



Before the  
Pennsylvania Public Utility Commission

# **JENKINS-STANTON #2 230 kV CIRCUIT**

**Attachments in Support of the  
Letter of Notification**

Application Docket No. \_\_\_\_\_

Submitted by: PPL Electric Utilities Corp.

## SUMMARY

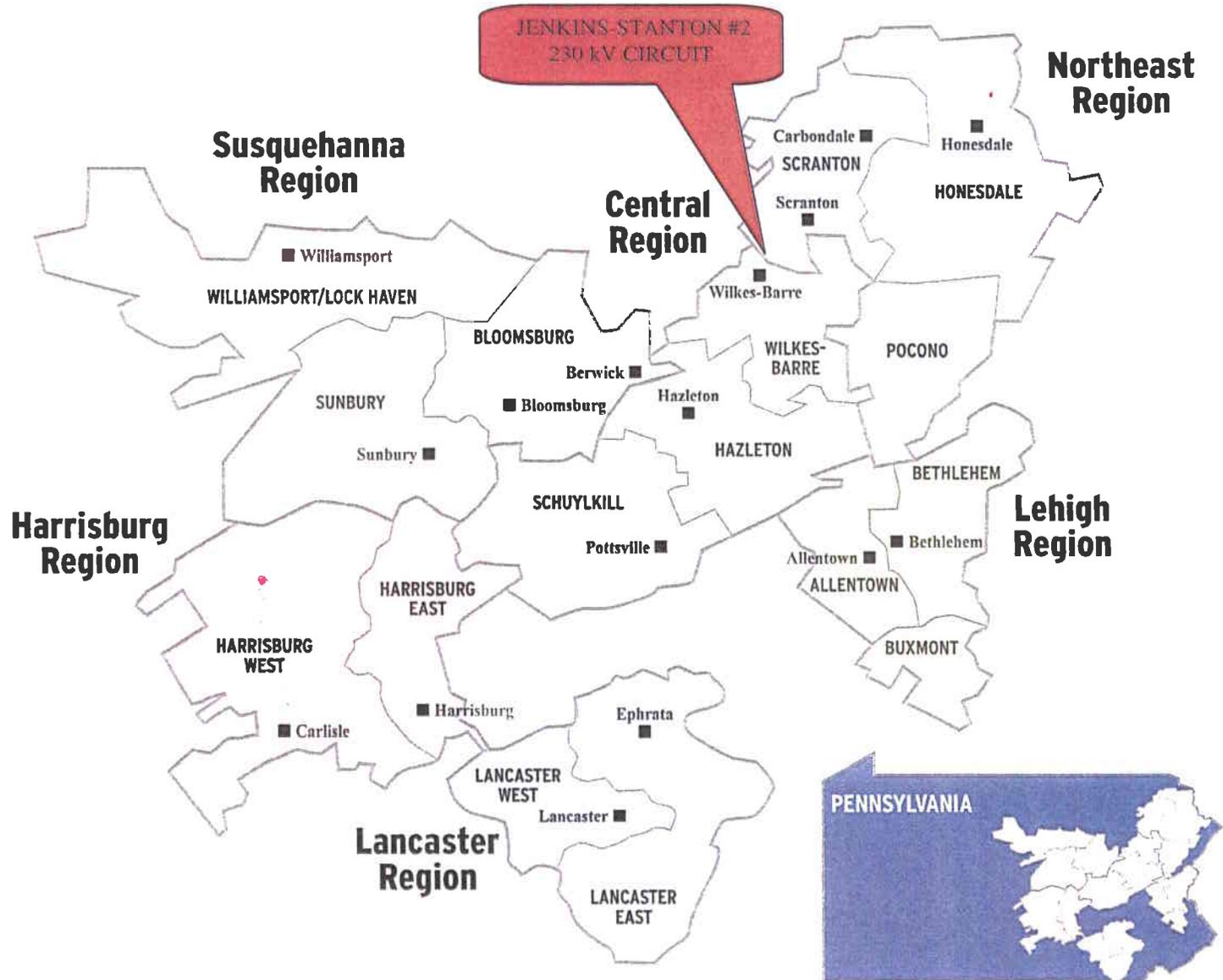
This Letter of Notification is being submitted by PPL Electric Utilities Corporation (PPL Electric) pursuant to the Pennsylvania Public Utility Commission's (PUC or the Commission) regulations at 52 Pa. Code §§57.71 through 57.77 for approval to site and construct the Jenkins-Stanton #2 230 kV Circuit in Luzerne County. This Project is required to improve reliability of service in the region by resolving a violation of reliability planning criteria of the PJM Interconnection, LLP. The new circuit will be approximately 8.5 miles in length and will be added to existing structures of the Jenkins-Stanton 230 kV Line and will be insulated and operated at 230 kV. Only two new structures will be needed for the Project.

The total estimated cost of the proposed Project is approximately \$8.8 million. This includes approximately \$8 million for the transmission line and approximately \$800,000 for the substation work associated with this Project. Subject to the Commission's approval, construction is scheduled to begin in March, 2014 to support the Project's in-service date of November, 2014.

This document, which describes the need for the Project and discusses the engineering and siting analysis for the proposed construction, includes the following attachments:

|              |   |
|--------------|---|
|              | Summary   |
| Attachment 1 | Necessity Statement   |
| Attachment 2 | Engineering Description   |
| Attachment 3 | Environmental Assessment  |
| Attachment 4 | PPL Electric Design Criteria and Safety Practices                                 |
| Attachment 5 | PPL Electric Magnetic Field Management Program                                    |
| Attachment 6 | List of Owners of Property within the Right-of-Way                                |
| Attachment 7 | List of Involved Governmental Agencies, Municipalities, and Other Public Entities |

# PPL ELECTRIC UTILITIES SERVICE TERRITORY



# **Attachment**

**1**

**ATTACHMENT 1  
JENKINS-STANTON #2 230 kV CIRCUIT  
NECESSITY STATEMENT**

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**TABLE OF CONTENTS**

| <b><u>SECTION</u></b> | <b><u>TOPIC</u></b>             | <b><u>PAGE</u></b> |
|-----------------------|---------------------------------|--------------------|
| A.                    | INTRODUCTION.....               | 1                  |
| B.                    | SYSTEM PLANNING PROCESS.....    | 2                  |
| C.                    | PJM'S ROLE IN THE PROJECT.....  | 5                  |
| D.                    | EXISTING SYSTEM.....            | 7                  |
| E.                    | DEFINITION OF THE PROBLEM ..... | 8                  |
| F.                    | PROPOSED SOLUTION .....         | 9                  |

**LIST OF FIGURES**

|          |  |    |
|----------|--|----|
| FIGURE 1 | FUNCTIONAL ONE-LINE DIAGRAM OF THE EXISTING TRANSMISSION SYSTEM..... | 10 |
| FIGURE 2 | FUNCTIONAL ONE-LINE DIAGRAM OF THE PROPOSED TRANSMISSION SYSTEM..... | 11 |

**MAP**

|       |                              |                            |
|-------|------------------------------|----------------------------|
| MAP 1 | PPL ELECTRIC SYSTEM MAP..... | ATTACHMENT 1<br>MAP POCKET |
|-------|------------------------------|----------------------------|

**ATTACHMENT 1  
JENKINS-STANTON #2 230 kV CIRCUIT  
NECESSITY STATEMENT**

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**A. INTRODUCTION**

PPL Electric Utilities Corporation (PPL Electric) proposes to add a second 230 kV circuit to the existing 8.5 mile line from PPL Electric's Jenkins 230-69 kV Substation to the PPL Electric's Stanton 230-69kV Substation. The peak load served from the Jenkins 230-69 kV Substation has exceeded 300 MW. The new circuit will be named the Jenkins-Stanton #2 230 kV Circuit. The new circuit will be added to existing structures of the Jenkins-Stanton 230 kV Line and will be insulated and operated at 230 kV.

Adding the second 230 kV circuit to the existing Jenkins-Stanton 230 kV Line will create 8.5 miles of double-circuit line from the Jenkins 230 kV Substation to the Stanton 230 kV Substation. This new double-circuit line will become the new Jenkins-Stanton #1 & #2 230 kV Line (see Figure 2). As a result of the proposed modifications to the existing single-circuit transmission line, creating the new double-circuit transmission line, the 60,600 customers served from the Jenkins 230-69 kV Substation will have improved reliability of service in the event of a NERC Category C contingency (N-1-1)<sup>1</sup> that, absent the proposed circuit, would have interrupted more than 300 MW of load at Jenkins 230-69 kV Substation.

The proposed new facility will provide improved reliability of service for 60,600 customers in Jenkins Township, Yatesville Borough, City of Wilkes-Barre, Plains Township, Wright Township, Bear Creek Township, Hanover Township, Avoca Borough, Laflin Borough, and Dupont Borough in Luzerne County, and the City of Scranton, and Moosic Borough in Lackawanna County.

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<sup>1</sup>NERC Category C criteria require the system to be stable and within applicable equipment thermal ratings and system limits under a variety of multiple facility contingency events, *i.e.*, with two elements of the system out of service. Such events include the loss of one system element followed by system readjustments, and then the loss of a second system element (*i.e.*, NERC Category C.3). This is referred to as the "n minus 1 minus 1" or "n-1-1" criteria.

This Project is required to prevent interrupting an amount of customer load that would exceed 300 MW for a NERC N-1-1 Reliability Criteria Test where both the Susquehanna-Jenkins and Jenkins-Stanton 230 kV Lines are lost. According to PJM Interconnection, LLP (PJM) Manual 14B, Attachment D: PJM Reliability Planning Criteria, PJM will not accept a planned loss of load of more than 300 MW for all reliability criteria tests.”

The estimated cost to site, design, and modify the existing overhead lines to a double-circuit transmission lines is approximately \$8.1 million. Additional work at the substations is expected to cost approximately \$800,000. Subject to the PUC’s approval, the Project’s scheduled in service date is November 2014.

A PPL Electric system map showing existing transmission facilities with a design voltage of 35 kV or greater is included in the Attachment 1 map pocket. This filing addresses only the existing and proposed transmission system in this portion of Luzerne County and Lackawanna County.

## **B. SYSTEM PLANNING PROCESS**

System Planning is the process which assures that the transmission system can supply electricity to all customer loads in a manner that is reliable and economic. This System Planning process assures that both the Bulk Electric System (BES)<sup>2</sup> and non-Bulk Electric System<sup>3</sup> (non-BES) are planned and constructed so that they, among other things, meet all PJM reliability planning criteria. :

- They are able to accommodate forecasted system flows during summer and winter peak load;
- They can adequately serve each customer’s needs with regard to capacity, voltage and reliability for all load levels throughout the daily load cycle;

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<sup>2</sup> Bulk Electric System (BES) - Includes transmission facilities operated at voltages of 100 kV or higher.

<sup>3</sup> Non-Bulk Electrical System (non-BES) - Includes transmission facilities operated at voltages less than 100 kV.

- They can sustain probable contingencies and disturbances with minimal customer service interruptions;
- They are in conformance with PPL Electric's transmission planning reliability principles, practices and standards (RP&P) for all normal and emergency operating conditions.

The process of planning the transmission system requires PPL Electric to look into the future to develop a reinforcement plan far enough in advance to be able to complete a project when it is needed. Ideally, transmission facility upgrades are planned such that the in-service date corresponds with the time frame that the facility is required to meet the planning criteria established by the RP&P. Significant lead times are needed to design and install new line and substation facilities where new sites and/or rights-of-way must be acquired.

The reliable and economical operation of PPL Electric's transmission system requires planning standards for system expansion and reinforcement. The principles upon which these planning practices are based recognize that:

- The system expansion should be coordinated to achieve the most economical balance of construction and operating expenditures;
- The system should maintain a proper balance between the degree of risk, amount and type of load interrupted, and the cost of providing the needed expansion; and
- The system reliability should be maintained to prevent large scale, long term, or frequent service interruptions to avoid adverse effects and hazards to the public.

PPL Electric undertakes an independent analysis of both its BES transmission facilities and its non-BES electric transmission system facilities. The PPL Electric planning practices are outlined in the RP&P, which was developed to ensure adequate and appropriate levels of electric service to its customers consistent with good utility practice.

The fundamental purpose of the RP&P is to provide PPL Electric planning engineers with a comprehensive set of planning practices and criteria that enable them to plan for a reliable transmission and distribution system for PPL Electric's customers. The RP&P is reviewed periodically by PPL Electric engineers and planners. The document is updated to reflect current standards and practices. Updates to the document are approved by PPL Electric's senior management. PPL Electric's RP&P is consistent with good utility practices and with the reliability criteria and standards used by similarly situated distribution and transmission utilities.

In accordance with these practices and PPL Electric's Reliability Criteria, PPL Electric transmission system is planned so that it can be operated at all projected load levels and during normal scheduled outages and withstand specific unscheduled contingencies without exceeding the equipment capability, causing system instability or cascade tripping, or exceeding voltage tolerances. The transmission system is required to have adequate capability so that it can be operated normally and can withstand the following unscheduled contingencies and other system conditions:

1. Normal operation of the system will not load any electric facility beyond its normal continuous rating.
2. The loss of any single transmission line, generating unit, power transformer, substation bus, circuit breaker, or double-circuit line due to the outage of a single tower or pole, does not result in any system electric facility being operated beyond its applicable emergency rating.
3. No customer load should remain interrupted for routine maintenance of non-BES transmission facilities.
4. The loss of any single facility should not result in a voltage drop of more than 5% on the non-BES transmission system.
5. Stability of the electric system should be maintained from a permanent three-phase transmission line fault cleared by normal primary relay action. In addition, system stability should be maintained for a permanent single phase

to ground line fault and the failure of the protective devices to operate properly resulting in a failed circuit breaker.

6. No large-scale, long-term or frequent interruptions may cause excessive load losses due to their adverse effects on, and hazard to, the public.
7. Excessive load is not interrupted for the loss of a single-circuit 69 kV line or double-circuit 69 kV line, and the lost load is within the specified limits as defined in the RP&P.

These principles are incorporated in the PPL Electric Utilities Transmission Planning RP&P document.

The transmission planning process begins with the development of a computer model of the future system. A specific study year is chosen, and the future system model is developed using the existing system plus any planned modifications to the transmission system scheduled to be completed prior to the study year. Load levels used in the system model are based on the latest forecast prepared annually by PJM.

