC 1341).

However, in the case of the SSES operation, the Pennsylvania Department of Environmental Resources determined that the 401 Certification was not required (PADER 1982). NRC has indicated in its Generic Environmental Impact Statement for License Renewal (NRC 1996, Section 4.2.1.1) that issuance of a National Pollutant Discharge Elimination System (NPDES) permit implies certification by the state. PPL

Susquehanna is applying to NRC for license renewal to continue SSES operations. Consistent with the GEIS, PPL Susquehanna is providing SSES's NPDES permit approval letter and cover sheet as evidence of state water quality (401) certification (Attachment F).

9.2 ALTERNATIVES

NRC

“The discussion of alternatives in the report shall include a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements.” 10 CFR 51.45(d), as required by 10 CFR 51.53(c)(2)

The coal, gas, and purchased power alternatives discussed in Section 7.2.1 probably could be constructed and operated to comply with applicable environmental quality standards and requirements. PPL Susquehanna notes that increasingly stringent air quality protection requirements could make the construction of a large fossil-fueled power plant infeasible in many locations. PPL Susquehanna also notes that the U.S. Environmental Protection Agency has revised requirements for design and operation of cooling water intake structures at new and existing facilities (40 CFR 125 Subparts I and J). These requirements could necessitate construction of Cooling Towers for the coal- and gas-fired alternatives replacing once-through surface water cooling.

9.3 REFERENCES

- NRC (U.S. Nuclear Regulatory Commission). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. Volume 1. NUREG-1437. Washington, DC. May.
- PADER (Pennsylvania Department of Environmental Resources). 1982. Letter from Louis Bercheni (Bureau of Water Quality Management) to Robert Tedesco (Director of Licensing, Nuclear Regulatory Commission). PPL Water Quality Certification Under Section 401(a)(1) of the Clean Water Act. July 16.

ATTACHMENT A
NRC NATIONAL ENVIRONMENTAL
POLICY ACT ISSUES FOR LICENSE
RENEWAL OF NUCLEAR POWER PLANTS

PPL Susquehanna has prepared this environmental report in accordance with the requirements of U.S. Nuclear Regulatory Commission (NRC) regulation 10 CFR 51.53. NRC included in the regulation a list of National Environmental Policy Act (NEPA) issues for license renewal of nuclear power plants. Table A-1 lists these 92 issues and identifies the section in which PPL Susquehanna addressed each applicable issue in this environmental report. For organization and clarity, PPL Susquehanna has assigned a number to each issue and uses the issue numbers throughout the environmental report.

TABLE A-1. SSES ENVIRONMENTAL REPORT DISCUSSION OF LICENSE RENEWAL NEPA ISSUES^a

Issue	Category	Section of this Environmental Report	GEIS Cross Reference ^b (Section/Page)
Surface Water Quality, Hydrology, and Use (for all plants)			
1. Impacts of refurbishment on surface water quality	1	NA	Issue applies to an activity, refurbishment, that SSES has no plans to undertake.
2. Impacts of refurbishment on surface water use	1	NA	Issue applies to an activity, refurbishment, that SSES has no plans to undertake.
3. Altered current patterns at intake and discharge structures	1	4.0	4.2.1.2.1/4-5
4. Altered salinity gradients	1	NA	Issue applies to a plant feature, discharge to saltwater, that SSES does not have.
5. Altered thermal stratification of lakes	1	NA	Issue applies to a plant feature, discharge to a lake, that SSES does not have.
6. Temperature effects on sediment transport capacity	1	4.0	4.2.1.2.3/4-8
7. Scouring caused by discharged cooling water	1	4.0	4.2.1.2.3/4-6
8. Eutrophication	1	4.0	4.2.1.2.3/4-9
9. Discharge of chlorine or other biocides	1	4.0	4.2.1.2.4/4-10
10. Discharge of sanitary wastes and minor chemical spills	1	4.0	4.2.1.2.4/4-10
11. Discharge of other metals in waste water	1	4.0	4.2.1.2.4/4-10
12. Water use conflicts (plants with once-through cooling systems)	1	NA	Issue applies to a plant feature, once-through cooling, that SSES does not have.
13. Water use conflicts (plants with cooling ponds or cooling towers using make-up water from a small river with low flow)	2	4.1	4.2.1.3/4-13

TABLE A-1. SSES ENVIRONMENTAL REPORT DISCUSSION OF LICENSE RENEWAL NEPA ISSUES^a (CONTINUED)

Issue	Category	Section of this Environmental Report	GEIS Cross Reference ^b (Section/Page)
Aquatic Ecology (for all plants)			
14. Refurbishment impacts to aquatic resources	1	NA	Issue applies to an activity, refurbishment, that SSES has no plans to undertake.
15. Accumulation of contaminants in sediments or biota	1	4.0	4.2.1.2.4/4-10
16. Entrainment of phytoplankton and zooplankton	1	4.0	4.2.2.1.1/4-15
17. Cold shock	1	4.0	4.2.2.1.5/4-18
18. Thermal plume barrier to migrating fish	1	4.0	4.2.2.1.6/4-19
19. Distribution of aquatic organisms	1	4.0	4.2.2.1.6/4-19
20. Premature emergence of aquatic insects	1	4.0	4.2.2.1.7/4-20
21. Gas supersaturation (gas bubble disease)	1	4.0	4.2.2.1.8/4-21
22. Low dissolved oxygen in the discharge	1	4.0	4.2.2.1.9/4-23
23. Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	1	4.0	4.2.2.1.10/4-24
24. Stimulation of nuisance organisms (e.g., shipworms)	1	4.0	4.2.2.1.11/4-25
Aquatic Ecology (for plants with once-through and cooling pond heat dissipation systems)			
25. Entrainment of fish and shellfish in early life stages for plants with once-through and cooling pond heat dissipation systems	2	NA, and discussed in Section 4.2	Issue applies to a plant feature, once-through cooling or a cooling pond, that SSES does not have.
26. Impingement of fish and shellfish for plants with once-through and cooling pond heat dissipation systems	2	NA, and discussed in Section 4.3	Issue applies to a plant feature, once-through cooling or a cooling pond, that SSES does not have.

TABLE A-1. SSES ENVIRONMENTAL REPORT DISCUSSION OF LICENSE RENEWAL NEPA ISSUES^a (CONTINUED)

Issue	Category	Section of this Environmental Report	GEIS Cross Reference ^b (Section/Page)
27. Heat shock for plants with once-through and cooling pond heat dissipation systems	2	NA, and discussed in Section 4.4	Issue applies to a plant feature, once-through cooling or a cooling pond, that SSES does not have.
Aquatic Ecology (for plants with cooling-tower-based heat dissipation systems)			
28. Entrainment of fish and shellfish in early life stages for plants with cooling-tower-based heat dissipation systems	1	4.0	4.3.3/4-33
29. Impingement of fish and shellfish for plants with cooling-tower-based heat dissipation systems	1	4.0	4.3.3/4-33
30. Heat shock for plants with cooling-tower-based heat dissipation systems	1	4.0	4.3.3/4-33
Ground-water Use and Quality			
31. Impacts of refurbishment on groundwater use and quality	1	NA	Issue applies to an activity, refurbishment, that SSES has no plans to undertake.
32. Groundwater use conflicts (potable and service water; plants that use < 100 gpm)	1	4.0	4.8.1.1/4-116
33. Groundwater use conflicts (potable, service water, and dewatering; plants that use > 100 gpm)	2	NA, and discussed in Section 4.5	Issue applies to an activity, using 100 gpm or more of groundwater, that SSES does not do.
34. Groundwater use conflicts (plants using cooling towers withdrawing make-up water from a small river)	2	4.6	4.8.1.3/4-117
35. Groundwater use conflicts (Ranney wells)	2	NA, and discussed in Section 4.7	Issue applies to a feature, Ranney wells, that SSES does not have.
36. Groundwater quality degradation (Ranney wells)	1	NA	Issue applies to a feature, Ranney wells, that SSES does not have.

