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June 26, 2017

VIA HAND DELIVERY

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, 2nd Floor North
P.O. Box 3265
Harrisburg, PA 17105-3265

**Re: Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, for Approval to Rebuild Approximately 3.9 Miles of the Existing Cumberland-West Shore 230 kV Transmission Line and to Construct Approximately 0.3 Miles of New 230 kV Transmission Lines to Interconnect the Williams Grove 230-69 kV Substation in Upper Allen Township, Cumberland County, Pennsylvania with the 230 kV System
Docket No. A-2017-**

Dear Secretary Chiavetta:

Enclosed for filing is the Letter of Notification of PPL Electric Utilities Corporation in the above-referenced proceeding. A CD containing a copy of the Letter of Notification and Attachments in Support of the Letter of Notification is also enclosed.

As indicated on the Certificate of Service, copies of the Letter of Notification are being served by certified mail, return receipt requested upon the involved governmental agencies, municipalities and property owners.

Subject to Commission approval, construction is scheduled to begin in September 2017 to support an in-service date of September 2018.

If you have any questions concerning this matter, please contact me at the address or telephone numbers provided above.

Rosemary Chiavetta, Secretary
June 26, 2017
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Respectfully submitted,



Christopher T. Wright

CTW/jl
Enclosures

cc: Certificate of Service
Office of Consumer Advocate
Office of Small Business, Advocate
Bureau of Investigation &, Enforcement
Robert F. Young
Paul T. Diskin
Yasmin Snowberger
Kimberly Hafner

**BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

Letter of Notification of PPL Electric :
Utilities Corporation, Filed Pursuant to :
52 Pa. Code Chapter 57 Subchapter G, : Docket No. A-2017-_____
for Approval to Rebuild Approximately :
3.9 Miles of the Existing Cumberland- :
West Shore 230 kV Transmission Line :
and to Construct Approximately 0.3 :
Miles of New 230 kV Transmission :
Lines to Interconnect the Williams :
Grove 230-69 kV Substation in Upper :
Allen Township, Cumberland County, :
Pennsylvania with the 230 kV System :

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LETTER OF NOTIFICATION

TO THE PENNSYLVANIA PUBLIC UTILITY COMMISSION:

PPL Electric Utilities Corporation ("PPL Electric") hereby files, pursuant to 52 Pa. Code § 57.72(d), this Letter of Notification to request approval from the Pennsylvania Public Utility Commission ("Commission") to rebuild and construct 230 kV transmission lines needed to interconnect the proposed new Williams Grove 230-69 kV Substation ("Williams Grove Substation") located in Upper Allen Township, Cumberland County, Pennsylvania (the "Project"). To interconnect the new Williams Grove Substation to the 230 kV system, PPL Electric proposes to rebuild approximately 3.9 miles of the existing single-circuit Cumberland – West Shore 230 kV Transmission Line as a double-circuit 230 kV transmission line, and to construct approximately 0.3 miles of new 230 kV transmission lines that will be located entirely within the proposed substation property. The Project will be located in Upper Allen Township. The Project is needed to avoid multiple reliability issues, and to reinforce the 230 kV and 69 kV systems serving Cumberland County.

Subject to the Commission's approval, construction is scheduled to begin in September 2017 to support an in-service date of September 2018. In support thereof, PPL Electric states as follows:

I. INTRODUCTION

1. This Letter of Notification is filed by PPL Electric, a public utility that provides electric distribution, transmission, and provider of last resort services in Pennsylvania subject to the regulatory jurisdiction of the Commission.

2. PPL Electric's address is PPL Electric Utilities Corporation, Two North Ninth Street, Allentown, Pennsylvania 18101.

3. PPL Electric's attorneys are:

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PPL Electric's attorneys are authorized to receive all notices and communications regarding this Letter of Notification.

4. PPL Electric furnishes electric service to approximately 1.4 million customers throughout its certificated service territory, which includes all or portions of twenty-nine counties and encompasses approximately 10,000 square miles in eastern and central Pennsylvania. PPL Electric is a "public utility" and an "electric distribution company" as defined in Sections 102 and 2803 of the Pennsylvania Public Utility Code, 66 Pa.C.S. §§ 102, 2803.

5. PPL Electric owns approximately 5,000 miles of transmission lines operating at 69 kV (kilovolts) or higher, approximately 375 substations with a capacity of 10 MVA (megavolt amperes) or more, and approximately 43,000 miles of distribution lines operating at less than 69 kV.

6. This Letter of Notification includes the following accompanying attachments:

- Attachment 1 Necessity Statement.
- Attachment 2 Engineering Description.
- Attachment 3 Description of the Right-of-Way.
- Attachment 4 Design Criteria and Safety Practices.

7. This Letter of Notification and accompanying Attachments, which are incorporated herein by reference, contain all the information required by 52 Pa. Code § 57.72(d)(4).

II. THE PROJECT

A. NEED FOR THE PROJECT

8. The proposed Project is one part of a large comprehensive plan to improve the reliability of service to approximately 130,000 customers served from the West Shore, Cumberland, and Juniata 230-69 kV regional substations in the greater Harrisburg area.

9. As explained in Attachment 1 to this Letter of Notification, this comprehensive plan will improve the reliability of the transmission and distribution systems serving the greater Harrisburg area by replacing facilities that have reached the end of their useful lives, and do not meet current design standards, with modern facilities that meet current design standards and have the technical ability to reduce the potential and duration of outages experienced by customers. The improved transmission and distribution systems will allow quicker load restoration after a

system interruption, which will contribute to a higher level of reliability for the customers served from these lines.