Once the system model is complete, comprehensive power flow simulations are performed to determine the ability of the system to comply with the PJM transmission planning reliability criteria. Compliance is determined by simulating the contingency conditions outlined above. All conditions where the system is not in conformance with the reliability criteria are identified, and system reinforcements are added to bring the system into compliance. Also identified are estimated costs and lead-times to implement the required reinforcements. Computer simulations of the system with the identified reinforcement alternatives are completed to identify the best overall reinforcement that will meet the needs of the region in a reliable and economic manner.

### **C. PJM'S ROLE IN THE PROJECT**

PJM is a Federal Energy Regulatory Commission ("FERC") approved Regional Transmission Organization charged with ensuring the reliability of the electric transmission system under its functional control and coordinating the movement of

electricity in all or parts of thirteen states and the District of Columbia, including most of Pennsylvania. In order to ensure reliable transmission service, PJM prepares an annual Regional Transmission Expansion Plan (“RTEP”) to identify system reinforcements that are required to, among other things, meet the North American Electric Reliability Corporation (“NERC”) Reliability Standards,<sup>4</sup> PJM reliability planning criteria, and transmission owner reliability criteria. The RTEP is a FERC-approved transmission planning process that results from a comprehensive analysis to identify existing and forecasted violations of the NERC, PJM and transmission owner reliability standards on the transmission systems within PJM’s service territory.<sup>5</sup>

PJM’s RTEP is an annual process that encompasses a comprehensive series of detailed analyses to ensure power continues to flow reliably to customers under stringent reliability criteria set by NERC. The NERC reliability standards, transmission owner criteria, and PJM reliability planning criteria are used by PJM and the transmission owners to analyze the system and to determine the specific transmission upgrade projects, as part of the overall reliability solution, that are needed to ensure long-term reliable electric service to customers and competitive power markets.

With respect to the BES, PJM conducts RTEP studies in conjunction with its transmission owners and applies NERC or PJM reliability criteria to specific conditions on the transmission system. When the studies show an inability of the transmission system to meet a specific reliability standard under these conditions, solutions such as construction of one or more new transmission lines or one or more upgrades to existing transmission facilities may be necessary. PPL Electric, an owner of transmission

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<sup>4</sup> On February 3, 2006, FERC certified the North American Electric Reliability Corporation (“NERC”) as the organization required to establish and enforce reliability standards for the bulk electric system. Thereafter, NERC develops and enforces reliability standards, which define the reliability requirements for planning and operating transmission systems in North America. The NERC Reliability Standards apply to all users, owners, and operators of the nation’s interconnected transmission grid, including PPL Electric.

<sup>5</sup> PJM’s RTEP process is currently set forth in Schedule 6 of PJM’s Amended and Restated Operating Agreement (“Schedule 6”). Schedule 6 governs the process by which PJM’s members rely on PJM to prepare an annual regional plan for the enhancement and expansion of the transmission facilities to ensure long-term, reliable electric service consistent with established reliability criteria. In addition, Schedule 6 addresses the procedures used to develop the RTEP, the review and approval process for the RTEP, the obligation of transmission owners to build transmission upgrades included in the RTEP, and the process by which interregional transmission upgrades will be developed.

facilities in Pennsylvania, is a member of PJM and actively participates in the PJM transmission planning process.

PJM generally monitors all BES facilities in PJM and ties to PJM. For non-BES areas of the system that become radial post-contingency, PJM will monitor that area if the radial system contains greater than 300 MW of load. The proposed Jenkins-Stanton #2 Project will resolve the violation of the PJM Reliability Planning Criteria which state that no more than 300 MW of load can be lost for any NERC reliability criteria test.

Projects that are necessary to resolve NERC criteria, PJM reliability criteria, or the transmission owners' own local transmission planning criteria are included as baseline projects in PJM's RTEP. These projects are presented before stakeholders at the Transmission Expansion Advisory Committee (TEAC) meetings. The Committee members are provided an opportunity to review and provide written comments to PJM on the proposed reinforcement prior to the project being included in the final RTEP.

The final draft RTEP is sent to the PJM Board for approval. Once the PJM Board approves the RTEP the transmission owners then move forward to implement the RTEP BES transmission and the non-BES facility upgrades as they are obligated to do under the PJM Tariff and Operating Agreements.

The purpose of the proposed Jenkins-Stanton #2 Project is to resolve a PJM Reliability Planning Criteria violation of a NERC criteria test. PPL Electric submitted the proposed Project to PJM for review and inclusion in the RTEP in 2009. The Project was presented before stakeholders at a TEAC meeting on May 20, 2009, approved by the PJM Board, and included in the 2009 RTEP Report as a baseline project b0910.

#### **D. EXISTING SYSTEM**

The Jenkins 230-69kV Substation in Plains Township, Luzerne County, has three (3) 230-69 kV transformers, and two (2) 230 kV lines (Susquehanna-Jenkins 230 kV Line & Jenkins-Stanton 230 kV Line). The Stanton 230-69kV Substation in Exeter Township, Luzerne County, has four (4) 230-69kV transformers, and four (4) 230 kV lines

(Susquehanna-Stanton #2 230 kV Line, Mountain-Stanton 230 kV Line, Jenkins-Stanton 230 kV Line, & Stanton-Lackawanna 230 kV Line).

The existing Jenkins-Stanton 230 kV Line extends from PPL Electric's Jenkins 230-69 kV Substation to PPL Electric's Stanton 230-69 kV Substation. The existing single-circuit 230 kV line is approximately 8.5 miles in total length, and is constructed for future double-circuit operation. **Figure 1** shows the functional arrangement of the existing transmission facilities in the area.

#### **E. DEFINITION OF THE PROBLEM**

Due to load growth in the area, transmission planning studies project, for 2016 and beyond, that the loss of the Susquehanna-Jenkins 230kV Line followed by the loss of the Jenkins-Stanton 230kV Line would interrupt in excess of 300 MW of load, which equates to approximately 60,600 customers as served from the Jenkins 230-69 kV Substation. PJM Manual 14B (PJM Region Transmission Planning Process) section 2.3.8 (NERC Category C3 "N-1-1" Analysis) states that if a radial system exists of 300 MW or greater post-contingency, it is subject to monitoring by PJM. Further, according to PJM Manual 14B, Attachment D: PJM Reliability Planning Criteria, PJM will not accept a planned loss of load of more than 300 MW for all reliability criteria tests.

After the loss of the Susquehanna-Jenkins 230 kV Line, the Jenkins 230-69 kV Substation would operate radially on the Jenkins-Stanton 230 kV Line. If the Jenkins-Stanton 230 kV Line were then to be lost, full voltage collapse would occur at Jenkins 230-69 kV Substation as all 230kV sources into the substation are interrupted and voltage in the 230 kV yard is lost (0 volts). Voltage collapse in this case would be in violation of PJM Manual 14B section 2.3.8. In addition, the loss of greater than 300 MW of load for the N-1-1 criteria test would violate PJM's Reliability Planning Criteria.

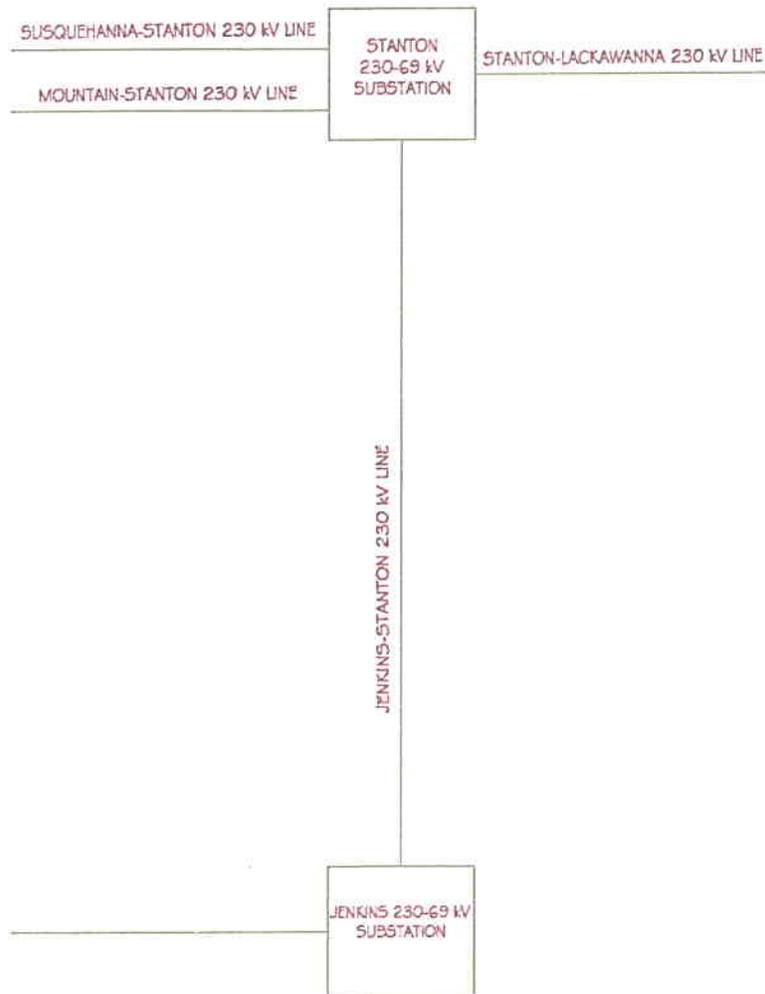
PPL Electric Utilities has recorded a greater than 300 MW load at the Jenkins 230-69 kV Substation in 2013 during recent heavy load periods. This condition was experienced on 07/16/2013 during peak load conditions.

## F. PROPOSED SOLUTION

To resolve the issue described above, PPL Electric, with approval from the PUC, plans to add the second 230kV circuit on the existing Jenkins-Stanton 230 kV Line over its entire 8.5 mile length. This addition will create the Jenkins-Stanton #1 & #2 230 kV double-circuit line. A small number of new structures will be added at or near Stanton 230-69 kV substation to accommodate bay rearrangements in the 230 kV yard. A total of two (2) new structures will be needed. No new right of way will be required.

PPL Electric determined, and confirmed with PJM, that the addition of Jenkins-Stanton #2 230 kV circuit will resolve the PJM Manual 14B section 2.3.8 violation, because the new 230 kV line will support voltage at Jenkins 230-69kV Substation for the previously identified N-1-1 contingency. The new Jenkins-Stanton #2 230 kV Line will also resolve the violation of the PJM Reliability Planning Criteria in PJM Manual 14B, Attachment D, which states that no more than 300 MW of load can be lost for any reliability criteria test. After completion of the Project, an outage on the Susquehanna-Jenkins 230 kV Line followed by an outage on the Jenkins-Stanton #1 230kV Line would meet all PJM Manual 14B, section 2.3.8 and Attachment D, reliability planning criteria. **Figure 2** shows the functional arrangement of the proposed transmission facilities in the area. The total estimated cost for the proposed work is approximately \$8.9 million for the transmission line work.

FUNCTIONAL ONE-LINE DIAGRAM OF THE  
EXISTING TRANSMISSION SYSTEM



**FIGURE 1**

FUNCTIONAL ONE-LINE DIAGRAM OF THE  
PROPOSED TRANSMISSION SYSTEM

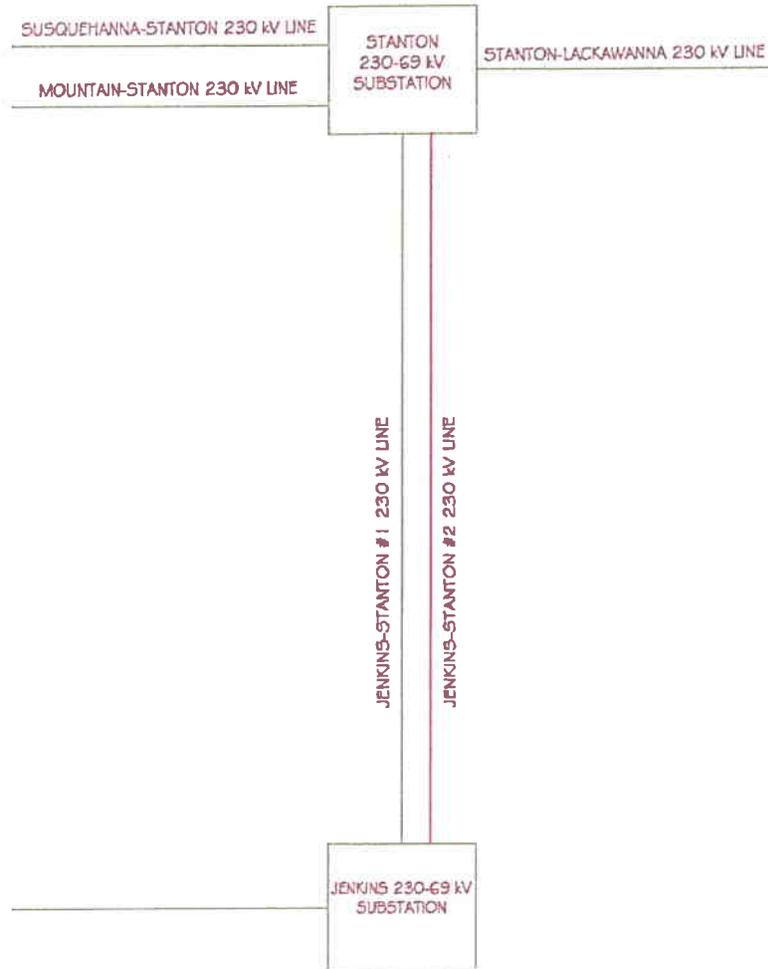


FIGURE 2

# **Attachment**

**2**

**ATTACHMENT 2  
JENKINS-STANTON #2 230 kV CIRCUIT  
ENGINEERING DESCRIPTION**

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**TABLE OF CONTENTS**

| <b><u>SECTION</u></b> | <b><u>TOPIC</u></b>                | <b><u>PAGE</u></b> |
|-----------------------|------------------------------------|--------------------|
| A.                    | DESCRIPTION OF PROPOSED LINE ..... | 1                  |
| B.                    | MAGNETIC FIELD MANAGEMENT.....     | 4                  |
| C.                    | RIGHT-OF-WAY STATUS.....           | 4                  |

**LIST OF TABLES**

|         |  |   |
|---------|--|---|
| TABLE 1 | DESIGN MINIMUM CONDUCTOR CLEARANCES..... | 3 |
| TABLE 2 | CONDUCTOR THERMAL RATINGS .....          | 3 |

**LIST OF FIGURES**

|          |                                       |   |
|----------|---------------------------------------|---|
| FIGURE 1 | TYPICAL EXISTING TOWER STRUCTURE..... | 5 |
| FIGURE 2 | TYPICAL EXISTING MONOPOLE.....        | 6 |

**MAP**

|      |                                 |                            |
|------|---------------------------------|----------------------------|
| MAPS | AERIAL PLOT PLAN – DRAWING..... | ATTACHMENT<br>2 MAP POCKET |
|------|---------------------------------|----------------------------|

**ATTACHMENT 2**  
**JENKINS-STANTON #2 230 kV CIRCUIT**  
**ENGINEERING DESCRIPTION**

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**A. DESCRIPTION OF PROPOSED LINE**

PPL Electric Utilities proposes to add a second circuit to the existing Jenkins-Stanton 230 kV Line from the Stanton Substation to the Jenkins Substation, approximately 8.5 miles. Refer to the Aerial Exhibit at the end of Attachment 2 which depicts the location of these facilities. The proposed line addition will be located in Luzerne County, Plains Township, Jenkins Township, Wyoming Borough, Exeter Borough and Exeter Township.