TABLE A-1. SSES ENVIRONMENTAL REPORT DISCUSSION OF LICENSE RENEWAL NEPA ISSUES^a (CONTINUED)

Issue	Category	Section of this Environmental Report	GEIS Cross Reference ^b (Section/Page)
37. Groundwater quality degradation (saltwater intrusion)	1	NA	Issue applies to a feature, location in a coastal area, that SSES does not have.
38. Groundwater quality degradation (cooling ponds in salt marshes)	1	NA	Issue applies to a feature, cooling ponds, that SSES does not have.
39. Groundwater quality degradation (cooling ponds at inland sites)	2	NA, and discussed in Section 4.8	Issue applies to a feature, cooling ponds at inland sites, that SSES does not have.
Terrestrial Resources			
40. Refurbishment impacts to terrestrial resources	2	NA, and discussed in Section 4.9	Issue applies to an activity, refurbishment, that SSES has no plans to undertake.
41. Cooling tower impacts on crops and ornamental vegetation	1	4.0	4.3.4/4-34
42. Cooling tower impacts on native plants	1	4.0	4.3.5.1./4-42
43. Bird collisions with cooling towers	1	4.0	4.3.5.2/4-45
44. Cooling pond impacts on terrestrial resources	1	NA	Issue applies to a feature, cooling ponds, that SSES does not have.
45. Power line right-of-way management (cutting and herbicide application)	1	4.0	4.5.6.1/4-71
46. Bird collisions with power lines	1	4.0	4.5.6.2/4-74
47. Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	1	4.0	4.5.6.3/4-77
48. Floodplains and wetlands on power line right-of-way	1	4.0	4.5.7/4-81
Threatened or Endangered Species (for all plants)			
49. Threatened or endangered species	2	4.10	4.1/4-1

**TABLE A-1. SSES ENVIRONMENTAL REPORT DISCUSSION OF LICENSE
RENEWAL NEPA ISSUES^a (CONTINUED)**

Issue	Category	Section of this Environmental Report	GEIS Cross Reference ^b (Section/Page)
Air Quality			
50. Air quality during refurbishment (non-attainment and maintenance areas)	2	NA, and discussed in Section 4.11	Issue applies to an activity, refurbishment, that SSES has no plans to undertake.
51. Air quality effects of transmission lines	1	4.0	4.5.2/4-62
Land Use			
52. Onsite land use	1	4.0	3.2/3-1
53. Power line right-of-way land use impacts	1	4.0	4.5.3/4-62
Human Health			
54. Radiation exposures to the public during refurbishment	1	NA	Issue applies to an activity, refurbishment, that SSES has no plans to undertake.
55. Occupational radiation exposures during refurbishment	1	NA	Issue applies to an activity, refurbishment, that SSES has no plans to undertake.
56. Microbiological organisms (occupational health)	1	4.0	4.3.6/4-48
57. Microbiological organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river)	2	4.12	4.3.6/4-48
58. Noise	1	4.0	4.3.7/4-49
59. Electromagnetic fields, acute effects (electric shock)	2	4.13	4.5.4.1/4-66
60. Electromagnetic fields, chronic effects	NA	4.0	NA – Not applicable. The categorization and impact finding definitions do not apply to this issue.
61. Radiation exposures to public (license renewal term)	1	4.0	4.6.2/4-87

TABLE A-1. SSES ENVIRONMENTAL REPORT DISCUSSION OF LICENSE RENEWAL NEPA ISSUES^a (CONTINUED)

Issue	Category	Section of this Environmental Report	GEIS Cross Reference ^b (Section/Page)
62. Occupational radiation exposures (license renewal term)	1	4.0	4.6.3/4-95
Socioeconomics			
63. Housing impacts	2	4.14	3.7.2/3-10 (refurbishment) 4.7.1/4-101 (renewal term)
64. Public services: public safety, social services, and tourism and recreation	1	4.0	Refurbishment 3.7.4/3-14 (public services) 3.7.4.3/3-18 (safety) 3.7.4.4/3-19 (social) 3.7.4.6/3-20 (tour, rec) Renewal Term 4.7.3/4-104 (public services) 4.7.3.3/4-106 (safety) 4.7.3.4/4-107 (social) 4.7.3.6/4-107 (tour, rec)
65. Public services: public utilities	2	4.15	3.7.4.5/3-19 (refurbishment) 4.7.3.5/4-107 (renewal term)
66. Public services: education (refurbishment)	2	NA, and discussed in Section 4.16	Issue applies to an activity, refurbishment, that SSES has no plans to undertake.
67. Public services: education (license renewal term)	1	4.0	4.7.3.1/4-106
68. Offsite land use (refurbishment)	2	NA, and discussed in Section 4.17.1	Issue applies to an activity, refurbishment, that SSES has no plans to undertake.
69. Offsite land use (license renewal term)	2	4.17.2	4.7.4/4-107
70. Public services: transportation	2	4.18	3.7.4.2/3-17 (refurbishment) 4.7.3.2/4-106 (renewal term)
71. Historic and archaeological resources	2	4.19	3.7.7/3-23 (refurbishment) 4.7.7/4-114 (renewal term)
72. Aesthetic impacts (refurbishment)	1	NA	Issue applies to an activity, refurbishment, that SSES will not undertake.

TABLE A-1. SSES ENVIRONMENTAL REPORT DISCUSSION OF LICENSE RENEWAL NEPA ISSUES^a (CONTINUED)

Issue	Category	Section of this Environmental Report	GEIS Cross Reference ^b (Section/Page)
73. Aesthetic impacts (license renewal term)	1	4.0	4.7.6/4-111
74. Aesthetic impacts of transmission lines (license renewal term)	1	4.0	4.5.8/4-83
Postulated Accidents			
75. Design basis accidents	1	4.0	5.3.2/5-11 (design basis) 5.5.1/5-114 (summary)
76. Severe accidents	2	4.20	5.3.3/5-12 (probabilistic analysis) 5.3.3.2/5-19 (air dose) 5.3.3.3/5-49 (water) 5.3.3.4/5-65 (groundwater) 5.3.3.5/5-96 (economic) 5.4/5-106 (mitigation) 5.5.2/5-114 (summary)
Uranium Fuel Cycle and Waste Management			
77. Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high-level waste)	1	4.0	6.2/6-8
78. Offsite radiological impacts (collective effects)	1	4.0	Not in GEIS.
79. Offsite radiological impacts (spent fuel and high-level waste disposal)	1	4.0	Not in GEIS.
80. Nonradiological impacts of the uranium fuel cycle	1	4.0	6.2.2.6/6-20 (land use) 6.2.2.7/6-20 (water use) 6.2.2.8/6-21 (fossil fuel) 6.2.2.9/6-21 (chemical)
81. Low-level waste storage and disposal	1	4.0	6.4.2/6-36 (low-level definition) 6.4.3/6-37 (low-level volume) 6.4.4/6-48 (renewal effects)
82. Mixed waste storage and disposal	1	4.0	6.4.5/6-63
83. Onsite spent fuel	1	4.0	6.4.6/6-70

TABLE A-1. SSES ENVIRONMENTAL REPORT DISCUSSION OF LICENSE RENEWAL NEPA ISSUES^a (CONTINUED)

Issue	Category	Section of this Environmental Report	GEIS Cross Reference ^b (Section/Page)
84. Nonradiological waste	1	4.0	6.5/6-86
85. Transportation	1	4.0	6.3/6-31, as revised by Addendum 1, August 1999.
Decommissioning			
86. Radiation doses (decommissioning)	1	4.0	7.3.1/7-15
87. Waste management (decommissioning)	1	4.0	7.3.2/7-19 (impacts) 7.4/7-25 (conclusions)
88. Air quality (decommissioning)	1	4.0	7.3.3/7-21 (air) 7.4/7-25 (conclusion)
89. Water quality (decommissioning)	1	4.0	7.3.4/7-21 (water) 7.4/7-25 (conclusion)
90. Ecological resources (decommissioning)	1	4.0	7.3.5/7-21 (ecological) 7.4/7-25 (conclusion)
91. Socioeconomic impacts (decommissioning)	1	4.0	7.3.7/7-24 (socioeconomic) 7.4/7-25 (conclusion)
Environmental Justice			
92. Environmental justice	NA	2.6.2	NA – Not applicable. The categorization and impact finding definitions do not apply to this issue.

a. Source: 10 CFR 51, Subpart A, Appendix A, Table B-1. (Issue numbers added to facilitate discussion.)

b. Source: Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437).
NEPA = National Environmental Policy Act.

