

ATTACHMENT “2”
MARTINS CREEK – SIEGFRIED #2 230 kV TRANSMISSION LINE REPLACEMENT
ENGINEERING DESCRIPTION

TABLE OF CONTENTS

<u>SECTION</u>	<u>TOPIC</u>	<u>PAGE</u>
A.	DESCRIPTION OF PROPOSED LINE	1
B.	MAGNETIC FIELD MANAGEMENT.....	3
C.	RIGHT-OF-WAY STATUS.....	3

LIST OF TABLES

TABLE 1	DESIGN MINIMUM CONDUCTOR CLEARANCES.....	2
TABLE 2	CONDUCTOR THERMAL RATINGS	2

LIST OF FIGURES

FIGURE 1	EXISTING 230 kV SINGLE CIRCUIT LATTICE STRUCTURE.....	4
FIGURE 2	PROPOSED 230 kV SINGLE CIRCUIT STEEL MONO-POLE	5

LIST OF MAPS

AERIAL EXHIBITS

ATTACHMENT “2” MAP POCKETS

ATTACHMENT “2”

MARTINS CREEK – SIEGFRIED #2 230 kV TRANSMISSION LINE REPLACEMENT ENGINEERING DESCRIPTION

A. PROPOSED LINE DESIGN

PPL Electric proposes to rebuild 10.7 miles of the Martins Creek – Siegfried #2 230 kV Transmission Line. The portion of the transmission line that PPL Electric proposes to rebuild begins at the Siegfried Substation located along West 27th Street in Northampton Borough and extends to the last structure in Northampton County before the line turns east, located just south of State Game Land 168 and the Moore Township boundary.¹ As previously discussed in Attachment “1,” this project is part of PPL Electric’s Vintage Conductor Program, which was developed to address aged, deteriorated transmission facilities.

This project involves the removal of the existing transmission line, including the steel lattice towers and conductors, all of which were built in 1926. The existing single-circuit 230 kV transmission line is supported by lattice towers with an average height of approximately 90 feet and average span of approximately 1,100 feet. Like the existing line, the proposed rebuilt transmission line will be a single-circuit 230 kV line. The proposed new transmission line will consist mostly of single-shaft steel poles equipped with upswept steel arms (Figure 1). Angle structures may consist of single, two- or three-pole structures depending on the severity of the angle.

All poles will be installed on concrete foundations. Additionally, some angle structures may be guyed. Altogether, this project requires the installation of approximately 52 structures with an average height of 120 feet. The average span length will be 1,100 feet. It is PPL Electric’s intention to place the new poles adjacent to the existing lattice towers along the centerline of the right-of-way. However, to reduce environmental impacts, the location of some poles may be shifted or adjusted, which could result in one or two more structures.

¹ The northern terminus of the line is located at the Martins Creek Power Generation Station.

The rebuilt transmission line will be designed to meet, and generally exceed, National Electrical Safety Code (“NESC”) minimum standards. Additional design criteria and safety rules practiced by PPL Electric are included in Attachment 4. Three power conductors, one optical ground wire (OPGW) and one steel overhead shield wire will be installed. The power conductors will be 1590 kcmil² 45/7 stranding ACSR.³ The OPGW will be 0.752-inch diameter OPGW with 48 single mode fibers. The steel overhead shield wire will consist of ½-inch extra high-strength steel.

The minimum conductor-to-ground clearance will be 32 feet for the rebuilt portion of the transmission line. This minimum clearance occurs at a maximum sag, which occurs at the maximum thermal conductor temperature of 125°C. Table 1 shows the designed minimum conductor clearances and Table 2 shows the conductor thermal ratings of the proposed transmission line.

TABLE 1
DESIGN MINIMUM CONDUCTOR CLEARANCES
FOR 1590 KCMIL 45/7 STRAND ACSR⁴

<u>Condition</u>	<u>Single-circuit Design Clearance-to-Ground</u>
Normal load, average weather (16°C ambient temperature)	41 feet
Predicted extreme thermal load (125°C conductor temperature)	32 feet
Predicted extreme weather conditions, 0°F (1-inch ice, 4 lbs. wind, -18°C)	38 feet

TABLE 2
CONDUCTOR THERMAL RATING
1590 KCMIL 45/7 ACSR
125°C MAXIMUM CONDUCTOR TEMPERATURE

<u>Condition</u>	<u>Ambient Temperature (°C)</u>	<u>Wind Speed (Knots)</u>	<u>Ampacity (Amps)</u>
Summer Normal	35	0	1,626
Winter Normal	10	0	1,873
Summer Emergency	35	1.5	2,013
Winter Emergency	10	1.5	2,267

² A circular mil is the cross-sectional areas of a wire one mil in diameter, where 1 kcmil = 0.5067 mm².

³ Aluminum conductor steel reinforced.

⁴ Clearances based on a maximum tension of 16,880 pounds and a ruling span of 1,000 feet.

B. MAGNETIC FIELD MANAGEMENT

PPL Electric's Magnetic Field Management Program is summarized in Attachment 5 and will be applied to reconstruction and new line projects including this reconstruction of the Martins Creek – Siegfried #2 230 kV Transmission Line. In order to reduce magnetic field exposures, the program generally prescribes a line design that provides 5 feet higher ground clearances than those required under the NESC and reverse phasing of new double-circuit lines where it is feasible to do so at low or no cost. The implementation of additional modifications will be considered, provided those modifications can be made at low or no cost and will not interfere with the operation of the line.

Since the Martins Creek – Siegfried #2 230 kV Transmission Line is being reconstructed for single circuit operation, reducing magnetic fields by reverse phasing is not possible. However, pursuant to PPL Electric's Magnetic Field Management Program, some reduction in magnetic field levels will be attained through the use of structures that are higher than the existing lattice towers, which will create higher ground clearances.

C. RIGHT-OF-WAY STATUS

The 10.7 mile section of the line will be rebuilt within the existing 100-foot wide PPL Electric right-of-way and, therefore, acquisition of additional rights-of-way is not anticipated. A list of all owners of property within the right-of-way is included as Attachment 7. The properties are shown on the aerial photographs contained in Attachment "2" map pockets.

EXISTING 230 kV SINGLE CIRCUIT LATTICE STRUCTURE



FIGURE 1

EXISTING STRUCTURE STATISTICS

Average Height – 90 feet

Overhead Groundwire to Phases – 11 feet

Phase to Phase – 26.5 feet

Average Ground Footprint – 780 square feet

PROPOSED 230 kV SINGLE CIRCUIT STEEL MONO-POLE



FIGURE 2

PROPOSED STRUCTURE STATISTICS

Average Height – 120 feet

Arm Length (Top & Bottom) – 12 feet

Arm Length (Middle) – 17.5 feet

Overhead Groundwire Arm Length – 14.5 feet

Average Ground Footprint – Approximately 50 square feet

Conductor Spacing:

Overhead Groundwire to Top Phase – 20 feet

Phase to Phase – 20 feet