The existing Jenkins-Stanton 230 kV line is already designed for double circuit operation to utilize six (6) 1590 kcmil<sup>1</sup> ACSR<sup>2</sup> conductors. It is currently operating with single circuit operation. The double circuit capacity will be utilized at this time by stringing the second circuit; three (3) phases of 1590 kcmil conductor. PPL Electric will also be replacing the existing 3/8" Steel overhead ground wire with a single 48 count optical ground wire for lightning protection and fiber optic communication capability for operational purposes.

The existing line consists of fifty (50) lattice tower structures and one monopole steel angle structure. The average height of the existing structures is approximately 140 feet. This Project involves the installation of two (2) additional steel monopoles. One monopole structure will be approximately 100 feet tall and will be used in conjunction with the existing monopole angle structure (see **Figure 2**) to carry the second circuit. The other monopole will be approximately 160 feet tall and will be used to connect the Mountain-Stanton Line to the tower currently carrying the Susquehanna 2- Stanton Line. The Susquehanna 2- Stanton Line will be removed as part of the Susquehanna-Roseland Project, and this tower will be utilized to transfer the existing Mountain-Stanton Line off the structure which it currently shares with the existing Jenkins-Stanton #1 230 kV Line. The additional steel structures will be within the existing PPL Electric

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<sup>1</sup> Kcmil wire size is the equivalent cross sectional area in thousands of circular mils. A circular mil is the area of a circle with a diameter of one thousandth (0.001) of an inch. A 1590 kcmil conductor is approximately 1.504 inches in diameter.

<sup>2</sup> ACSR stands for "aluminum conductor steel reinforced."

right-of-way or on PPL Electric fee owned property. These new structures will be on foundations.

After the addition of the second circuit, the tower line will be a double circuit line carrying the Jenkins-Stanton #1 and the new Jenkins-Stanton #2 230 kV Line.<sup>3</sup>

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<sup>3</sup> The information provided regarding design is based on the preliminary design. The final design may be somewhat different.

The new 230 kV circuit will be designed according to (and generally exceeding) National Electrical Safety Code (NESC) minimum standards. Additional design criteria and safety rules practiced by PPL Electric Utilities are included in Attachment 4. The minimum conductor to ground clearance will be 38 feet which occurs at a maximum conductor temperature of 284° F. The design minimum conductor ground clearances and conductor thermal ratings are as follow:

**TABLE 1**  
**DESIGN MINIMUM CONDUCTOR CLEARANCES**  
**FOR 1590 KCMIL, 45/7 STRANDING ACSR**

| <u>Condition</u>  | <u>Double-Circuit Design<br/>Clearance to Ground</u> |
|---|--|
| Normal load, average weather<br>(60°F ambient temperature)              | 49.67 feet   |
| Predicted extreme thermal load<br>(284°F conductor temperature)         | 38.00 feet   |
| Predicted NESC extreme wind load<br>(60°F ambient temperature)          | 46.51 feet   |
| Predicted extreme weather conditions<br>(1-inch ice, 8 lbs. wind, 15°F) | 47.05 feet   |

*Clearances based on a maximum tension of 21,900 lbs. at 1 inch ice, 8 lbs. wind, 0°F and a ruling span of 1000 feet.*

**TABLE 2**  
**CONDUCTOR THERMAL RATING**  
**1590 KCMIL 45/7 STRANDING ACSR “LAPWING”**  
**(284°F) 140°C MAXIMUM CONDUCTOR**

| Condition        | <u>Ambient Temperature<br/>°C</u> | <u>Wind Speed<br/>ft/sec</u> | <u>Ampacity<br/>Amps</u> |
|------------------|-----------------------------------|------------------------------|--------------------------|
| Summer Normal    | 35                                | 0                            | 1796                     |
| Winter Normal    | 10                                | 0                            | 2020                     |
| Summer Emergency | 35                                | 2.533                        | 2183                     |
| Winter Emergency | 10                                | 2.533                        | 2411                     |

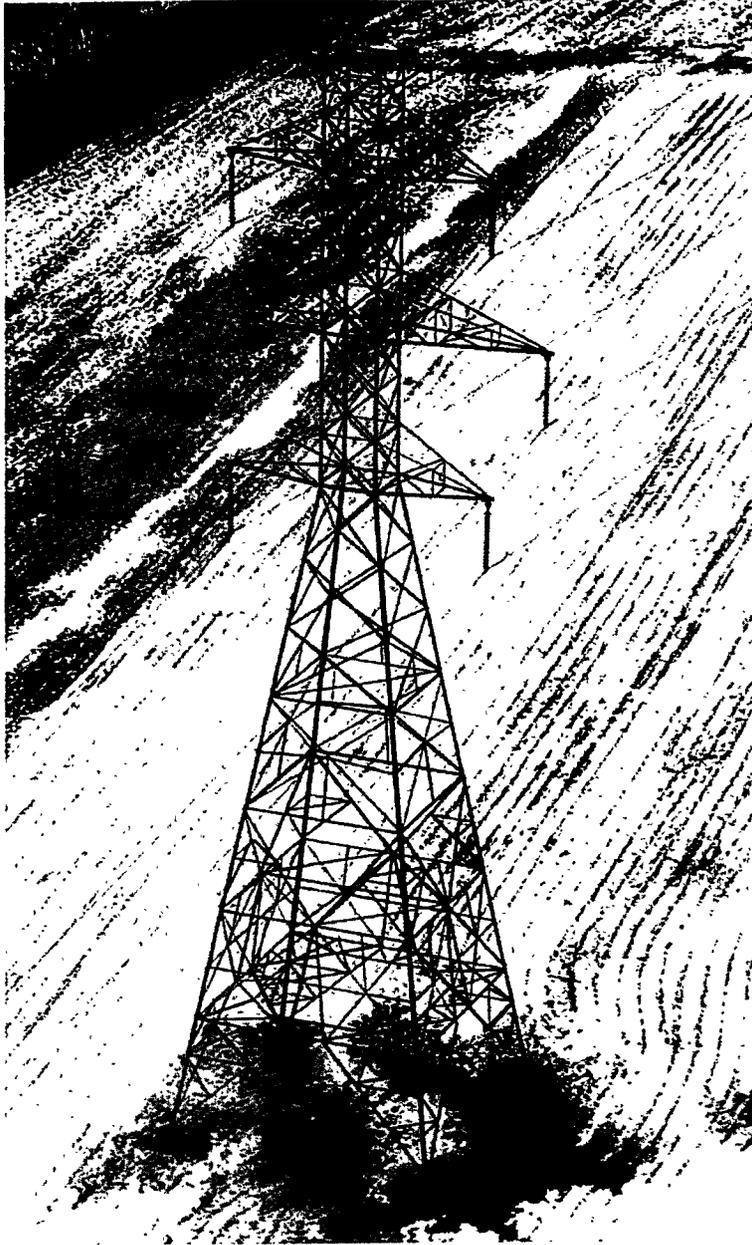
## **B. MAGNETIC FIELD MANAGEMENT**

PPL Electric's Magnetic Field Management Program, summarized in Attachment 5, is applied to new and reconstructed transmission line projects. The company does not believe that the current scientific evidence demonstrates that magnetic fields cause any adverse health effects or pose a health or safety danger to the public. Nevertheless, PPL Electric has determined, as a matter of policy, to design its new and rebuilt transmission lines to reduce magnetic fields when that can be done at low or no cost and consistent with functional requirements. PPL Electric's Magnetic Field Management Program has been developed to implement that policy decision. To reduce magnetic field exposures, the program generally prescribes the use of a line design that provides at least five feet higher ground clearance than NESC standards and reverse phasing of new double-circuit lines where it is feasible to do so at low or no cost.

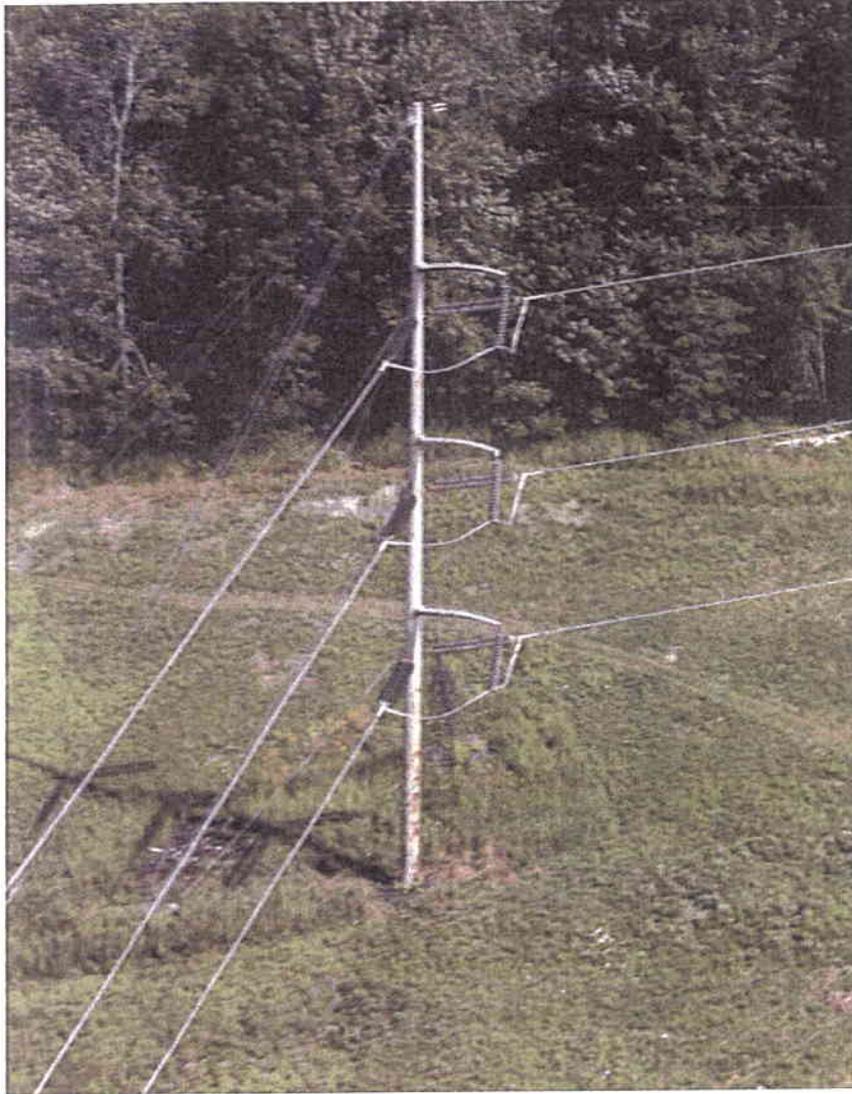
Reverse phasing will be utilized when installing the second circuit to produce cross-cancellation of EMF. The existing structures were designed to have additional vertical clearance to ground than required by NESC standards. Increased vertical distances facilitate the dispersion of EMF levels measured at ground level.

## **C. RIGHT-OF-WAY STATUS**

The proposed line will be constructed entirely within existing PPL Electric Right of Way or on existing PPL Electric fee owned property. Therefore, no additional right-of-way is required for the Project.



**FIGURE 1 - Existing Typical Tower Structure**



**FIGURE 2 - Existing Angle Structure**

# **Attachment**

**3**

**ATTACHMENT 3  
JENKINS-STANTON #2 230 kV CIRCUIT  
ENVIRONMENTAL ASSESSMENT**

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**TABLE OF CONTENTS**

| <b><u>SECTION</u></b> | <b><u>TOPIC</u></b>                    | <b><u>PAGE</u></b> |
|-----------------------|--|--------------------|
| A.                    | INTRODUCTION.....                      | 1                  |
| B.                    | LAND USE.....                          | 1                  |
| C.                    | CULTURAL RESOURCES.....                | 2                  |
| D.                    | NATURAL FEATURES.....                  | 2                  |
| E.                    | THREATENED AND ENDANGERED SPECIES..... | 3                  |

**ATTACHMENT 3**  
**JENKINS-STANTON #2 230 kV CIRCUIT**  
**ENVIRONMENTAL ASSESSMENT**

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**A.     INTRODUCTION**

To meet the increasing demand for electricity and to improve reliability, PPL Electric is proposing to construct an additional 230 kV circuit between the Jenkins Substation and the Stanton Substation. The Project involves the addition of approximately 8.5 miles of new 230 kV transmission circuit to the existing structures which currently carry the Jenkins-Stanton #1 230 kV circuit and the installation of two (2) new structures to accommodate the new line. The existing structures are designed to accommodate a second 230 kV circuit but currently only carry one 230 kV circuit.

The Project was discussed with Plains, Exeter, and Jenkins townships, Wyoming and Exeter Boroughs, and Luzerne County. Neither the Municipalities, nor the County had any objection. A list of involved governmental agencies, municipalities and other public entities is presented in Attachment 7.

**B.     LAND USE**

The Project is located in part on property owned in fee by PPL Electric and in part within existing PPL Electric transmission line right-of-way. Both the property owned in fee and the right-of-way contain existing electrical facilities which will be upgraded. No additional property rights are required to complete this Project.