ATTACHMENT B
SPECIAL-STATUS SPECIES
CORRESPONDENCE

Table of Contents

<u>Letter</u>	<u>Page</u>
George T. Jones (PPL Susquehanna) to Carole Copeyon (U.S. Fish and Wildlife Service)	B-2
David Densmore (U.S. Fish and Wildlife Service) to George T. Jones (PPL Susquehanna)	B-6
George T. Jones (PPL Susquehanna) to James R. Leigey (Pennsylvania Game Commission, Bureau of Land Management)	B-8
James R. Leigey (Pennsylvania Game Commission, Bureau of Land Management) to George T. Jones (PPL Susquehanna)	B-44
George T. Jones (PPL Susquehanna) to Chris Firestone (Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry)	B-46
Chris Firestone (Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry) to George T. Jones (PPL Susquehanna)	B-50
Ellen Shultzabarger (Pennsylvania Natural Diversity Inventory) to Jerry Fields (PPL Susquehanna)	B-51
George T. Jones (PPL Susquehanna) to Christopher A. Urban (Pennsylvania Fish and Boat Commission, Non-game and Endangered Species Unit)	B-54
Christopher A. Urban (Pennsylvania Fish and Boat Commission) to George T. Jones (PPL Susquehanna)	B-58

George T. Jones
Vice President
Special Projects

Two North Ninth Street
Allentown, PA 18101-1170
Tel. 610.774.7602 Fax 610.774.7797
gjones@pplweb.com



March 24, 2005

ⁿ JTF 5/25/06
Ms. Carole Copeyog
U.S. Fish and Wildlife Service
Pennsylvania Field Office
315 South Allen Street
Suite 322
State College, PA 16801

**PPL SUSQUEHANNA, LLC
REQUEST FOR INFORMATION ON
THREATENED OR ENDANGERED SPECIES
LICREN ER 101013
PLR-050**

ⁿ JTF 5/25/06
Dear Mrs. Copeyog,

PPL Susquehanna, LLC (PPL Susquehanna) is preparing an application to the U. S. Nuclear Regulatory Commission (NRC) to renew the operating licenses for Susquehanna Steam Electric Station (SSES) Units 1 and 2. Current operating licenses for the two-unit plant expire in 2022 and 2024. The renewal term would be for an additional 20 years beyond the original license expiration date. As part of the license renewal process, the NRC requires license applicants to "assess the impact of the proposed action on threatened or endangered species in accordance the Endangered Species Act" (10 CFR 51.53). The NRC will also request an informal consultation with your office at a later date under Section 7 of the Endangered Species Act. By contacting you early in the application process, we hope to identify any issues that we need to address or any information that we should provide to your office to expedite the NRC consultation.

PPL Susquehanna has operated SSES and associated transmission lines since 1982. The facility is located on the west bank of the Susquehanna River in Salem Township, Luzerne County, Pennsylvania, approximately 5 miles northeast of Berwick, Pennsylvania (see attached map).

The Final Environmental Statement (FES) for construction prepared in 1973 by the U.S. Atomic Energy Commission and the FES prepared for operation prepared in 1981 by the U.S. Nuclear Regulatory Commission identified three short 230-kilovolt ties in the vicinity of SSES, one longer 230 kilovolt line (Stanton #2), and two longer 500 kilovolt lines (Sunbury #2 and Siegfried) that were built to connect SSES to the electric grid. The three short connections were to provide startup power for SSES from pre-existing 230-kilovolt lines in the immediate vicinity of the plant and to connect the Unit 1 output to the pre-existing 230-kilovolt Susquehanna Switchyard across the Susquehanna River.

After publication of the FES for operation, PPL Susquehanna made several changes in the transmission system. As a result of these system changes, the transmission lines are somewhat different than those described in the FES. Six transmission lines connect the station to the regional grid, and are thus relevant to license renewal. They include:

- Short ties in the SSES vicinity (3) – These three lines (approximately 6.3 total miles) identified in the FES as necessary to connect SSES to the 230-kilovolt electrical system are primarily in areas controlled by SSES and not accessible to the public; however, U.S. Highway 11, Pennsylvania State Highway 239, and other paved roads in the immediate plant vicinity are crossed by the short ties.
- Stanton #2 – This single circuit 230-kilovolt line runs generally northeast from SSES for approximately 30 miles in a 100- to 400-footwide corridor.
- Wescosville – This 500-kilovolt line connects SSES with the Alburdis substation. It runs generally southeast for approximately 76 circuit miles in a corridor ranging from 100 to 350 feet wide.
- Sunbury #2 – This 500-kilovolt line shares a corridor with the pre-existing Sunbury #1 line and runs west-southwest. The corridor is about 325 feet wide and approximately 30 miles long.

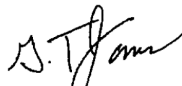
In total, for the specific purpose of connecting SSES to the transmission system, PPL Susquehanna has approximately 150 miles of corridor that occupy approximately 3,341 acres. The corridors pass through land that is primarily agricultural or forest land. The areas are mostly remote, with low population densities. The longer lines cross numerous state and U.S. highways. Impact of these corridors on land usage is minimal; farmlands that have corridors passing through them generally continue to be used as farmland.

Pennsylvania counties crossed by the transmission lines include Luzerne (the location of SSES), Carbon, Columbia, Lehigh, Northampton, Northumberland, Montour, and Snyder. Based on our direct observations, a preliminary review of PPL Susquehanna records, a review of the U.S. Fish and Wildlife Service web site for federally-listed endangered or threatened species, we believe that the following four species could occur in the vicinity of Susquehanna Steam Electric Station or its associated transmission lines identified above: 1) Indiana bats (*Myotis sodalis*), which are federally-listed as endangered, hibernate in Luzerne County; 2) Bog turtles (*Clemmys muhlenbergii*), federally-listed as threatened, occur in Lehigh and Northampton Counties; 3) Bald eagles (*Haliaeetus leucocephalus*), federally-listed as threatened, nest in Northumberland County; and 4) Northeastern bulrush (*Scirpus ancistrochaetus*), federally-listed as endangered, are known from Carbon and Lehigh Counties.

PPL Susquehanna is committed to the conservation of significant natural habitats and protected species, and expects that operation of SSES, including maintenance of the identified transmission lines, through the license renewal period (an additional 20 years) would not adversely affect any listed species. PPL Susquehanna has no plans to alter current operations over the license renewal period. Any maintenance activities necessary to support license renewal would be limited to previously disturbed areas. No additional land disturbance is anticipated in support of license renewal.

Please do not hesitate to call Jerry Fields (610) 774-7889 if you have any questions or require any additional information. After your review, we would appreciate receiving your input by April 22, 2005, detailing any concerns you may have about any listed species or critical habitat in the area or confirming PPL Susquehanna's conclusion that operation of SSES over the license renewal term would have no effect on any threatened or endangered species. This will enable us to meet our application preparation schedule. PPL Susquehanna will include a copy of this letter and your response in the Environmental Report that will be submitted to the NRC as part of the SSES license renewal application.

Sincerely,



George T. Jones

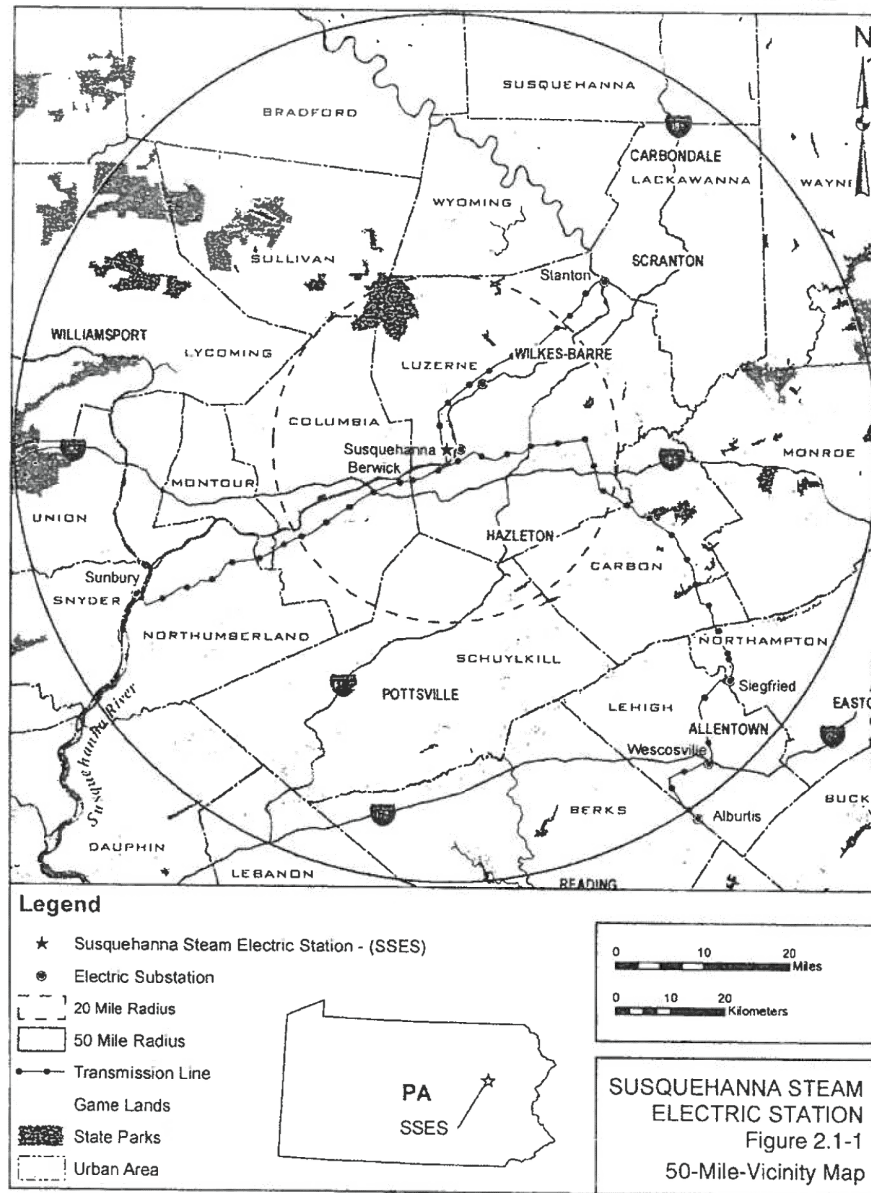
Attachment – Figure 2.1-1, 50-Mile Vicinity Map