Land use in the area is mixed. Uses include agricultural, residential, recreational, commercial, and industrial. Land use impacts are anticipated to be minimal due to the fact that the Project is located in areas that contain existing PPL Electric facilities which will be upgraded. Only two new structures will be required. Interference with existing land uses will be further minimized because, where possible, PPL Electric will use previously established access roads for construction. Any interference with land use for access roads will be temporary.

No nearby communication towers, pipelines, or other utilities will be affected by the proposed Project. The closest point of the Wilkes-Barre Wyoming Valley Airport is located approximately 1 mile southwest of the proposed Project. PPL Electric does not anticipate any interference with airport operations due to the Project utilizing pre-existing electrical structures and the fact that the structure heights will remain the same. However, PPL Electric will file any required documentation with both the Federal Aviation Administration and the Pennsylvania Department of Transportation Bureau of Aviation.

**C. CULTURAL RESOURCES**

The Project was reviewed by the Pennsylvania Historical and Museum Commission (PHMC). The PHMC has determined that there will be no effect on National Register eligible or listed historic or archaeological properties in the area.<sup>1</sup> Therefore, there are no anticipated impacts to such resources and no further investigations are required.

**D. NATURAL FEATURES**

The Project will not affect any unique geological, scenic, or natural areas. The recreational area located closest to the Project is the Frances Slocum State Park, which is located approximately 1.80 miles west of the Project location. There are no anticipated impacts to these features due to the distance from the project area, and the extensive development between the project area and the features.

Limited vegetation management may be required for this Project. Only minimal vegetation removal may be needed because the Project is being completed entirely within existing PPL Electric right-of-way and on PPL Electric fee-owned property, which are currently cleared of trees. In areas where vegetation management is required to complete the Project, PPL Electric will apply its “Specifications for Initial Clearing and Control of Vegetation On or Adjacent to

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<sup>1</sup> File No. ER 2013-1753-079-A.

Electric Line Right-of-Way Through Use of Herbicides, Mechanical and Hand Clearing Techniques” to mitigate any impacts.

PPL Electric has retained STV Energy Services, Inc. to identify and delineate all wetlands and watercourses within the existing right-of-way. These will be identified, delineated and added to the construction plans. All construction activities will be planned to avoid impacts to wetlands and watercourses, to the extent feasible. If impacts cannot be avoided, PPL Electric will obtain all permits necessary from the Pennsylvania Department of Environmental Protection and the United States Army Corps of Engineers and will comply with all conditions placed on the permits. In addition, PPL Electric will acquire any required soil erosion and sedimentation control permits and comply with any conditions placed on those permits.

#### **E. THREATENED AND ENDANGERED SPECIES**

PPL Electric has coordinated with state and federal agencies to obtain information regarding threatened and endangered species in close proximity to the project area. STV Energy Services, Inc. has been retained by PPL Electric to coordinate with these agencies. A review of the Pennsylvania Natural Diversity Inventory (PNDI) records indicates that there are potential impacts to threatened and endangered species and/or special concern species and resources which fall under the jurisdiction of two separate agencies. One potential impact falls under the jurisdiction of the Pennsylvania Department of Conservation and Natural Resources (DCNR) and the other potential impact is under the jurisdiction of the Pennsylvania Fish and Boat Commission (PAFBC).<sup>2</sup>

The potential impact under the jurisdiction of the PAFBC is in reference to two separate species of special concern, including the *Lampsilis cariosa* (Yellow Lamomussell) and an unnamed species. On December 19, 2012, STV Energy Services, Inc. provided the additional information required by the PAFBC for further review of the species of concern under its jurisdiction. After reviewing the additional information, the PAFBC has determined that the Project will have no

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<sup>2</sup> PNDI Search ID: 20121113379847.

adverse impacts to the species of special concern. This response is documented in correspondence dated January 23, 2013 from the PAFBC.

The potential impact under the jurisdiction of the DCNR is in reference to the *Amelanchier humilis* (Serviceberry) which is currently a species of special concern. In correspondence dated March 5, 2013, the DCNR requested that a plant survey be performed for the project area. STV Energy Services, Inc. performed the required plant survey on May 15, 2013 and found no issues/concerns with Serviceberry. A report documenting the results of the field survey was submitted to the DCNR for review. In correspondence dated June 21, 2013, the DCNR has determined that the Project will have no adverse impacts to the species of special concern.

# **Attachment**

**4**

## **PPL DESIGN CRITERIA AND SAFETY PRACTICES**

The National Electrical Safety Code (NESC) is a set of rules to safeguard people during the installation, operation, and maintenance of electric power lines. The NESC contains the basic provisions considered necessary for the safety of employees and the public. Although it is not intended as a design specification, its provisions establish minimum design requirements. PPL Electric Utilities Corp. (PPL) has developed design specifications and safety rules which meet or surpass all requirements specified by the NESC.

### Engineering Design Criteria and Parameters

The NESC includes loading requirements and clearances for the design, construction, and operation of power lines. The "loads" on conductors and supporting structures are the mechanical forces that develop from the weight of the conductors, the weight of ice on the conductors, plus wind pressure on the conductors and supporting structures. Loading requirements are the loads on the conductors and structures that are anticipated assuming certain ice and wind conditions. Loading requirements always contain "safety factors" to allow for unknown or unanticipated contingencies. The clearances and loading requirements contained in the NESC were developed to ensure public safety and welfare.

PPL transmission line design standards meet or surpass the NESC standards. For example, the relative order of grades of construction for conductors and supporting structures is B, C, and N; Grade B being the highest. According to the NESC standards, construction Grades B, C, or N may be used for transmission lines (except at crossings of railroad tracks and limited access highways where Grade B construction is specified). However, PPL designs all of its transmission lines for Grade B construction. The use of Grade B design and construction specifies enhancements such as larger-minimum crossarm dimensions, larger-minimum conductor size, and increased safety factors.

Another example is the design parameters utilized to account for ice and wind loadings on the overhead ground wire (OHGW) and power conductors. The NESC standard ice and wind design magnitudes for the PPL territory are 0.5 inch thickness of radial ice combined with four pounds per square foot horizontal wind pressure (equivalent to 40-mile per hour wind velocity). The conductor sags and tensions used in line designs are the result of various ice and wind combinations, depending on the elevation at the line location and line design voltage. The conductor sags and tensions used in the design of all PPL transmission lines are at least 0.5-inch ice combined with eight pounds wind pressure (equivalent to 57 miles per hour wind velocity). This means that PPL lines are designed to operate safely and reliably during inclement weather even more severe than assumed by the NESC. In addition, PPL transmission lines are designed with more clearance to the ground than required by the NESC. The tables below compare PPL and NESC ground clearances for lines of various voltages.

**138 kV**

| <u>Surface Underneath Conductors</u>                                      | <u>Vertical Clearance to Ground</u> |                   |
|---|-------------------------------------|-------------------|
|   | <u>NESC Standard</u>                | <u>PPL Design</u> |
| Roads, streets, alleys  | 21 Ft.                              | 30 Ft.            |
| Other land traversed by vehicles (such as cultivated field, forest, etc.) | 21 Ft.                              | 30 Ft.            |
| Spaces accessible to pedestrians only                                     | 17 Ft.                              | 30 Ft.            |
| Railroad tracks   | 31 Ft.                              | 35 Ft.            |

## 230 kV

| <u>Surface Underneath Conductors</u>                                      | <u>Vertical Clearance to Ground</u> |                   |
|---|-------------------------------------|-------------------|
|   | <u>NESC Standard</u>                | <u>PPL Design</u> |
| Roads, streets, alleys  | 23 Ft.                              | 32 Ft.            |
| Other land traversed by vehicles (such as cultivated field, forest, etc.) | 23 Ft.                              | 32 Ft.            |
| Spaces accessible to pedestrians only                                     | 19 Ft.                              | 32 Ft.            |
| Railroad tracks   | 31 Ft.                              | 36 Ft.            |

## 500 kV

| <u>Surface Underneath Conductors</u>                                      | <u>Vertical Clearance to Ground</u> |                   |
|---|-------------------------------------|-------------------|
|   | <u>NESC Standard</u>                | <u>PPL Design</u> |
| Roads, streets, alleys  | 28 Ft.                              | 53 Ft.            |
| Other land traversed by vehicles (such as cultivated field, forest, etc.) | 28 Ft.                              | 53 Ft.            |
| Spaces accessible to pedestrians only                                     | 24 Ft.                              | 53 Ft.            |
| Railroad tracks   | 38 Ft.                              | 53 Ft.            |

A relay protection system is used to protect the public safety and welfare as well as equipment and the transmission system. Relay protection is installed for all transmission lines to automatically de-energize the line in the unlikely event that the line or supporting structure fails and the line contacts the ground.

### Periodic Maintenance Program on All Transmission Lines

To ensure continued public safety and integrity of service, a periodic maintenance and inspection program is implemented for every transmission line. The program is administered through the use of helicopter patrols, with supplemental foot and structure

climbing patrols. A number of helicopter patrols are performed on all lines annually. The two-man helicopter crew flies parallel, to the left, and above the line so that the observer can look for signs of line damage or deterioration and observe clearances between vegetation and conductors. The observations are included in a report that is forwarded to the appropriate department for corrective action.

Foot and structure climbing patrol programs for a transmission line begin approximately three to five years after the line is energized, unless a helicopter patrol reports a need for earlier action. The frequency of foot patrols varies from once every year to once every several years depending on line type and age.

An assigned foot patroller checks right-of-way conditions, including access roads, bridges, pole washouts, tower footers, vegetation height and clearance to conductors, pole and tower deterioration and, with the use of binoculars, insulators, and condition of hardware. Identified problems are included in a report that is forwarded to the appropriate department for corrective action.

A scheduled line outage is required to perform an overhead patrol because of "hands-on" inspection of hardware. Overhead patrols are conducted on a schedule determined by line age, operating record, and observed general condition. The necessary repairs are also done during the inspection outage.

### Personnel Safety Rules

The following are a few of the PPL safety rules that demonstrate the Company's concern for employee safety:

- Work procedures have been developed to allow work to be performed on energized facilities in a safe manner. When lines or apparatus are removed from service to be worked on, the Energy Control Process system is applied. This system provides that a red tag must be physically placed on the control handle of the de-energized equipment. The red tag may be removed only after proper authorization to energize the equipment. Various other tags are used for limited operations and informational purposes.

Employees will not apply or remove a tag or change the status of tagged equipment unless authorized.

- Temporary safety grounds are used on de-energized facilities for employee safety during maintenance, construction, or reconstruction work. Safety grounds are wires connecting the de-energized facility to an electrical ground. If the facility should be energized, the safety grounds will divert the current directly to ground and reduce the likelihood of personal injury. The conductor size and attachment clamps of temporary safety grounds must be capable of conducting anticipated fault currents. Rubber gloves, rubber sleeves, and additional rubber protective equipment are used as required when applying or removing temporary safety grounds to or from the lines or apparatus to be grounded. An approved nonconductive working stick of sufficient length to allow workers to maintain the following required minimum clearances is used to test that the line has been de-energized and to apply temporary safety grounds:

| <u>Voltage-kV</u> | <u>Minimum Clearance</u> |
|-------------------|--------------------------|
| 138               | 3'-7"                    |
| 230               | 5'-3"                    |
| 500               | 11'-3"                   |

Before applying grounds, a test is done to confirm that the line is de-energized. The voltage test device is checked before and after use to assure reliability. When ground pins are used to establish proper ground points, they are driven to a depth of not less than four feet as near vertical as possible.

- Poles or structures are inspected and examined for structural integrity before climbing. If there is any reason to believe that a pole is unsafe, it is stabilized before work is performed. Appropriate safety gear in the form of body belts, safety straps, hard hats, gloves, etc., is worn by linemen during line work activity.

# **Attachment**

**5**



**MAGNETIC  
FIELD  
MANAGEMENT**  
PPL Electric Utilities  
Corporation

DECEMBER 2004

**TABLE OF CONTENTS**

INTRODUCTION ..... 1

DEVELOPMENT OF PPL EU's MAGNETIC FIELD MANAGEMENT PROGRAM..... 6

VARIABLES THAT AFFECT MAGNETIC FIELDS ..... 6

    Effect of Phase Current on Magnetic Fields ..... 6

    Effect of Conductor Configuration on Magnetic Fields ..... 7

    Effect of Distance from the Magnetic Field Source ..... 7

SUMMARY OF PPL EU's MAGNETIC FIELD MANAGEMENT PROGRAM..... 8

MAGNETIC FIELD MANAGEMENT PROGRAM GUIDELINES..... 9

    Overhead Lines ..... 9

        New or Rebuilt Transmission Lines ..... 9

        Reconductoring or Adding Additional Circuits to Existing Transmission Lines ..... 14

        Distribution Lines ..... 14

    Underground Transmission Lines..... 15

CHARTS..... 16

# INTRODUCTION

At PPL Electric Utilities Corp. (PPL EU), magnetic field management means investigating and implementing methods at low or no cost to reduce magnetic fields in new or rebuilt transmission and distribution lines. This document explains PPL EU's Magnetic Field Management Program, which is part of PPL EU's larger Electric and Magnetic Fields (EMF) policy.

## **PPL EU's View**

Some people are worried that electric and magnetic fields are harming their health. Others think the scientific research does not show a problem at all, and still others believe there's just too much scientific uncertainty to draw any conclusions.

Here's what we do know now. Various panels of scientists that have reviewed the EMF research generally have drawn two main conclusions. First, the large body of evidence does not demonstrate that EMF are harmful. Second, additional research is recommended to explore questions raised in some studies.

Given these conclusions, PPL EU is taking a reasoned approach in responding to the EMF issue. PPL EU's approach to the EMF issue consists of five elements:

- Providing EMF information to customers and employees
- Providing magnetic field measurements
- Establishing and implementing a magnetic field management program to reduce magnetic fields in new or rebuilt facilities when it can be done at no, or low, cost
- Integrating EMF in the public involvement process that PPL EU undertakes in the siting of transmission lines
- Have supported additional research

## **EMF Are All Around Us**

Electric and magnetic fields occur in nature and in all living things. The earth, for instance, has a magnetic field, which makes the needle on a compass point north.