Response Requested: YES ☒ by April 22, 2005

g:\goadmin\licrenewal\plr\plr-050.doc

Susquehanna Steam Electric Station Units 1 & 2
License Renewal Application

Susquehanna Steam Electric Station Units 1 & 2
License Renewal Application



Location and Features

Page 2.1-2

September 2006



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pennsylvania Field Office
315 South Allen Street, Suite 322
State College, Pennsylvania 16801-4850



May 23, 2005

George Jones
PPL Susquehanna
2 North Ninth Street
Allentown, PA 18101-1179

RE: USFWS Project #2005-1190

Dear Mr. Jones:

This responds to your letter of March 24, 2005, requesting information about federally listed and proposed endangered and threatened species within the area affected by the proposed U.S. Nuclear Regulatory Commission renewal of an operating license for Susquehanna Steam Electric Station Units 1 and 2, located in Luzerne County, Pennsylvania. The following comments are provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of endangered and threatened species.

The project is located within the range of the Indiana bat (*Myotis sodalis*), a species that is federally listed as endangered. Due to the proximity of the project site to a known Indiana bat hibernaculum (*i.e.*, within five miles), tree removal or forest clearing within the project area could result in the direct take of roosting Indiana bats, which could be injured or killed when trees are cut. Studies have found that forested areas located within five miles of hibernacula provide important foraging and roosting habitat for Indiana bats, especially during the fall and spring, when bats are building up their fat reserves prior to and after hibernation. In addition, female maternity colonies and individual male bats may be found in the vicinity of hibernacula throughout the summer months.

To avoid the direct take of Indiana bats, tree-cutting activities should be carried out from November 16 to March 31, during which time bats are hibernating. If any timber-cutting is necessary from April 1 to November 15, the following trees greater than or equal to five inches diameter breast height (d.b.h.) should not be cut or physically disturbed (*e.g.*, while harvesting any adjacent trees) in order to avoid killing or injuring roosting Indiana bats: 1) dead or dying trees and snags (including lightning struck trees) with exfoliating bark; 2) live trees (such as shagbark and shellbark hickory) which have exfoliating or defoliating bark in the trunk or branches; and 3) trees or snags that have characteristics typical of roost sites for Indiana bats (*i.e.*, have exfoliating or defoliating bark, or contain cracks, crevices, or holes that could be used by the species as a potential roost). Tree-clearing from November 16 to March 31 may proceed without these restrictions.

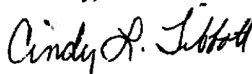
Based on a review of the project information, including the size of the project area and the anticipated effects on forested habitat, we have determined that the proposed project will not have a significant adverse effect on overall habitat quality for the Indiana bat. Therefore, if a seasonal restriction on tree-cutting is implemented to avoid the direct take of Indiana bats, construction of the proposed project is not likely to adversely affect this species. If you are unable to implement the above measures to avoid adverse effects, however, further consultation with this office will be necessary.

This response relates only to endangered and threatened species under our jurisdiction, based on an office review of the proposed project's location. No field inspection of the project area has been conducted by this office. Consequently, this letter is not to be construed as addressing other Service concerns under the Fish and Wildlife Coordination Act or other authorities.

To avoid potential delays in reviewing your project, please use the above-referenced USFWS project tracking number in any future correspondence regarding this project.

If you have any questions regarding this matter, please contact Jennifer Dombroskie of my staff at 814-234-4090.

Sincerely,



David Densmore
Supervisor



COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA GAME COMMISSION
2001 ELMERTON AVENUE, HARRISBURG, PA 17110-9797

June 23, 2005

Mr. George T. Jones
PPL Susquehanna, LLC
Two North Ninth Street
Allentown, PA 18101-1179

In re: Operating License Renewal
Susquehanna Steam Electric Station
Units 1 & 2 and Associated Transmission Lines
Salem Township, Luzerne County, PA

Dear Mr. Jones:

This is our response to your letter dated March 24, 2005 requesting information on the above referenced project.

We have completed an office review of the power plant area and the associated transmission lines that connect the power station to the regional grid. We have determined that the renewal of the operating license should not adversely impact any special concern species of birds or mammals recognized by the Pennsylvania Game Commission (PGC). Currently, our agency is not aware of any instances where the power plant operation and maintenance activities are causing adverse impacts to special concern species of birds and mammals, their habitat, or State Game Lands.

Please be advised that future maintenance and operation of the power plant and its associated transmission lines have the potential to adversely impact special concern species and State Game Lands. There are a number of endangered and threatened bird and mammal species and State Game Lands that occur along the transmission line routes. In order to protect special concern species of animals and plants, it is requested that all proposed maintenance site areas surrounding the power plant or located along the transmission line routes be screened using the new Department of Conservation and Natural Resources PNDI Environmental Review tool. It can be accessed at the following new web site: www.naturalheritage.state.pa.us. If the screening results indicate potential conflicts with species of special concern under the jurisdiction of the PGC or other resource agencies, you will need to follow the directions contained in the search results in order to resolve the potential conflicts.

ADMINISTRATIVE BUREAUS:

PERSONNEL: 717-787-7836 ADMINISTRATION: 717-787-5670 AUTOMOTIVE AND PROCUREMENT DIVISION: 717-787-6594
LICENSE DIVISION: 717-787-2084 WILDLIFE MANAGEMENT: 717-787-5529 INFORMATION & EDUCATION: 717-787-6286 LAW ENFORCEMENT: 717-787-5740
LAND MANAGEMENT: 717-787-6818 REAL ESTATE DIVISION: 717-787-6568 AUTOMATED TECHNOLOGY SYSTEMS: 717-787-4076 FAX: 717-772-2411

WWW.PGC.STATE.PA.US

AN EQUAL OPPORTUNITY EMPLOYER

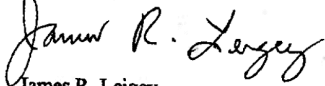
Mr. George T. Jones

-2-

June 23, 2005

If additional information becomes available on endangered or threatened species, impacts to critical or unique habitats or State Game Lands, this determination may be reconsidered. If you have any questions, please contact me at (717) 783-5957.

Very truly yours,



James R. Leigey
Wildlife Impact Review Coordinator
Division of Environmental Planning
And Habitat Protection
Bureau of Land Management

JRL/jrl

Cc: File
Densmore (USFWS)

George T. Jones
Vice President
Special Projects

Two North Ninth Street
Allentown, PA 18101-1179
Tel. 610.774.7602 Fax 610.774.7797
gtjones@pplweb.com



March 24, 2005

Ms. Chris Firestone, Native Plant Program Manager
Pennsylvania Department of Conservation and Natural Resources
Bureau of Forestry (Plant Program)
Forest Advisory Services
P O Box 8552
Harrisburg, PA 17105-1673

PPL SUSQUEHANNA, LLC
REQUEST FOR INFORMATION ON STATE-LISTED
SPECIES AND IMPORTANT HABITATS (PLANTS)
LICREN ER 101013
PLR-052

Dear Ms. Firestone:

PPL Susquehanna, LLC (PPL Susquehanna) is preparing an application to the U. S. Nuclear Regulatory Commission (NRC) to renew the operating licenses for Susquehanna Steam Electric Station (SSES) Units 1 and 2. Current operating licenses for the two-unit plant expire in 2022 and 2024. The renewal term would be for an additional 20 years beyond the original license expiration date. As part of the license renewal process, the NRC requires license applicants to "assess the impact of the proposed action on threatened or endangered species in accordance the Endangered Species Act" (10 CFR 51.53). The NRC will also request an informal consultation with your office at a later date under Section 7 of the Endangered Species Act. By contacting you early in the application process, we hope to identify any issues that we need to address or any information that we should provide to your office to expedite the NRC consultation.