Electric fields and magnetic fields of a different type also surround every wire that carries electricity. In everyday life, these EMF arise from several basic sources, including power lines, electrical appliances, home and building wiring, other utility lines and cables, and currents flowing on water pipes. Though they often occur together, EMF are made up of two separate components:

### **Electric Fields**

Electric fields are produced by the voltage—or electrical pressure—on a wire. The higher the voltage, the higher the electric field. As long as a wire is energized—has voltage present—an electric field is present (see Figure 1). In other words, an appliance, or an electric power line, doesn't actually have to be turned on to create an electric field. It just has to be plugged in. Electric fields diminish with distance and can be blocked or partially shielded by objects such as trees and houses.

### **Magnetic Fields**

Magnetic fields are created by the current or flow of electricity through a wire. Generally speaking, the higher the current, the higher the magnetic field. Because they only occur when current is flowing, magnetic fields are present only when the power is turned on (see Figure 1). Magnetic fields also diminish with distance, but—unlike electric fields—are not blocked by common objects. In recent years, public and scientific interest has turned toward the magnetic field component of EMF because of some scientific studies regarding these fields.

Figure 1

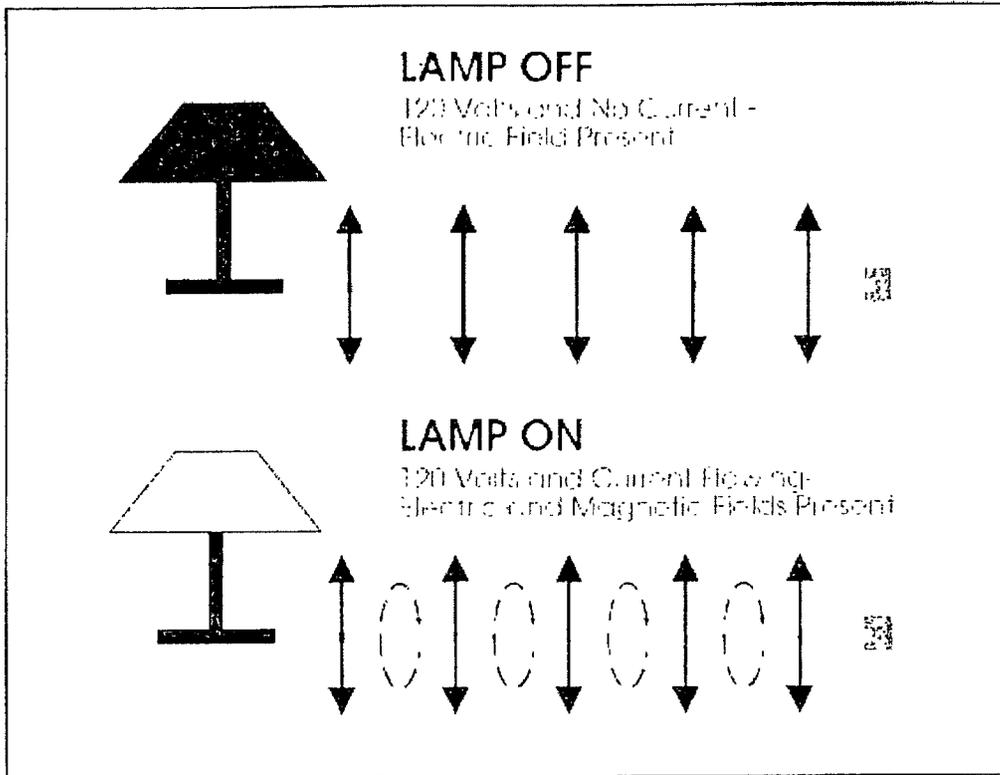


Figure 2

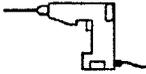
| Magnetic field strengths decrease with distance |   | Source: "EMF in Your Environment", U.S. Environmental Protection Agency 1992 |           |           |
|---|---|--|-----------|-----------|
| Magnetic fields are measured in milligauss      |   | At 6 inches  | At 1 foot | At 2 feet |
| Clothes dryer                                   |    | 2 to 10  | * to 3    | *         |
| Microwave oven                                  |    | 100 to 300   | 1 to 200  | 1 to 30   |
| Toaster   |    | 5 to 20  | * to 7    | *         |
| Power drill                                     |    | 100 to 200   | 20 to 40  | 3 to 6    |
| Can opener                                      |    | 500 to 1500  | 40 to 300 | 3 to 30   |
| Mixer   |    | 30 to 600  | 5 to 100  | * to 10   |
| Hair dryer                                      |   | 1 to 700   | * to 70   | * to 10   |
| Color television                                |  | Data not available   | * to 20   | * to 8    |

FIGURE 2 \* The magnetic field measurement at this distance from the operating appliance could not be distinguished from background measurements taken before the appliance had been turned on.

### Measuring Magnetic Fields

Magnetic fields usually are measured in a unit called a milligauss. Magnetic field levels found in the living areas of homes typically range from less than 1 milligauss to about 4 milligauss according to the U.S. Environmental Protection Agency. They can be higher in some cases. The levels next to appliances can exceed 1,000 milligauss (1 gauss). Figures 2 and 3 show how the strength of the field falls off as you move away from the source, just as the heat of a campfire grows weaker as you walk away from it. For overhead power lines, the strength of the magnetic fields is dependent upon a number of factors that will be explained later. Those factors produce a magnetic field that drops off rapidly as you move away from the power line.

Figure 3

| <b>Sample Magnetic Field Levels in Milligauss</b> |                               |               |                |                |
|---|-------------------------------|---------------|----------------|----------------|
| <b>Type of Overhead Power Line</b>                | <b>Distance from the line</b> |               |                |                |
|   | <b>Under the line</b>         | <b>50 ft.</b> | <b>100 ft.</b> | <b>200 ft.</b> |
| 220 kV and 500 kV                                 | 5-400                         | 5-250         | 1-75           | 0.5-20         |
| 69 kV and 138 kV                                  | 3-80                          | 0.5-2.5       | 0.1-10         | 0.1-3          |
| 12 kV and below                                   | 0.4-20                        | 0.1-1         | -              | -              |

The magnetic field values provided in this table represent a general range of values associated with the types of overhead power lines listed and are provided for illustration. There will be circumstances in which there will be magnetic field levels above or below the range of values provided due to variations in such factors as height of the wires, current flow and so on.

## **DEVELOPMENT OF PPL EU's MAGNETIC FIELD MANAGEMENT PROGRAM**

One element of our response to EMF concerns expressed by some of our customers is PPL EU's Magnetic Field Management Program. The program was initiated in March 1991 because PPL EU believes it makes good sense, as a matter of policy, to respond to the concerns expressed by some of our customers and to reduce magnetic fields in new and rebuilt facilities where it can be done with either no-cost or low-cost design changes.

This document updates the original program which has been revised several times since 1991. These guidelines were developed by PPL EU's EMF Working Group.

### **VARIABLES THAT AFFECT MAGNETIC FIELDS**

Magnetic fields from transmission and distribution lines are a function of a number of design variables. The following parameters affect the magnetic field levels produced by transmission and distribution lines:

- Current
- Height of conductors above ground
- Configuration of conductors
- Distance from the line

### **EFFECT OF PHASE CURRENT ON MAGNETIC FIELDS**

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At power frequencies (i.e., 60 hertz), the magnetic field level is a function of the current or flow of electricity through a wire. Keeping all other parameters the same, the magnetic field is proportional to the current. Hence, if the current increases by 25 percent, the resulting magnetic field level will increase by 25 percent.

The overall load current on any line varies with the demand for power. It's usually highest during daytime hours and lowest at night. There also are weekly, monthly, seasonal and yearly variations.

The difference in the currents between each phase in a multiphase line also can affect the magnetic field. This difference is called phase unbalance. For a constant load, a statistical analysis of this phase unbalance can be made to determine its effect on the magnetic field. Close to the line, there is very little effect. However, the phase unbalance slows the rate at which the magnetic field decreases with distance from the line.

### **EFFECT OF CONDUCTOR CONFIGURATION ON MAGNETIC FIELDS**

In the transmission and distribution of power, utilities like PPL EU presently use both three-phase and single-phase lines. Each phase on a three-phase power line has either a single conductor or a bundle of two or more conductors. In a three-phase system, the ground-level magnetic field is a result of the fields produced by the currents in each of the phases. Placing the three phases as close together as possible (compaction) creates some field cancellation, and the ground-level magnetic field is reduced. However, appropriate phase separation is required for the reliable operation of the line. In addition, the arrangement of the phases can create some; field cancellation and reduction of the ground-level magnetic field.

### **EFFECT OF DISTANCE FROM THE MAGNETIC FIELD SOURCE**

Magnetic field strength diminishes with the vertical and lateral distances from the magnetic field source. Increasing the height of the conductors above ground is useful for magnetic field reduction at ground level, but may result in increased structure costs and increased aesthetic impact of the structures. Another possible method of increasing the distance to the magnetic field source is to increase the right-of-way requirements. By keeping buildings off increased rights of way, thereby requiring the public to live and work further away from lines, exposure to magnetic fields produced by the lines can be reduced. Increases in right of way are not always practical and may increase costs significantly, however.

## **SUMMARY OF PPL EU's MAGNETIC FIELD MANAGEMENT PROGRAM**

Under its Magnetic Field Management Program, PPL EU has changed the way it builds and rebuilds some of its transmission and distribution lines. These design changes reduce magnetic field levels (assuming balanced circuit loadings and phase currents) by up to 69 percent in most of the company's new transmission lines. These guidelines now are being applied to new and reconstructed transmission facilities, based on this program.

The distribution component of the program focuses on 12 kV lines, the company's standard distribution voltage. It concentrates on the three-phase, primary 12 kV lines, since these are the most heavily loaded facilities and often are located in densely populated areas. The guidelines in this program are being applied to these three-phase, primary 12 kV lines.

A maximum 3-5 percent change in estimated cost was used as the limit for the guidelines since this value is consistent with low cost, is within estimating accuracy and is likely to have little impact on overall line costs.

The magnetic field calculations used in this document for the design of PPL EU's overall magnetic field management plan assume balanced load conditions among the phases and a fixed level of current, not necessarily representative of specific transmission or distribution lines. These levels were calculated using the Electric Power Research Institute's ENVIRO computer program. Under actual operating conditions, the magnetic field levels that result may vary due to such things as actual load per circuit, overall current on each phase conductor and the electrical configuration and operation of each line.

# MAGNETIC FIELD MANAGEMENT PROGRAM GUIDELINES

The guidelines for magnetic field management are noted below, with discussion points for each.

## **OVERHEAD LINES**

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### **NEW OR REBUILT TRANSMISSION LINES**

- 1. Balance transmission circuit loads and phase currents as much as possible.**
  - PPL EU should continue to make every effort to balance loadings between the two circuits of a double circuit line when planning new or rebuilt facilities to maximize the effects of reverse phasing.
  - PPL EU should continue the practice of balancing single-phase loads across the three phases of the distribution system. (Unbalanced phase currents on the distribution system are reflected through to the transmission system.)
    - Unbalanced phase currents result in higher magnetic fields that do not drop off as quickly with distance as do the fields resulting from balanced phase currents.
    - For a 5 percent phase current unbalance, the magnetic field 50 feet from the centerline of a single circuit 138 kV line could be more than twice the value than if the same line had balanced phase circuits.
  - Balanced phase currents on each three-phase distribution circuit also reduce magnetic fields from the distribution circuits themselves. In addition, they reduce magnetic fields on the transmission system from which the distribution system circuits are supplied and connected through substations.
  - Apart from magnetic field considerations, balanced phase currents on each three-phase distribution circuit also reduce line losses and improve the system voltage.

**2. Continue with the present practice of using long-span construction as the PPL EU 138/69 kV standard**

- Structure designs for short-span and long-span construction are illustrated on Charts I and II, respectively.
  - Short-span design does not significantly reduce magnetic fields when compared to long-span design even though it is more compact than long-span design. Comparison of the magnetic field values from Chart III indicates essentially the same values. Therefore, short-span design should not be used solely to reduce magnetic fields.
  - PPL EU will continue to use long-span construction for 138/69 kV double-circuit lines and for single-circuit/future-double-circuit lines.
  - For single-circuit/future-double-circuit lines, PPL EU will continue to install two conductors on the top positions and one in the middle position as shown in Chart IV.
    - This arrangement minimizes magnetic fields as shown in Chart V by placing the three initial conductors higher on the structure, which increases the ground clearances, and by placing the conductors in a triangular configuration.

**3. Compact design structures are not a low-cost alternative and should be used for magnetic field reduction only in special applications.**

Chart VI illustrates the compact design structure.

- The compact design increases the initial installation costs by 79 percent when compared to the long-span design but reduces the magnetic field from 9 mG to 3 mG (about 67 percent) at the edge of the 100-foot-wide right of way as shown on Chart III.

**4. Reverse phase new or rebuilt double-circuit transmission lines for all voltage levels.**

- Reverse phasing was adopted by PPL EU in March 1991 for double-circuit 138/69 kV transmission lines and in April 1992 for all other double circuit transmission lines. Reverse phasing is shown in Chart VII. Reverse phasing will reduce the magnetic fields when the current flow on both circuits is in the same

direction. Calculated values contained here are based on balanced and equal phase currents on both circuits.

- Reverse phasing reduces the magnetic field of a double circuit 138 kV single pole transmission line from 29 mG to 9 mG (about 69 percent) at the edge of the 100-foot-wide right of way as shown on Chart III.
- Reverse phasing reduces the magnetic field of a double circuit 230 kV single pole transmission line from 49 mG to 16 mG (about 67 percent) at the edge of the 150-foot-wide right of way as shown on Chart VIII.
- Reverse phasing reduces the magnetic field of a double-circuit 500 kV single pole transmission line from 37 mG to 21 mG (about 43 percent) at the edge of the 200-foot-wide right of way as shown on Chart IX.
- When new or rebuilt double-circuit lines require tapping existing double-circuit lines, PPL EU will review the existing lines to determine if reverse phasing can be provided at low cost.
- Computer modeling is required to develop the optimum phasing and overall conductor arrangements for lines added to, or rebuilt in, multiple-line corridors.
  - Merely adding a reverse-phase double-circuit line to an existing transmission line corridor or reverse phasing a rebuilt line in the multiple-line corridor will not necessarily produce lower magnetic field levels at the edge of the corridor right of way.
  - The corridor must be computer modeled with all the lines, existing phase conductor locations and currents. Then, magnetic field calculations must be made varying the phase arrangements of the new or reconstructed line to determine the appropriate phasing arrangement.
  - Current flow direction on a line also must be considered. For example, a reverse-phased line should have the current flowing in the same direction on both circuits. If the current flow is in the opposite direction for one circuit, reverse phasing will not produce the lowest magnetic field and another phase arrangement that produces lower fields may need to be utilized.