PPL Susquehanna has operated SSES and associated transmission lines since 1982. The facility is located on the west bank of the Susquehanna River in Salem Township, Luzerne County, Pennsylvania, approximately 5 miles northeast of Berwick, Pennsylvania (see attached map).

The Final Environmental Statement (FES) for construction prepared in 1973 by the U.S. Atomic Energy Commission and the FES prepared for operation prepared in 1981 by the U.S. Nuclear Regulatory Commission identified three short 230-kilovolt ties in the vicinity of SSES, one longer 230 kilovolt line (Stanton #2), and two longer 500 kilovolt lines (Sunbury #2 and Siegfried) that were built to connect SSES to the electric grid. The three short connections were to provide startup power for SSES from pre-existing 230-kilovolt lines in the immediate vicinity of the plant and to connect the Unit 1 output to the pre-existing 230-kilovolt Susquehanna Switchyard across the Susquehanna River.

After publication of the FES for operation, PPL Susquehanna made several changes in the transmission system. As a result of these system changes, the transmission lines are somewhat different than those described in the FES. The attached Figure shows the transmission system as currently configured. Six transmission lines connect the station to the regional grid, and are thus relevant to license renewal. They include:

- Short ties in the SSES vicinity (3) – These three lines (approximately 6.3 total miles) identified in the FES as necessary to connect SSES to the 230-kilovolt electrical system are primarily in areas controlled by SSES and not accessible to the public; however, U.S. Highway 11, Pennsylvania State Highway 239, and other paved roads in the immediate plant vicinity are crossed by the short ties.
- Stanton #2 – This single circuit 230-kilovolt line runs generally northeast from SSES for approximately 30 miles in a 100- to 400-footwide corridor.
- Wescosville – This 500-kilovolt line connects SSES with the Albutis substation. It runs generally southeast for approximately 76 circuit miles in a corridor ranging from 100 to 350 feet wide.
- Sunbury #2 – This 500-kilovolt line shares a corridor with the pre-existing Sunbury #1 line and runs west-southwest. The corridor is about 325 feet wide and approximately 30 miles long.

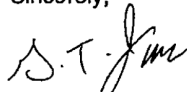
In total, for the specific purpose of connecting SSES to the transmission system, PPL Susquehanna has approximately 150 miles of corridor that occupy approximately 3,341 acres. The corridors pass through land that is primarily agricultural or forest land. The areas are mostly remote, with low population densities. The longer lines cross numerous state and U.S. highways. Impact of these corridors on land usage is minimal; farmlands that have corridors passing through them generally continue to be used as farmland.

Pennsylvania counties crossed by the transmission lines include Luzerne (the location of SSES), Carbon, Columbia, Lehigh, Northampton, Northumberland, Montour, and Snyder. Based on our direct observations, a preliminary review of PPL Susquehanna records, a review of the Pennsylvania Natural Heritage Program, and a review of the U.S. Fish and Wildlife Service web site, we believe that the following species could occur in the vicinity of Susquehanna Steam Electric Station or its associated transmission lines identified above: 1) Indiana bats (*Myotis sodalis*), which are federally-listed as endangered, hibernate in Luzerne County; 2) Bald eagles (*Haliaeetus leucocephalus*), federally-listed as threatened, nest in Northumberland County; In addition to the Indiana bat, state-listed mammals recorded in counties crossed by the transmission lines are the Eastern woodrat (*Neotoma magister*), the small-footed myotis (*Myotis leibii*), and the Eastern fox squirrel (*Sciurus niger vulpinus*). The Eastern woodrat is known from Carbon and Snyder Counties, and the small-footed myotis has been recorded in Luzerne and Northumberland Counties.

PPL Susquehanna is committed to the conservation of significant natural habitats and protected species, and expects that operation of SSES, including maintenance of the identified transmission lines, through the license renewal period (an additional 20 years) would not adversely affect any listed species. PPL Susquehanna has no plans to alter current operations over the license renewal period. Any maintenance activities necessary to support license renewal would be limited to previously disturbed areas. No additional land disturbance is anticipated in support of license renewal.

Please do not hesitate to call Jerry Fields (610) 774-7889 if you have any questions or require any additional information. After your review, we would appreciate receiving your input by April 22, 2005, detailing any concerns you may have about any listed species or critical habitat in the area or confirming PPL Susquehanna's conclusion that operation of SSES over the license renewal term would have no effect on any threatened or endangered species. This will enable us to meet our application preparation schedule. PPL Susquehanna will include a copy of this letter and your response in the Environmental Report that will be submitted to the NRC as part of the SSES license renewal application.

Sincerely,



George T. Jones

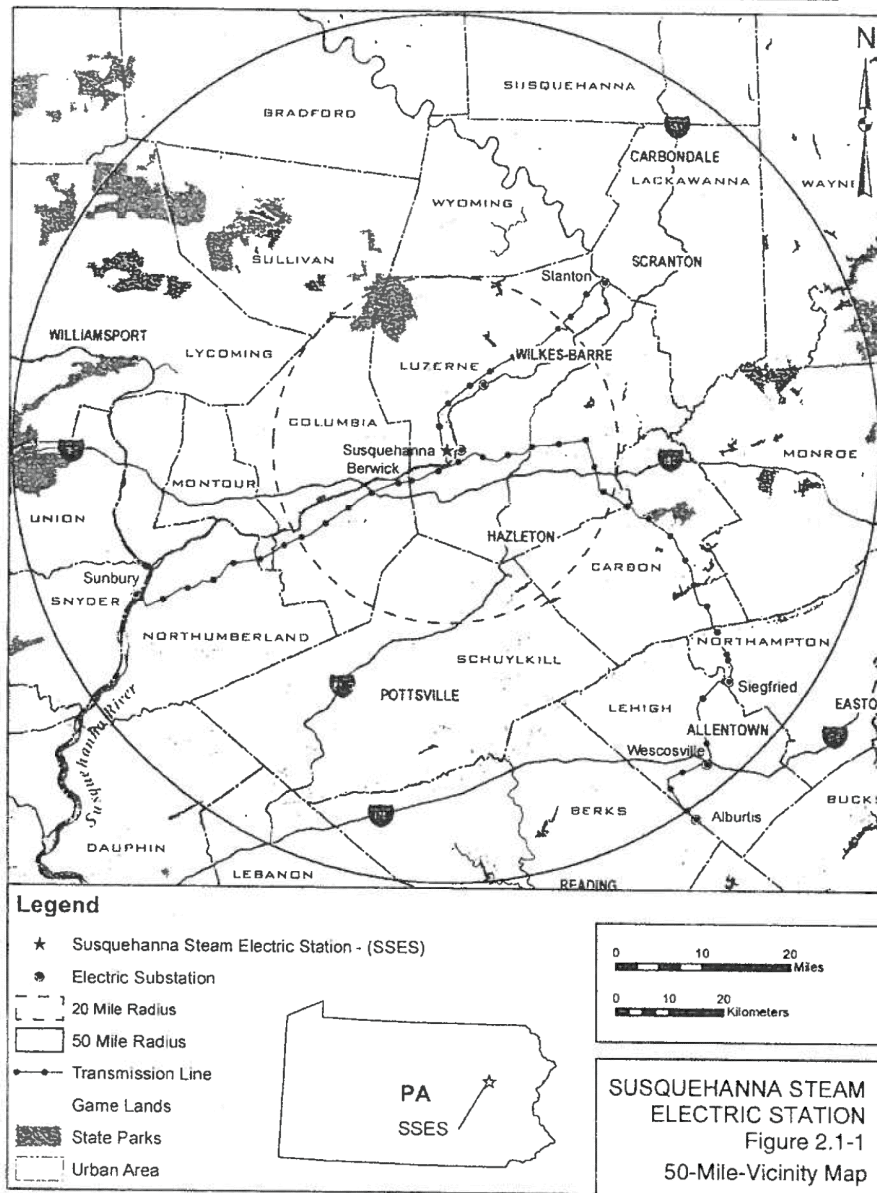
Attachment – Figure 2.1-1, 50-Mile Vicinity Map

Response Requested: YES ☒ by April 22, 2005

g:\goadmin\licrenewal\plr\plr-052.doc

Susquehanna Steam Electric Station Units 1 & 2
License Renewal Application

Susquehanna Steam Electric Station Units 1 & 2
License Renewal Application



Location and Features

Page 2.1-2

September 2006

Susquehanna Steam Electric Station Units 1 & 2
License Renewal Application

APR 03 '06 11:58 FR BUREAU OF FORESTRY 717 783 5109 TO 916187747797 P.01/01



Pennsylvania Department of Conservation and Natural Resources

Bureau of Forestry

April 3, 2006

George T. Jones
PP&L
FAX: 610-774-7797 (hard copy will NOT follow)

Pennsylvania Natural Diversity Inventory Review, PNDI	17665
Susquehanna Stream Electric Station	
Salem Twp., Luzerne County	

Dear Mr. Jones,

This responds to your request about a Pennsylvania Natural Diversity Inventory (PNDI) ER Tool "Potential Impact" or a species of special concern impact review. We screened this project for potential impacts to species and resources of special concern under the Department of Conservation and Natural Resources' responsibility, which includes plants, natural communities, terrestrial invertebrates and geologic features only.

☒ NO PROJECT IMPACT ANTICIPATED ☐ PNDI records indicate that no known occurrences of species or resources of special concern under DCNR's jurisdiction occur in the vicinity of the project. Therefore, we do not anticipate the project referenced above will impact plants, natural communities, terrestrial invertebrates and geologic features of special concern. No further coordination with DCNR is needed for this project. ☒ PNDI records indicate special concern species or resources are located in the vicinity of the project. However, based on the information submitted to us concerning the nature of the project, the immediate location, and our detailed resource information, we determined that no impact is likely. No further coordination with DCNR is needed for this project. ☐ POTENTIAL PROJECT IMPACT - UNDER FURTHER REVIEW Based on our PNDI map review we determined potential impacts to species and/or resources of special concern. This project has been passed on to our review committee. The committee will contact the applicant/consultant directly if more information is needed to assess the project's potential impacts. Response time is typically less than a month after the date on this notification.
COMMENTS: This response represents the most up-to-date summary of the PNDI data files and is good for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on-site. A field survey of any site may reveal previously unreported populations. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered. This finding applies to impacts to plants, natural communities, terrestrial invertebrates and geologic features only. To complete your review of state and federally-listed species of special concern, please be sure the U.S. Fish and Wildlife Service, the PA Game Commission and the Fish and Boat Commission has been contacted regarding this project either directly or by performing a search with the online PNDI ER Tool found at www.naturalheritage.state.pa.us .


Ellen Shultzabarger, Environmental Review Specialist FOR Chris Firestone, Plant Program Mgr
DCNR/BOF/PNDI, PO Box 8552, Harrisburg, PA 17105 ~ Ph: 717-772-0258 ~ F: 717-772-0271 ~ c-eshultz@state.pa.us

Stewardship Partnership Service

An Equal Opportunity Employer

www.dcnr.state.pa.us

Printed on Recycled Paper

** TOTAL PAGE .01 **

Susquehanna Steam Electric Station Units 1 & 2
License Renewal Application

MAY-11-2005 15:02

PNDI

717 772 0271 P.01/03



Pennsylvania Natural Diversity Inventory

Scientific information and expertise for the conservation of Pennsylvania's native biological diversity

DCNR, Bureau of Forestry

May 11, 2005

Jerry Fields
PPL
Two North Ninth St, Allentown, PA 18101
FAX: 610-774-7797 (hard copy will NOT follow)

Re: Pennsylvania Natural Diversity Inventory Review, PER NO: 17665
Susquehanna Steam Electric Station—change in FES transmission system
Carbon, Columbia, Lehigh, Luzerne and Northumberland Counties

Dear Mr. Fields,

In response to your request received on March 30, 2005 the Pennsylvania Natural Diversity Inventory (PNDI) information system was used to gather information regarding the presence resources of special concern within the referenced site.

PNDI records indicate that occurrences of plant species of special concern under DCNR's jurisdiction are known to occur in the vicinity of the transmission lines. Please see the list attached for species found in the vicinity of the project areas. If any construction or maintenance/disturbance activity is planned along these lines, please send our office more detailed information on the project (i.e. detailed site location maps, site plans, current land cover, etc.) so we can determine if a plant survey would be necessary.

This finding applies to impacts to plants, natural communities, terrestrial invertebrates and geologic features only. For review of potential impacts to species of special concern not listed above and to complete your review of state and federal listed species of special concern, please forward this project to the three agencies listed below.

PA Game Commission
Bureau of Land Management
2001 Elmerton Avenue
Harrisburg, PA 17110-9797
717-783-5957
birds & mammals

PA Fish & Boat Commission
Bureau of Fisheries and Engineering
450 Robinson Lane
Bellefonte, PA 16823
814-359-5113
fish, reptiles, amphibians, aquatic organisms

US Fish & Wildlife Service
Bonnie Dershem
315 South Allen Street, Suite 322
State College, PA 16801
814-234-4090
all federally listed species in PA

This response represents the most up-to-date summary of the PNDI data files and is good for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on-site. A field survey of any site may reveal previously unreported populations.

PNDI attempts to be a complete information resource on species of special concern within the Commonwealth. PNDI is the environmental review function of the Pennsylvania Natural Heritage Program, and uses a site-specific information system that describes significant natural resources within the Commonwealth. This system includes data descriptive of plant and animal species of special concern, exemplary natural communities and unique geological features. PNDI is a cooperative project of the Department of Conservation and Natural Resources, The Nature Conservancy and the Western Pennsylvania Conservancy.

Feel free to phone our office if you have questions concerning this response or the PNDI system, and please refer to the P.E.R. Reference Number at the top of the letter in future correspondence concerning this project.

Sincerely,

Ellen M. Shultzabarger
Environmental Review Specialist

pt: 717-772-0258 f: 717-772-0271

Western Pennsylvania Conservancy
205 Fourth Ave.
Pittsburgh, PA 15222
(412)268-2777
www.paconservancy.org

Pennsylvania Dept. of Conservation and Natural Resources
Bureau of Forestry
P. O. Box 8552
Harrisburg, PA 17105-8552
(717)781-3444
www.dcnr.state.pa.us

The Nature Conservancy
208 Airport Drive
Middletown, PA 17057
(717)848-3862
www.tnc.org

03/02/03 P

1272 222 272

PND1

03:03 15:03 2005 MAY-11-11-AM

PPL Susquehanna-SSES Transmission Lines
Plants, Invertebrates, Natural Communities and Geologic Features along Project Areas by County
 May 11, 2005

<u>Scientific Name</u>	<u>Common Name</u>	<u>PA Current Status</u>	<u>PA Proposed Status</u>
Carbon County			
<i>Carex haydenii</i>	Cloud Sedge	TU	PT
<i>Carex longii</i>	Long's Sedge	TU	TU
<i>Carex polymorpha</i>	Variable Sedge	PE	PT
<i>Cuscuta cephalanthi</i>	Button-bush Dodder	TU	TU
<i>Dicentra eximia</i>	Wild Bleeding-hearts	PE	PE
<i>Eleocharis intermedia</i>	Matted Spike-rush	PT	PT
<i>Iris cristata</i>	Crested Dwarf Iris	PE	PE
PA Natural Community	Acidic Shrub Swamp		
PA Natural Community	Scrub oak-heath-pitch pine barrens		
<i>Polygonum careyi</i>	Carey's Smartweed	PE	PE
Columbia County			
None			
Lehigh County			
<i>Juncus torreyi</i>	Torrey's Rush	PT	PE
<i>Spiranthes luckii</i>	Shining Ladies-tresses	N	TU
<i>Polygonum careyi</i>	Carey's Smartweed	PE	PE
<i>Leucothoe racemosa</i>	Swamp Doghobble	TU	PE
<i>Lythum alatum</i>	Winged Loosestrife	TU	PE
Luzerne County--Northern Transmission Line			
<i>Carex disperma</i>	Soft Leaved Sedge	PR	PR
<i>Elymus trachycaulus</i>	Slender Wheatgrass	N	TU
<i>Hesperia leonardus</i>	Leonard's Skipper	G4	
PA Natural Community	Talus Cave Community		
<i>Prunus pumila</i> var. <i>susquehansae</i>			PT