**5. Increase the minimum ground clearance for all new transmission lines.**

**138/69 kV Transmission Lines**

- Increasing the minimum line design ground clearance from 25 feet to 30 feet may add up to about 5 percent to the installed cost of a new double-circuit single pole 138/69 kV line. For a given project, such cost may be substantially less, however. In fact, PPL EU frequently uses higher-than-minimum ground clearances due to such features as road crossings, line crossings and site-specific terrain. With long-span reverse-phase design, the magnetic field is reduced from 9 mG to 7 mG (about 22 percent) at the edge of a 100-foot-wide right of way as shown in Chart X.
  - In the actual design of transmission lines to include higher minimum ground clearances, there may be limited segments (such as highway crossings, severe slopes and transmission line crossing locations) where National Electrical Safety Code (NESC) minimum ground clearances may need to be used. The NESC minimum ground clearances are less than the increased ground clearance discussed previously.

**230 kV Transmission Lines**

- Increasing the minimum line design ground clearances from 27 feet to 32 feet may add up to about 5 percent to the cost of a single-circuit single-pole line (current standard). For a given project, such cost may be substantially less, however. In fact, PPL EU frequently uses higher-than-minimum ground clearances due to such features as road crossings, line crossings and site-specific terrain. By increasing the clearances, the magnetic field is reduced from 30 mG to 28 mG (about 7 percent) at the edge of a 150-foot-wide right of way.
- Increasing clearances from 27 feet to 32 feet could theoretically add up to about 2.8 percent to the cost of a double-circuit single-pole line (current standard) and reduce the magnetic field of a reverse-phase line from 16 mG to 15 mG (about 6 percent) at the edge of a 150-foot-wide right of way. Chart XI is a summary of this data.
- Studies are required for each new 230 kV line to determine optimum structure types, ground clearances, configurations and designs to reduce field levels. Such

studies could include analysis of reduction measures such as additional minimum ground clearances, increasing conductor tensions, using reduced phase spacing (a "Delta" configuration on a single-circuit line), installing the second circuit initially, and/or adding a second set of conductors that are reverse phased and operated in parallel with the first set (bundled/split phase).

### **500 kV Transmission Lines**

- Increasing ground clearances from 33 feet to 53 feet may add up to about 4.5 percent to the cost of a single-circuit "H-frame" line (current standard). For a given project, such cost may be substantially less, however. In fact, PPL EU frequently uses higher-than-minimum ground clearances due to such features as road crossings, line crossings and site-specific terrain. By increasing the clearances, the magnetic field is reduced from 42 mG to 35 mG (about 17 percent) at the edge of a 200-foot-wide right of way.
- Increasing ground clearances from 33 feet to 53 feet could theoretically add up to 2.8 percent to the cost of a double-circuit "H-frame" line (current standard) and reduces the magnetic field of a reverse-phase line from 21 mG to 16 mG (about 24 percent) at the edge of a 200-foot-wide right of way. Chart XII is a summary of this data.
- Studies are required for each new 500 kV line to determine optimum structure types, ground clearances, configurations and designs to reduce field levels. Such studies could include analysis of reduction measures such as additional minimum ground clearances, increasing conductor tensions, using reduced-phase spacing (a "Delta" configuration on a single circuit line), installing the second circuit initially, and/or adding a second set of conductors that are reverse phased and operated in parallel with the first set (bundled/split phase).

## **RECONDUCTORING OR ADDING ADDITIONAL CIRCUITS TO EXISTING TRANSMISSION LINES**

**When reconductoring or adding additional circuits to existing transmission lines, PPL EU will evaluate low-cost or no-cost options for magnetic field management on a case-by-case basis.**

When reconductoring existing transmission lines or adding additional circuits, low-cost alternatives may not exist; however, the following steps will be taken:

- For a single-circuit line, the use of a Delta arrangement or other modifications on the existing structure, with reduced-phase spacing, will be evaluated.
- For double-circuit lines, application of reverse phasing may reduce the magnetic field under the line and within the right of way and will be evaluated.
- For single- and double-circuit lines, evaluate using higher conductor tensions that can increase the minimum line design ground clearance.

## **DISTRIBUTION LINES**

**At the 12 kV distribution level, new main three-phase lines will continue to be constructed with five feet of additional ground clearance.**

- Main lines are the most heavily loaded sections of a distribution line and therefore have the highest magnetic fields associated with them.
- Increasing the ground clearance by five feet reduces the magnetic field under the line from 14 mG to 11 mG using the standard eight-foot crossarm design. These values are based on increasing pole heights from 45 feet to 50 feet and a typical operating current of 300 amps per phase.
- Chart XIII is a summary of this data. Increasing ground clearance by five feet could theoretically add about 5 percent to the cost of a typical distribution line.

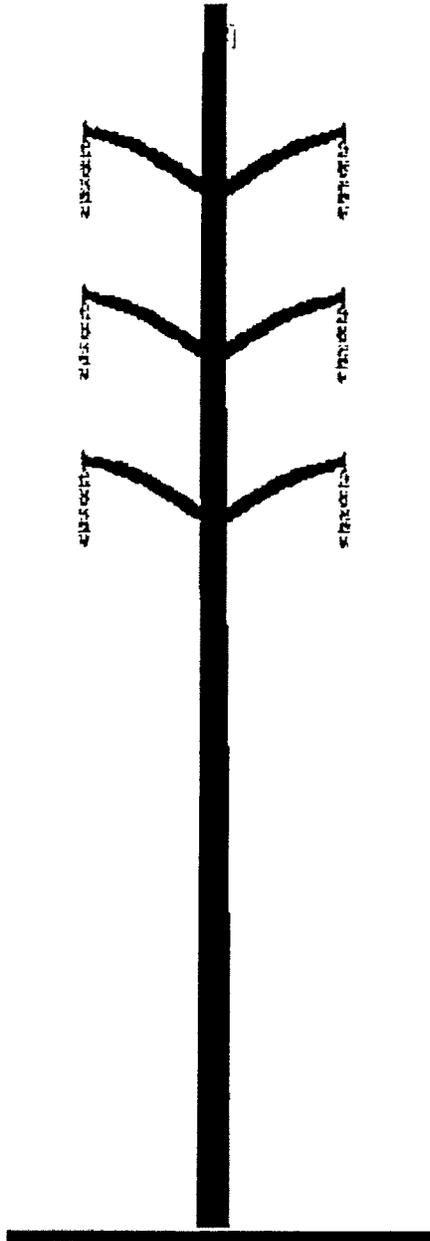
## **UNDERGROUND TRANSMISSION LINES**

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**Underground transmission lines are required due to environmental or land use factors or restrictions on available clearances, PPL EU will evaluate options for magnetic field management techniques on a case-by-case basis.**

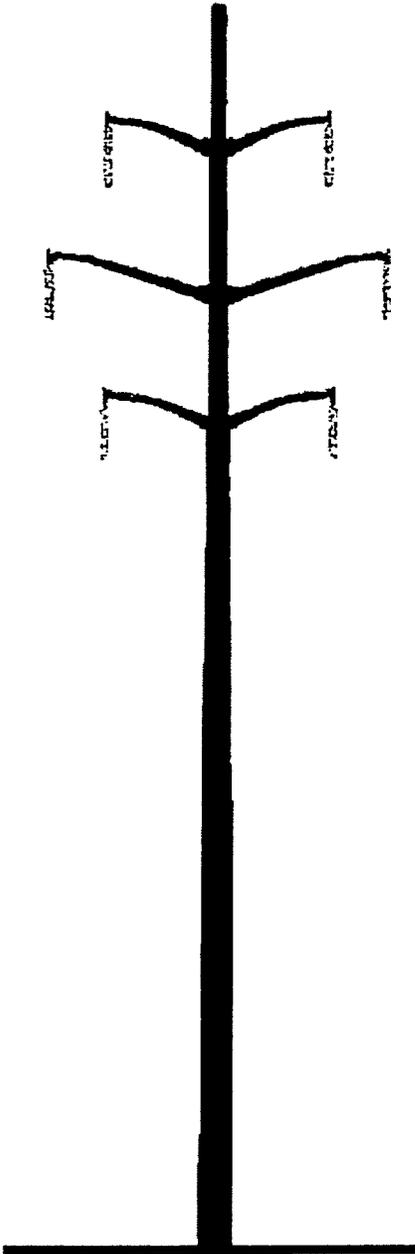
- The phase arrangement that produces the lowest field will be determined.
- The depth of burial of the line will be determined considering the cost of excavation and the location of other buried utilities in the area.
- The use of steel pipe ferromagnetic shielding that reduces magnetic fields will be evaluated.

# Short-Span Construction



- **More compact design**
- **Should not be used solely to reduce magnetic fields**
- **Typical conductor data:**
  - 1 3/8" HS steel overhead ground wire - 7.3 feet sag
  - 6-556.5 KCMIL 24/7 ACSR power conductors - (PARAKEET) 10.0 feet sag
  - Average span - 400 feet

# Long-Span Construction Remains PPL EU 138 kV Standard



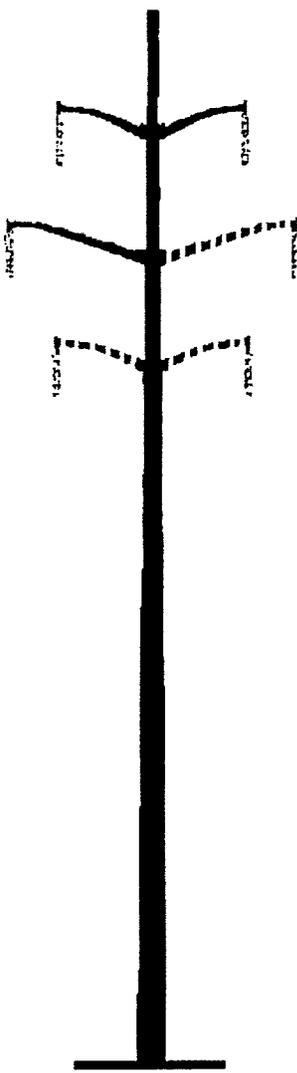
- Lower cost alternative
- Reduces magnetic fields due to higher structures
- Typical conductor data:
  - 1 3/8" HS steel overhead ground wire - 17.3 feet sag
  - 6-556.5 KCMIL 24/7 ACSR power conductors - (PARAKEET) 23.0 feet sag
  - Average span - 600 feet

**138/69 kV REVERSE-PHASE TRANSMISSION LINES  
CALCULATED MAGNETIC FIELDS AT 400 AMPERES**

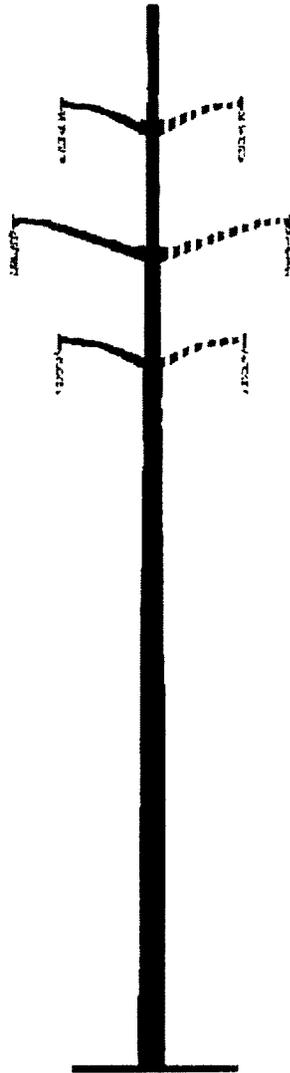
| TYPE<br>CONSTRUCTION          | MAGNETIC FIELD IN<br>MILLIGAUSS AT THE<br>EDGE OF THE<br>RIGHT OF WAY |
|-------------------------------|---|
| SHORT SPAN<br>(CHART I)       | 30  |
| SHORT SPAN<br>(REVERSE PHASE) | 8   |
| LONG SPAN<br>(CHART II)       | 29  |
| LONG SPAN<br>(REVERSE PHASE)  | 9   |
| COMPACT<br>(CHART VI)         | 14  |
| COMPACT<br>(REVERSE PHASE)    | 3   |

The edge of right of way is 50 feet from the line centerline.  
 The 400 ampere phase current is balanced between phases.  
 Calculations are based on a minimum ground clearance of 25 feet.  
 LONG SPAN, SHORT SPAN and COMPACT are double-circuit lines.

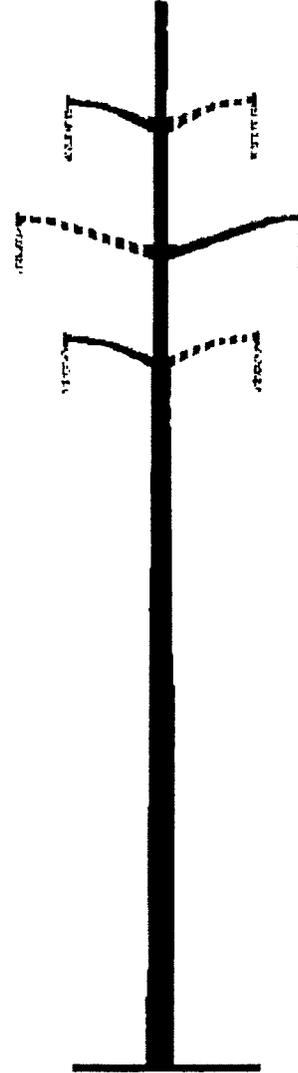
# Typical Single-Circuit Structure Designs



Top/Middle



Vertical



Top/Middle/Bottom

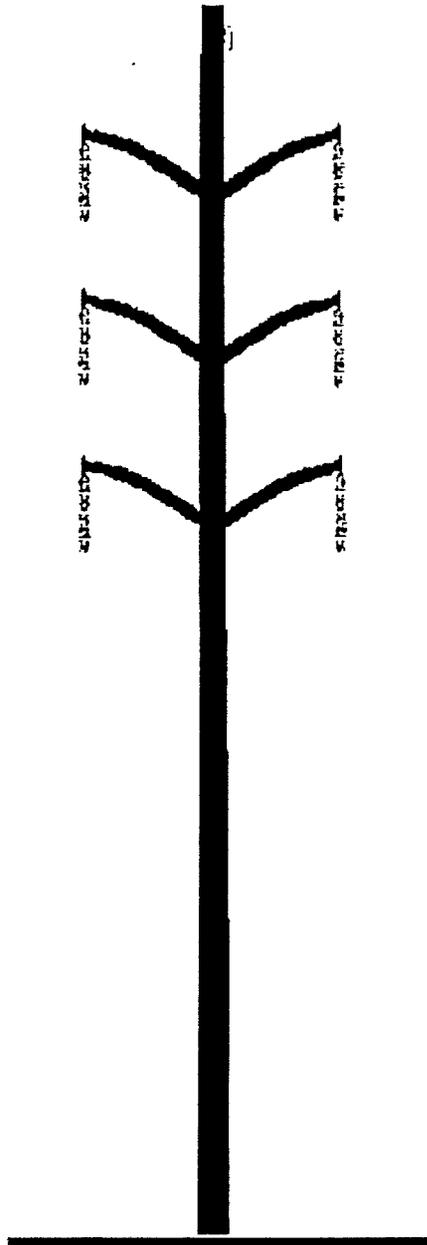
——— initial single circuit  
- - - - - future second circuit

**138/69 kV SINGLE CIRCUIT TRANSMISSION LINES  
CALCULATED MAGNETIC FIELDS AT 400 AMPERES**

| TYPE<br>CONSTRUCTION | MAGNETIC FIELD IN<br>MILLIGAUSS AT THE<br>EDGE OF THE<br>RIGHT OF WAY |
|----------------------|---|
| TOP/MIDDLE/BOTTOM    | 20  |
| VERTICAL             | 17  |
| TOP/MIDDLE           | 12  |

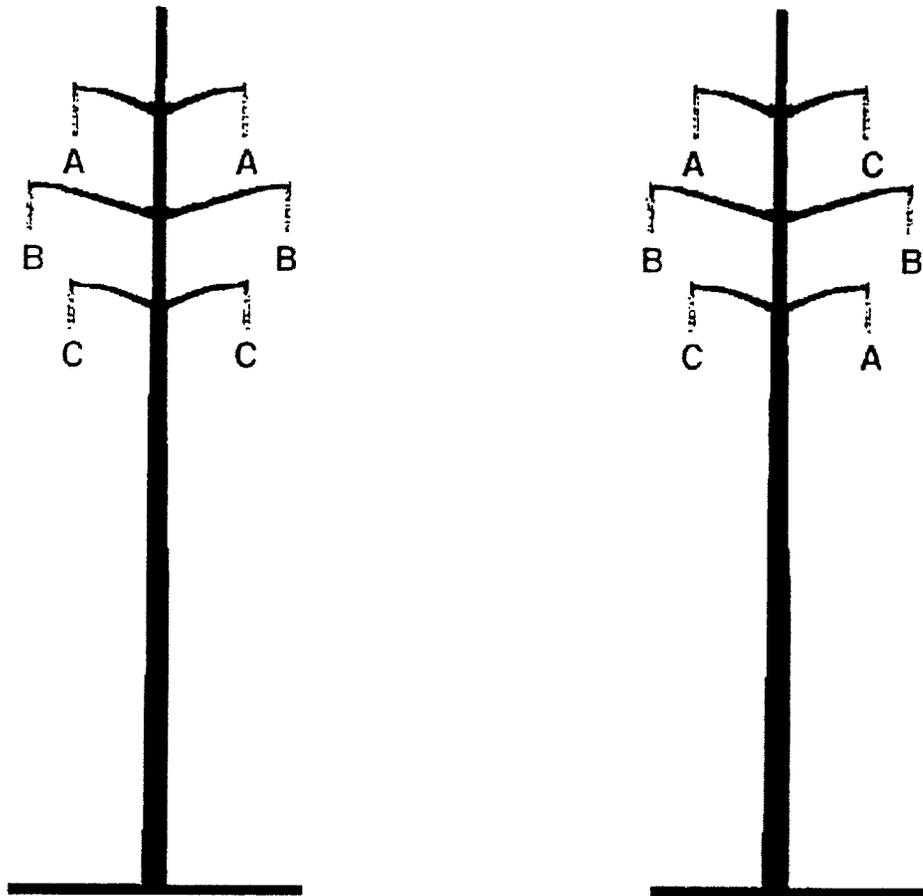
The edge of right of way is 50 feet from the line centerline.  
The 400 ampere phase current is balanced between phases.  
Calculations are based on a minimum ground clearance of 25 feet.

# Compact Design Structure



- **Minimize magnetic fields due to compact design**
- **Not a low-cost alternative**
- **Typical conductor data:**
  - 1 3/8" HS steel overhead ground wire - 9.0 feet sag
  - 6-556.5 KCMIL 24/7 ACSR power conductors - (PARAKEET) 9.0 feet sag
  - Average span - 300 feet

# Reverse Phasing of Double-Circuit Transmission Lines



From: → → → → To:

Reverse phasing also can be one of the following phase arrangements:

|   |   |    |   |   |    |   |   |    |   |   |    |   |   |
|---|---|----|---|---|----|---|---|----|---|---|----|---|---|
| A | B |    | B | A |    | B | C |    | C | A |    | C | B |
| C | C | or | C | C | or | A | A | or | B | B | or | A | A |
| B | A |    | A | B |    | C | B |    | A | C |    | B | C |

**230 kV REVERSE-PHASE TRANSMISSION LINES  
CALCULATED MAGNETIC FIELDS AT 800 AMPERES**

| TYPE<br>CONSTRUCTION                      | MAGNETIC FIELD IN<br>MILLIGAUSS AT THE<br>EDGE OF THE<br>RIGHT OF WAY |
|---|---|
| DOUBLE CIRCUIT<br>POLE                    | 49  |
| DOUBLE CIRCUIT<br>POLE<br>(REVERSE-PHASE) | 16  |

The edge of right of way is 75 feet from the line centerline.  
The 800 ampere phase current is balanced between phases.  
Calculations are based on a minimum ground clearance of 27 feet.

**500 kV REVERSE-PHASE TRANSMISSION LINES  
CALCULATED MAGNETIC FIELDS AT 1100 AMPERES**

| TYPE<br>CONSTRUCTION                      | MAGNETIC FIELD IN<br>MILLIGAUSS AT THE<br>EDGE OF THE<br>RIGHT OF WAY |
|---|---|
| DOUBLE CIRCUIT<br>POLE                    | 37  |
| DOUBLE CIRCUIT<br>POLE<br>(REVERSE PHASE) | 21  |

The edge of right of way is 100 feet from the line centerline.  
The 1,100 ampere phase current is balanced between phases.  
Calculations are based on a minimum ground clearance of 33 feet.

**INCREASED 138/69 kV MINIMUM GROUND CLEARANCE  
CALCULATED MAGNETIC FIELDS AT 400 AMPERES**

| TYPE<br>CONSTRUCTION         | MINIMUM<br>GROUND<br>CLEARANCE<br>FEET | MAGNETIC FIELD IN<br>MILLIGAUSS AT THE<br>EDGE OF THE<br>RIGHT OF WAY |
|------------------------------|--|---|
| SINGLE CIRCUIT<br>TOP/MIDDLE | 25                                     | 12  |
| SINGLE CIRCUIT<br>TOP/MIDDLE | 30                                     | 10  |
| LONG SPAN                    | 25                                     | 29  |
| LONG SPAN                    | 30                                     | 26  |
| LONG SPAN<br>(REVERSE PHASE) | 25                                     | 9   |
| LONG SPAN<br>(REVERSE PHASE) | 30                                     | 7   |

The edge of right of way is 50 feet from the line centerline.  
The 400 ampere phase current is balanced between phases.

**INCREASED 230 kV MINIMUM GROUND CLEARANCE  
CALCULATED MAGNETIC FIELDS AT 800 AMPERES**

| TYPE<br>CONSTRUCTION                      | MINIMUM<br>GROUND<br>CLEARANCE<br>FEET | MAGNETIC FIELD IN<br>MILLIGAUSS AT THE<br>EDGE OF THE<br>RIGHT OF WAY |
|---|--|---|
| SINGLE CIRCUIT<br>TOP/MIDDLE              | 27                                     | 30  |
| SINGLE CIRCUIT<br>TOP/MIDDLE              | 32                                     | 28  |
| DOUBLE CIRCUIT<br>POLE                    | 27                                     | 49  |
| DOUBLE CIRCUIT<br>POLE                    | 32                                     | 46  |
| DOUBLE CIRCUIT<br>POLE<br>(REVERSE PHASE) | 27                                     | 16  |
| DOUBLE CIRCUIT<br>POLE<br>(REVERSE PHASE) | 32                                     | 15  |

The edge of right of way is 75 feet from the line centerline.  
The 800 ampere phase current is balanced between phases.

**INCREASED 500 kV MINIMUM GROUND CLEARANCE  
CALCULATED MAGNETIC FIELDS AT 1,100 AMPERES**

| TYPE<br>CONSTRUCTION                      | MINIMUM<br>GROUND<br>CLEARANCE<br>FEET | MAGNETIC FIELD IN<br>MILLIGAUSS AT THE<br>EDGE OF THE<br>RIGHT OF WAY |
|---|--|---|
| SINGLE CIRCUIT<br>"H" STRUCTURE           | 33                                     | 42  |
| SINGLE CIRCUIT<br>"H" STRUCTURE           | 53                                     | 35  |
| DOUBLE CIRCUIT<br>POLE                    | 33                                     | 37  |
| DOUBLE CIRCUIT<br>POLE                    | 53                                     | 31  |
| DOUBLE CIRCUIT<br>POLE<br>(REVERSE PHASE) | 33                                     | 21  |
| DOUBLE CIRCUIT<br>POLE<br>(REVERSE PHASE) | 53                                     | 16  |

The edge of right of way is 100 feet from the line centerline.  
The 1,100 ampere phase current is balanced between phases.

**12 KV DISTRIBUTION LINES  
CALCULATED MAGNETIC FIELDS AT 300 AMPERES**

| TYPE<br>CONSTRUCTION | POLE<br>HEIGHT<br>FEET | MAGNETIC FIELD IN MILLIGAUSS* |                               |
|----------------------|------------------------|-------------------------------|-------------------------------|
|                      |                        | AT CENTERLINE                 | AT 30 FEET FROM<br>CENTERLINE |
| STANDARD<br>CROSSARM | 45                     | 14                            | 7                             |
| STANDARD<br>CROSSARM | 50                     | 11                            | 6                             |

\* Field level under the line at mid-span based on 300 amps, balanced loading, one meter above ground level.