03/03 P

717 772 0271

PNDI

03:03 15:03 2005-11-24 PM

PPL Susquehanna-SSES Transmission Lines
Plants, Invertebrates, Natural Communities and Geologic Features along Project Areas by County
 May 11, 2005

<u>Scientific Name</u>	<u>Common Name</u>	<u>PA Current Status</u>	<u>PA Proposed Status</u>
Luzerne County—Southern Transmission Line			
<i>Carex polymorpha</i>	Variable Sedge	PE	PT
<i>Hemiluca mela</i>	Barrens Buckmoth	G5	
<i>Hesperia leonardus</i>	Leonard's Skipper	G4	
<i>Lonicera hirsuta</i>	Hairy Honeysuckle	TU	PE
<i>Lupine perennis</i>	Lupine	PR	PR
<i>Metaxaglaea semilaria</i>	Footpath Sallow Moth	G5	
<i>Nannothemis beta</i>	Elfin Skimmer	G4	
<i>PA Natural Community</i>	Ridgetop dwarf tree forest		
<i>Papaipema sp. 1</i>	Flypoison Borerer Moth	G2G3	
<i>Rosa virginiana</i>	Virginia Rose	TU	TU
<i>Utricularia inflata</i>	Floating Bladderwort	N	TU
Montour			
Nothing			
Northumberland			
<i>Carex longi</i>	Long's Sedge	TU	TU
<i>Citheronia sepulchralis</i>	Pine Devil	G5	
<i>Xestia elinata</i>	Southern Variable Dart Noth	G5	

TOTAL P.03

George T. Jones
Vice President
Special Projects

Two North Ninth Street
Allentown, PA 18101-1179
Tel. 610.774.7602 Fax 610.774.7797
gtjones@pplweb.com



March 24, 2005

Mr. Christopher A. Urban
Non-game and Endangered Species Unit
Pennsylvania Fish & Boat Commission
450 Robinson Lane
Bellefonte, PA 16823

PPL SUSQUEHANNA, LLC
REQUEST FOR INFORMATION ON STATE-LISTED
SPECIES AND IMPORTANT HABITATS (FISH, REPTILES,
AMPHIBIANS, AND AQUATIC INVERTEBRATES)
LICREN ER 101013
PLR-049

Dear Mr. Urban:

PPL Susquehanna, LLC (PPL Susquehanna) is preparing an application to the U. S. Nuclear Regulatory Commission (NRC) to renew the operating licenses for Susquehanna Steam Electric Station (SSES) Units 1 and 2. Current operating licenses for the two-unit plant expire in 2022 and 2024. The renewal term would be for an additional 20 years beyond the original license expiration date. As part of the license renewal process, the NRC requires license applicants to "assess the impact of the proposed action on threatened or endangered species in accordance the Endangered Species Act" (10 CFR 51.53). The NRC will also request an informal consultation with your office at a later date under Section 7 of the Endangered Species Act. By contacting you early in the application process, we hope to identify any issues that we need to address or any information that we should provide to your office to expedite the NRC consultation.

PPL Susquehanna has operated SSES and associated transmission lines since 1982. The facility is located on the west bank of the Susquehanna River in Salem Township, Luzerne County, Pennsylvania, approximately 5 miles northeast of Berwick, Pennsylvania (see attached map).

The Final Environmental Statement (FES) for construction prepared in 1973 by the U.S. Atomic Energy Commission and the FES prepared for operation prepared in 1981 by the U.S. Nuclear Regulatory Commission identified three short 230-kilovolt ties in the vicinity of SSES, one longer 230 kilovolt line (Stanton #2), and two longer 500 kilovolt lines (Sunbury #2 and Siegfried) that were built to connect SSES to the electric grid. The three short connections were to provide startup power for SSES from pre-existing 230-kilovolt lines in the immediate vicinity of the plant and to connect the Unit 1 output to the pre-existing 230-kilovolt Susquehanna Switchyard across the Susquehanna River.

After publication of the FES for operation, PPL Susquehanna made several changes in the transmission system. As a result of these system changes, the transmission lines are somewhat different than those described in the FES. Six transmission lines connect the station to the regional grid, and are thus relevant to license renewal. They include:

- Short ties in the SSES vicinity (3) – These three lines (approximately 6.3 total miles) identified in the FES as necessary to connect SSES to the 230-kilovolt electrical system are primarily in areas controlled by SSES and not accessible to the public; however, U.S. Highway 11, Pennsylvania State Highway 239, and other paved roads in the immediate plant vicinity are crossed by the short ties.
- Stanton #2 – This single circuit 230-kilovolt line runs generally northeast from SSES for approximately 30 miles in a 100- to 400-footwide corridor.
- Wescosville – This 500-kilovolt line connects SSES with the Albutis substation. It runs generally southeast for approximately 76 circuit miles in a corridor ranging from 100 to 350 feet wide.
- Sunbury #2 – This 500-kilovolt line shares a corridor with the pre-existing Sunbury #1 line and runs west-southwest. The corridor is about 325 feet wide and approximately 30 miles long.

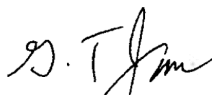
In total, for the specific purpose of connecting SSES to the transmission system, PPL Susquehanna has approximately 150 miles of corridor that occupy approximately 3,341 acres. The corridors pass through land that is primarily agricultural or forest land. The areas are mostly remote, with low population densities. The longer lines cross numerous state and U.S. highways. Impact of these corridors on land usage is minimal; farmlands that have corridors passing through them generally continue to be used as farmland.

Pennsylvania counties crossed by the transmission lines include Luzerne (the location of SSES), Carbon, Columbia, Lehigh, Northampton, Northumberland, Montour, and Snyder. Based on our direct observations, a preliminary review of PPL Susquehanna records, a review of the Pennsylvania Natural Heritage Program, and a review of the U.S. Fish and Wildlife Service web site, we believe that the Bog turtle (*Clemmys muhlenbergii*), federally-listed as threatened and state-listed as endangered, occurs in Lehigh and Northampton Counties.

PPL Susquehanna is committed to the conservation of significant natural habitats and protected species, and expects that operation of SSES, including maintenance of the identified transmission lines, through the license renewal period (an additional 20 years) would not adversely affect any listed species. PPL Susquehanna has no plans to alter current operations over the license renewal period. Any maintenance activities necessary to support license renewal would be limited to previously disturbed areas. No additional land disturbance is anticipated in support of license renewal.

Please do not hesitate to call Jerry Fields (610) 774-7889 if you have any questions or require any additional information. After your review, we would appreciate receiving your input by April 22, 2005, detailing any concerns you may have about any listed species or critical habitat in the area or confirming PPL Susquehanna's conclusion that operation of SSES over the license renewal term would have no effect on any threatened or endangered species. This will enable us to meet our application preparation schedule. PPL Susquehanna will include a copy of this letter and your response in the Environmental Report that will be submitted to the NRC as part of the SSES license renewal application.