# **Attachment**

**6**

**ATTACHMENT 6**  
**JENKINS-STANTON #2 230 kV CIRCUIT**  
**LIST OF OWNERS OF PROPERTY WITHIN THE RIGHT-OF-WAY**

---

ARCHITECTURE & ENG GROUP  
140 MAFFETT ST  
PLAINS, PA 18705-1000

JOHN P & ELLEN M BABUSCAK  
109 WYNDTREE DR  
WILKES-BARRE, PA 18702-2750

THOMAS BELLES  
C/O PNC BANK-KATHLEEN DUNSMUIR  
11 W MARKET ST  
WILKES-BARRE, PA 18768

BIRCHWOOD MHP LLC  
PO BOX 3491  
CROFTON, MD 21114

ROBERT & KELLY BISHOP  
RR 1 BOX 301A  
PITTSSTON, PA 18643-9786

BLC REAL ESTATE LLC  
1633 BROADWAY - 39TH FLOOR  
NEW YORK, NY 10019

JOHN & TARA BONIN  
631 ROZELLE ROAD  
WYOMING, PA 18644

ARTHUR BOYANOWSKI  
PO BOX 4  
TUNKHANNOCK, PA 18657

JOHN J & LOUISE L BROGAN  
32 PARK LN  
PITTSSTON, PA 18643-2511

ANNA BRUNS  
2137 SCHOOLEY ROAD  
PITTSSTON, PA 18643

CAMILLE T CALVITTI  
1395 SUSQUEHANNA AVE  
PITTSSTON, PA 18643-2522

E BRENDAN CARROLL  
PO BOX 681  
PITTSSTON, PA 18640-0681

ARTHUR T CHARNOGURSKY  
50 PARK LANE  
PITTSSTON, PA 18643-2414

DAVID L CHAUMP  
313 DAMON ST  
WEST PITTSSTON, PA 18643

MARC W SR & KIMBERLY CHERVINITSKI  
347 JOHNS RD  
PITTSSTON TWP, PA 18643

SIMON & DENISE CHOUGH  
216 URICK LN  
MONROEVILLE, PA 15146-4928

ANN & BERNARD COSSACK  
319 DRAKE ST  
OLD FORGE, PA 18518-2338

JOHN J DALY  
41 LOMBARDO DR  
WILKES BARRE, PA 18702-2732

DAMOCLES HOLDINGS LLC  
15 WASHINGTON AVE  
PITTSSTON, PA 18643

MICHAEL DANKO  
93 SLOCUM AVE  
PITTSSTON, PA 18643-1031

CHESTER DANOWSKI ETAL  
267 MOSKALUK RD  
BERWICK, PA 18603-6423

MICHAEL & KATHLEEN DIMAGGIO  
44 LOMBARDO DR  
WILKES BARRE, PA 18702-2730

MICHAEL N DIMARCO  
5 FAIRFIELD DR  
LAFLIN, PA 18702

ALBERT & DEBRA DIRLAM  
1128 OBERDORFER RD  
HARDING, PA 18643

DONALD & BARBARA EIFERT  
21 CLYDE ST  
WEST PITSTON, PA 18643

KIMBERLY A ESSER  
1186 ROZELLE ROAD  
HARDING, PA 18643

EXETER HOSE COMPANY NO I  
57 LINCOLN ST  
PITSTON, PA 18643-2637

GENE P & TERRY J FISCHI  
155 JASON DR  
PLAINS, PA 18702-2727

FM INC  
3062 FULTON STREET  
BROOKLYN, NY 11208

BERNARD F & KAREN A FOGLIA  
26 PARK LN  
PITSTON, PA 18643-2511

ANNA GASHI ETAL  
C/O CLAYTON HOUGH  
RR 4 BOX 382B  
WEST PITSTON, PA 18643-9303

JOSEPH J & DOLORES M GASHI  
RR 4 BOX 384  
WEST PITSTON, PA 18643-9303

HARRY J & JOSEPHINE GIACOMETTI  
1 WIDENER DR  
WILKES BARRE, PA 18702-2700

WILLIAM HELLMANN  
405 W MAPLE AVE  
MORRISVILLE, PA 19067-2113

THOMAS P & MARGARET M HOGAN  
630 ROZELLE RD  
WEST PITSTON, PA 18643

JOSEPH M HOPKINS  
1517 RIVER RD P BLAN  
PITSTON, PA 18640-1324

ANN M IDE & DIANE WEISS  
815 SCHOOLEY AVE  
PITSTON, PA 18643-9306

HOWARD E IDE  
811 SCHOOLEY AVE  
PITSTON, PA 18643-9306

JAMES H & IDA M IDE  
995 SCHOOLEY AVE  
PITSTON, PA 18643-9308

MICHAEL B & PHYLLIS JACEWICZ  
95 E SAYLOR AVE  
PLAINS, PA 18702-2709

WILLIAM J & KATHLEEN A JAMES  
291 SUTTON CREEK ROAD  
WEST PITSTON, PA 18643

ROBERT E & LINDA L JENKINS  
108 WYNDTREE DR  
WILKES BARRE, PA 18702-2749

JENKINS TWP SUPERVISORS  
1475 RIVER RD  
JENKINS TWP, PA 18640-1323

ANN MARIE KACHMARSKY  
29 PARK LN  
PITSTON, PA 18643-2510

HELEN M KEITHLINE ETAL  
C/O S&S RAYMOND III  
43 N SUNSET DR  
WOODBINE, NJ 08270-9661

EDMUND & JOANN J KELLEHER  
692 SCHOOLEY ROAD  
PITSTON, PA 18643

MARGARET KELLEY  
PO BOX 3094  
PITSTON, PA 18643

HARRY J & KARL D KEMMERER  
31 HAZLETON ST  
ASHLEY, PA 18706-2809

RICHARD KENZAKOSKI ETAL  
C/O DIANE SOTT  
85 OLD PICKAWAY ROAD  
WILKES BARRE, PA 18702

LEONARD KOLESAR  
1931 SUSQUEHANNA AVE  
PITSTON, PA 18643-2527

JOHN S & JACQUELINE KOSIEROWSKI  
24 PARK LN  
PITSTON, PA 18643-2511

JOHN & HARRIET KOUKALTSIOS  
7 STITES ST  
WYOMING, PA 18644-1333

TONI A KRETCHIK  
C/O TONI JACKLOSKI  
RR 1 BOX 301  
DALLAS, PA 18612-9734

MARK KRUCHINSKY &  
MICHAEL KRUCHINSKY ETAL  
1521 RIVER RD  
JENKINS TWP, PA 18640

DAVID P & DENISE A LAPSANSKY  
3120 HIGHLAND DR  
EASTON, PA 18045-3145

JOSEPH & ELIZABETH LATONA  
3 WIDENER DR  
WILKES BARRE, PA 18702-2700

LEO & GERTRUDE LATONA  
5 WIDENER DR  
WILKES BARRE, PA 18702-2700

SAMUEL & MARY LATONA  
7 WIDENER DR  
WILKES BARRE, PA 18702-2700

MARK LAVERDI & DONNA HAGGERTY  
4 WIDENER DR  
WILKES-BARRE, PA 18702

JOSEPH M LOMBARDO TRST  
16 BROAD ST  
PITTSTON, PA 18640-1807

GRACE LOYACK  
305 FRANKLIN ST  
WEST PITTSTON, PA 18643

DOMINIC LUSSI & ANGELO LUSSI  
& MARIA LUSSI  
28 PARK LN  
PITTSTON, PA 18643-2511

MADDIE ENTERPRISES LLC  
575 PIERCE ST STE 500  
KINGSTON, PA 18704-5754

JOHN J & TRUDY A MAHASKY  
107 WYNDTREE DR  
WILKES BARRE, PA 18702-2750

VITO & MARIE T MALACARI  
148 JASON DR  
PLAINS, PA 18702-2725

ROBERT A MARIANI &  
RICHARD MARIANI  
288 HARLAND ST  
PITTSTON, PA 18643

BRA L MARTIN  
556 ELIZABETH ST  
HARDING, PA 18643

CHARMAYNE & JOHN MEDVIC  
C/O CHARLES OSENKARSKI  
12 LAUREL STREET  
PLAINS, PA 18705

MERICLE RIVER ROAD LLC  
C/O MERICLE COMM REAL EST SER  
EAST MOUNTAIN CORPORATE CENTER  
100 BALTIMORE DRIVE  
WILKES BARRE, PA 18702-7955

DANIEL & LISA MIMNAUGH  
43 LOMBARDO DR  
WILKES BARRE, PA 18702-2732

MARK A & GINA M MISCAVAGE  
851 N MAIN STREET  
WILKES-BARRE, PA 18702

LAWRENCE J & BARBARA B MONTANTE  
146 JASON DR  
PLAINS, PA 18702-2725

WILLIAM J & TRACEY MUNLEY  
111 MAIN ST INKERMAN  
PITTSTON, PA 18640-3141

DOROTHY C MURPHY  
1515 RIVER ROAD  
PITTSTON, PA 18640-1324

CASPER & DELLA NAPOLI  
522 DENNISON ST  
WYOMING, PA 18644-1912

NATURE CONSERVANCY  
C/O HAROLD E COX  
1100 SCHOOLEY AVE  
PITTSTON, PA 18643

DEANNA NICKAS  
105 WYNDTREE DR  
WILKES-BARRE, PA 18702

CHARLOTTE A PARA ETAL  
1475 RIVER RD  
PITTSTON, PA 18640-1323

JOSEPH R & FLORENCE PARA  
13 PARA DR  
JENKINS TWP, PA 18640-1310

AMITA R & RAGESH R PATEL  
32 ROSEDALE DR  
POTTSTOWN, PA 19464

JOSEPH B & MARY A PATRIZI  
304 WOODY RD  
PLAINS, PA 18702-2728

ERIC M PIECZYNSKI  
1519 RIVER RD  
JENKINS TWP, PA 18640-1324

JAMES & FRANCES PISANO  
1399 SUSQUEHANNA AVE  
PITTSTON, PA 18643-2522

FRANK J & IDA PIZANO  
959 WYOMING AVE  
PITTSTON, PA 18643-1102

JAMES PIZANO ETAL  
1921 SUSQUEHANNA AVE  
PITTSTON, PA 18643-2527

KENNETH B PIZANO &  
CHARLES A PIZANO JR  
1927 SUSQUEHANNA AVE  
PITTSTON, PA 18643

LOUIS R & KATRINA M PIZANO  
682 NE 77TH ST  
MIAMI, FL 33138-5107

THOMAS & EVELYN PIZANO  
255 SUSQUEHANNA AVE  
PITTSTON, PA 18643-2630

JAMES V & VICTORIA POPPLE  
43 CONNELL ST  
OLD FORGE, PA 18518

JOHN L & GAIL M POPPLE  
100 PINE RD  
WILKES BARRE, PA 18702-9756

PPL ELECTRIC UTILITIES CORP  
C/O PPL REAL ESTATE TAXES  
2 N NINTH ST -GENTW2  
ALLENTOWN, PA 18101

PPL GENERATION LLC  
C/O PPL REAL ESTATE TAXES  
2 N NINTH ST GENTW2  
ALLENTOWN, PA 18101

MARY R & GARY QUICK JR  
33 PARK LN  
PITTSTON, PA 18643-2510

STANLEY & ROSE RAJZA  
157 JASON DR  
PLAINS, PA 18702-2727

REDEV AUTH OF LUZ CO  
16 LUZERNE AVE  
WEST PITTSTON, PA 18643-2817

REDEV AUTH OF LUZ CO  
272 PIERCE STREET  
KINGSTON, PA 18704-5136

MARK D & REBECCA LYNN REID  
1382 S 6TH STREET  
LOUISVILLE, KY 40208

SCOTT D & MEGAN E REIDER  
225 MONTGOMERY AVE  
WEST PITTSTON, PA 18643

PAUL W RENFER & ANN M KNAUFF  
RR 1 BOX 89  
PITTSTON, PA 18643-9730

ROBERT A & CHRISTINA RODZINAK  
305 WOODY RD  
WILKES BARRE, PA 18702-2729

JOSEPH ROMANOWSKI ETAL  
RR 4 BOX 680  
WEST PITTSTON, PA 18643-9326

JOSEPH & JACQUELINE RUANE  
42 LOMBARDO DR  
WILKES BARRE, PA 18702-2730

MICHAEL J RUANE & CYNTHIA WANYO  
27 PARK LN  
PITTSTON, PA 18643-2510

FRANK & MARTINA RYDER ETAL  
PO BOX 405  
PITTSTON, PA 18640-0405

DONATO E & ESTHER M SABIA  
25 PARK LN  
PITTSTON, PA 18643-2510

S&S NATHAN  
RR 1 BOX 91A  
PITTSTON, PA 18643-9730

PAUL & ELLEN SAVAKINAS  
853 N MAIN STREET  
WILKES BARRE, PA 18702

DAVID & DONNA SHULTZ  
127 STAUB RD  
TRUCKSVILLE, PA 18708-1835

WASIL J & LINDA A SIMKO  
PO BOX 5186  
AVOCA, PA 18641

CHRISTOPHER & VANNESSA SMITH  
31 PARK LN  
PITTSTON, PA 18643-2510

NICOLE G SMITH  
999 SCHOOLEY AVE  
PITTSTON, PA 18643

WARREN W & LINDA K SMITH  
RR 4 BOX 660  
WEST PITTSTON, PA 18643-9321

STEVE & JO ANN SMITHONIC  
RR 4 BOX 624 ROZELLE RD  
WEST PITTSTON, PA 18643-9316

PAUL & IRENE SORBELLI  
103 E SAYLOR AVE  
WILKES BARRE, PA 18702

VINCENT SORBELLI  
107 EAST SAYLOR AVE  
WILKES BARRE, PA 18702

ST CECELIAS CEMETERY  
WYOMING AVE  
PITTSTON, PA 18643

JOSEPH & ELIZABETH STRAZDUS  
629 ROZELLE RD  
WEST PITTSTON, PA 18643

BRUNO & MARIE TAFANI  
15 STURMER ST  
PITTSTON, PA 18643-1015

KIMBERLY TAMBUR  
RR 1 BOX 88B HARDING  
PITTSTON, PA 18643-9730

JAMES P THOMAS JR  
8 WIDENER DR  
WILKES BARRE, PA 18702-2751

OWNSHIP OF PLAINS  
126 N MAIN ST  
PLAINS, PA 18705-1506

UMH PROPERTIES INC  
JUNIPER BUSINESS PLAZA  
3499 RT 9 NORTH ST 3C  
FREEHOLD, NJ 07728

UNITED METHODIST HOME FOR THE  
AGING  
209 ROBERTS RD  
PITTSTON, PA 18640-3111

CHAD & NICHOLE URSO  
2 WIDENER DR  
WILKES BARRE, PA 18702-2751

JOSEY A VALENTI  
8 PATRICK RD  
PITTSTON, PA 18640-3245

VALENTI REALTY LLC  
PO BOX 3044  
PITTSTON, PA 18643

PENELOPE J WAITKUS  
102 WYNDTREE DR  
WILKES BARRE, PA 18702-2749

SUZANNE & SCOTT WARREN  
103 WYNDTREE DR  
WILKES BARRE, PA 18702-2750

MARY ANN & MARY WASLASKY  
303 WOODY RD  
PLAINS, PA 18702-2729

ERIC W & MELISSA M WASSEL  
40 LOMBARDO DR  
WILKES BARRE, PA 18702-2730

KURT WEINL & MEGAN JONES  
265 OBERDORFER RD  
WEST PITTSTON, PA 18643

RICHARD & MICHELLE WEINSTOCK  
36 LOMBARDO DR  
WILKES BARRE, PA 18702-2730

WESLEY VILLAGE  
LAFLIN ROAD  
PITTSTON, PA 18640

MICHAEL WIENCKOSKI  
RR 4 BOX 628  
WEST PITTSTON, PA 18643-9318

WYOMING BOROUGH  
277 WYOMING AVENUE  
WYOMING, PA 18644

PATRICIA ZABROSKI  
106 WYNDTREE DR  
WILKES BARRE, PA 18702-2749

EUGENE & JUDITH ZAREMSKI  
110 MAIN ST  
PITTSTON, PA 18640-3140

DONALD & MARY ANN ZURENDA  
801 SLOCUM AVE  
PITTSTON, PA 18643-1032

# **Attachment**

**7**

**ATTACHMENT 7**  
**JENKINS-STANTON #2 230 kV CIRCUIT**  
**LIST OF INVOLVED GOVERNMENTAL AGENCIES, MUNICIPALITIES**  
**AND OTHER PUBLIC ENTITIES**

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1. Pennsylvania Historical and Museum Commission  
Bureau for Historic Preservation  
Commonwealth Keystone Building, Second Floor  
400 North Street  
Harrisburg, Pennsylvania 17120-0053  
Attn: Mr. Douglas C. McLearen, Chief
  
2. Honorable Barry Schoch, P.E., Secretary  
Pennsylvania Department of Transportation  
c/o Office of Chief Counsel  
Commonwealth Keystone Building  
400 North Street, 9th Floor  
Harrisburg, PA 17120  
ATTN: Andrew Gordon, Esquire
  
3. Department of Environmental Protection  
P.O. Box 2063  
Market Street State Office Building  
Harrisburg, Pennsylvania 17105-2063  
Attn: Office of Field Operations
  
4. Luzerne County Planning Commission  
Penn Place  
20 North Pennsylvania Avenue  
Wilkes-Barre, PA 18711  
Attn: Adrian Merolli, Director
  
5. Luzerne County Council  
Penn Place  
20 North Pennsylvania Avenue  
Wilkes-Barre, PA 18711  
Attn: Tim McGinley, Chairperson
  
6. Exeter Borough Council  
1101 Wyoming Avenue  
Exeter, PA 18643
  
7. Exeter Township  
RR 1 Box 191, Route 92  
Pittston, PA 18643

8. Jenkins Township Supervisors  
46 ½ Main Street  
Inkerman, PA 18640
  
9. Plains Township Commissioners  
126 North Main Street  
Plains, PA 18705
  
10. Wyoming Borough Council  
277 Wyoming Avenue  
Wyoming, PA 18644