Sincerely,



George T. Jones

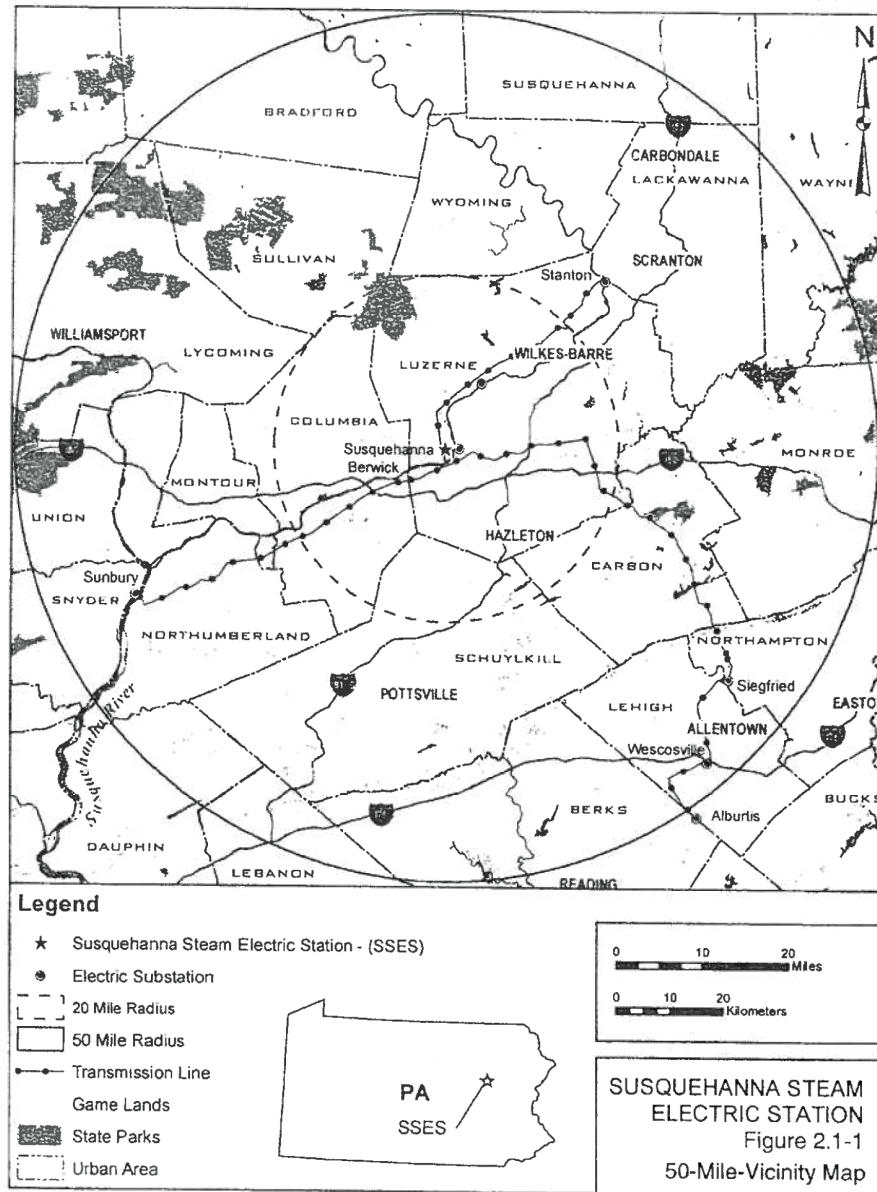
Attachment – Figure 2.1-1, 50-Mile Vicinity Map

Response Requested: YES ☒ by April 22, 2005

g:\goadmin\licrenewal\plr\plr-049.doc

Susquehanna Steam Electric Station Units 1 & 2
License Renewal Application

Susquehanna Steam Electric Station Units 1 & 2
License Renewal Application



Location and Features

Page 2.1-2

September 2006



Pennsylvania Fish & Boat Commission

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5237 Fax: (814) 359-5175

April 19, 2005

IN REPLY REFER TO
SIR # 18976

PPL
GEORGE T. JONES
TWO NORTH NINTH ST
ALLENTOWN, PA 18101

RE: Species Impact Review (SIR) - Rare, Candidate, Threatened and Endangered Species
PPL SUSQUEHANNA LICENSE RENEWAL FOR SUSQUEHANNA STEAM ELECTRIC STATION
SALEM Township/Borough, LUZERNE County, Pennsylvania

This responds to your inquiry about a Pennsylvania Natural Diversity Inventory (PNDI) Internet Database search "potential conflict" or a threatened and endangered species impact review. These projects are screened for potential conflicts with rare, candidate, threatened or endangered species under Pennsylvania Fish & Boat Commission jurisdiction (fish, reptiles, amphibians, aquatic invertebrates only) using the Pennsylvania Natural Diversity Inventory (PNDI) database and our own files. These species of special concern are listed under the Endangered Species Act of 1973, the Wild Resource Conservation Act, and the Pennsylvania Fish & Boat Code (Chapter 75), or the Wildlife Code. The absence of recorded information from our files does not necessarily imply actual conditions on site. Future field investigations could alter this determination. The information contained in our files is routinely updated. A Species Impact Review is valid for one year only.

X **NO ADVERSE IMPACTS EXPECTED FROM THE PROPOSED PROJECT**

— Except for occasional transient species, rare, candidate, threatened or endangered species under our jurisdiction are not known to exist in the vicinity of the project area. Therefore, no biological assessment or further consultation regarding rare species is needed with the Commission. Should project plans change, or if additional information on listed or proposed species becomes available, this determination may be reconsidered.

X An element occurrence of a rare, candidate, threatened, or endangered species under our jurisdiction is known from the vicinity of the proposed project. However, given the nature of the proposed project, the immediate location, or the current status of the nearby element occurrence(s), no adverse impacts are expected to the species of special concern.

If you have any questions regarding this review, please contact the biologist indicated below:

— Jeff Schmid	814-359-5236	— J.R. Holtsmaster	814-359-5194
<u>X</u> Kathy Derge	814-359-5186	— Bob Morgan	814-359-5129

I am enclosing a copy of our "SIR Request Form", which is to be used for all future species impact review requests. Please make copies of the attached form and use with all future project reviews. Thank you in advance for your cooperation and attention to this important matter of species conservation and habitat protection.

SIGNATURE: Christopher A. Urban DATE: April 19, 2005
Christopher A. Urban
Chief, Natural Diversity Section

Our Mission:

www.fish.state.pa.us

To provide fishing and boating opportunities through the protection and management of aquatic resources.

Susquehanna Steam Electric Station Units 1 & 2
License Renewal Application

PFBC-DES-NDS-1 (5/2/03)

COMMONWEALTH OF PENNSYLVANIA
FISH AND BOAT COMMISSION
NATURAL DIVERSITY SECTION
SPECIES IMPACT REVIEW (SIR) REQUEST FORM

- A. This form provides the site information necessary to perform a computer database search for species of special concern listed under the Endangered Species Act of 1973, the Wild Resource Conservation Act, the Pennsylvania Fish and Boat Code or the Wildlife Code.
- B. Use only *one form* for each proposed project or location. Complete the information below and mail form to:

Natural Diversity Section
Division of Environmental Services
PA Fish and Boat Commission
450 Robinson Lane
Bellefonte, PA 16823
Fax: (814) 359-5175

- C. This form, a cover letter including a project narrative, and accompanying maps should be sent to the above address for environmental reviews that *only* concern *reptiles, amphibians, fishes and aquatic invertebrates*. Reviews for other natural resources must be submitted to other appropriate agencies.
- D. The absence of recorded information from our databases and files does not necessarily imply actual conditions on site. Future field investigations could alter this determination. The information contained in our files is routinely updated. A review is valid for one year.
- E. *Please send us only one (1) copy of your request* – either by fax or by mail – not both. Mail is preferred to improve legibility of maps. Facsimile submission will not improve our response turn-around time.
- F. *Allow 30 days for completion of the review from the date of PFBC receipt*. Large projects and workload may extend this review timeframe.
- G. *In any future correspondence with us following your receipt of the SIR response, please refer to the assigned SIR number at the top left of our cover letter.*
- H. **FORMS THAT ARE NOT COMPLETED IN FULL WILL NOT BE REVIEWED.**

PLEASE PRINT OR TYPE: If available, provide the potential conflict PNDI Search Number: _____

PFBC response should be sent to: _____

Company/Agency: _____ Form Preparer: _____

Address: _____

Project Description: _____ Phone (8:00 AM to 4:00 PM): _____

Indicate if the project is: Transportation ☐ or Non-transportation ☐ (check one)

Will the proposed project encroach directly or indirectly (e.g., runoff) upon wetlands or waterways? Circle one for each:

Wetlands: Yes No Unknown Waterways: Yes No Unknown

County: _____ Township/Municipality: _____

Name of the United States Geological Survey (U.S.G.S.) 7.5 Minute Quadrangle Map where project is located: _____

Attach an 8.5" by 11" photocopy (DO NOT REDUCE) of the section of the U.S.G.S. Quadrangle Map which identifies the project location. On this map, indicate the location of the project center (if linear, depict both ends) and outline the approximate boundaries of the project area.

Specify latitude/longitude of the project center.

Indicate latitude/longitude in degrees-minutes-seconds format only. Latitude: _____° / _____' / _____" N
Longitude: _____° / _____' / _____" W

Three steps are needed to convert from decimal degrees to degrees-minutes-seconds: (1) Degrees will be the whole number. (2) To get minutes, multiply the decimal degree portion by 60. (3) Multiply the decimal minute portion by 60 to get seconds.

Example: (Latitude) 40.93748 = 40°; 0.93748 x 60 = 56.2488' = 56'; 0.2488 x 60 = 14.928 = 15" = 40°56'15" N

(Longitude) 75.94740 = 75°; 0.94740 x 60 = 56.844' = 56'; 0.844 x 60 = 50.64 = 51" = 75°56'51" W

FOR PFBC USE ONLY

SIR#	Quad Name	Data Source	Search Result-Potential Species Conflict	Action