1. Existing System

10. Presently, customers in Cumberland County receive their bulk electric power supply from multiple 230 kV lines. These 230 kV transmission lines provide power to two regional transmission substations, the Cumberland 230-69 kV Substation and the West Shore 230-69 kV Substation. The 230 kV system in Cumberland County serves approximately 90,900 customers.

11. The Cumberland 230-69 kV Substation is interconnected with the West Shore 230-69 kV Substation by the approximately 11.6-mile, single-circuit Cumberland – West Shore 230 kV Transmission Line.

12. The Cumberland 230-69 kV Substation is interconnected with the Juniata 230-69 kV Substation, via the Juniata - Cumberland 230 kV Transmission Line.

13. The West Shore 230-69 kV Substation is interconnected with the Brunner Island 230-69 kV Substation, via the Brunner Island – West Shore #1 230 kV Transmission Line.

14. The Cumberland 230-69 kV Substation and the West Shore 230-69 kV Substation supply several 69 kV transmission lines, which in turn supply various 69-12 kV distribution substations in Cumberland County. These 69-12 kV distribution substations supply power to the majority of commercial and residential homes in the area.

15. The Cumberland – West Shore #3 and Cumberland – West Shore #4 69 kV transmission lines extend approximately 20 miles and 23 miles, respectively, between the Cumberland and West Shore 230-69 kV Substations. The Cumberland – West Shore #3 and Cumberland – West Shore #4 69 kV transmission lines are networked lines that occupy common

tower structures.¹ The Cumberland – West Shore #3 and Cumberland – West Shore #4 69 kV transmission lines collectively serve approximately 30,646 customers in Cumberland County.

16. A description and one-line diagram of the existing system is provided in the Necessity Statement included as Attachment 1 to this Letter of Notification.

2. Need for the Project

17. Studies conducted for PPL Electric's transmission system, in conjunction with the PJM Interconnection, LLC ("PJM") Regional Transmission Expansion Plan ("RTEP") process, revealed that the Cumberland – West Shore #3 and Cumberland – West Shore #4 69 kV transmission lines are at risk of excessive load drop by the summer of 2018 in violation of PPL Electric's reliability practices. Detailed descriptions of the PJM RTEP process, PPL Electric's system planning process, and PPL Electric's reliability practices are provided in Attachment 1 to this Letter of Notification.

18. As explained above, the Cumberland – West Shore #3 and Cumberland – West Shore #4 69 kV transmission lines are long, networked transmission lines that occupy common tower structures. PPL Electric studies concluded that, by the summer of 2018, an outage of the networked Cumberland – West Shore #3 and #4 69 kV transmission lines due to a tower structure failure would result in the loss of 165 MW load or 30,646 customers in Cumberland County until repairs could be made. This amount of interrupted load would violate PPL Electric Transmission System Development Standards for maximum allowable load loss due to a 69 kV multi-circuit structure failure.

19. In addition, as explained in Attachment 1, operating 69 kV transmission lines in a networked configuration presents serious technical concerns and is less reliable than a radial

¹ In a "networked" configuration, the transmission line has a voltage source and power supply available at each end of the line. Power can flow from either end of the line to serve customer load.

configuration.² With the current transmission topology in the Cumberland County area, the Cumberland-West Shore #3 & #4 69 kV transmission lines are required to remain in network operation to maintain proper thermal load support on the system.

20. Detailed descriptions of the reliability issues are provided in Attachment 1 to this Letter of Notification.

B. THE PROPOSED PROJECT

21. To resolve these reliability issues and to improve service to customers in Cumberland County, PPL Electric proposes to construct the Williams Grove 230-69 kV Substation in Upper Allen Township, Cumberland County, Pennsylvania.

22. The new Williams Grove Substation will provide a new 230 kV backbone source that will be located more central to the load it will serve. With the new proposed Williams Grove Substation and 230 kV connecting lines, PPL Electric will be able to: (i) remediate the significant initial load drop violation described above; (ii) reduce the overhead transmission line exposure by shortening the distances of the Cumberland-West Shore #3 & #4 69 kV transmission lines; and (iii) operate the Cumberland-West Shore #3 & #4 69 kV transmission lines radially, rather than in network, to improve system reliability.

23. The site for the proposed Williams Grove Substation is crossed by the existing 11.6-mile, single-circuit Cumberland – West Shore 230 kV Transmission Line. This line will be split and tied into the Williams Grove Substation.

24. Approximately, 3.9 miles of the existing Cumberland – West Shore 230 kV Transmission Line between the Cumberland 230-69 kV Substation and the new Williams Grove Substation will be renamed the Cumberland-Williams Grove 230 kV Transmission Line. To tie

² In a “radial” configuration, the transmission line has a voltage source and power supply available at only one end of the line. Power will flow from the transmission substation (230-69 kV) source to the loads along the line.

the existing single-circuit 230 kV line into the new Williams Grove Substation, PPL Electric proposes to construct approximately 0.12 miles of new 230 kV transmission line. The 0.12-mile segment of new transmission line will be located entirely on the PPL Electric-owned site for Williams Grove Substation. No additional right-of-way is required for the construction, operation or maintenance of this new segment of 230 kV transmission line.

25. Approximately 3.9 miles of the existing Cumberland – West Shore 230 kV Transmission Line between the West Shore 230-69 kV Substation and the proposed new Williams Grove Substation will be renamed the Williams Grove – West Shore 230 kV Transmission Line. This existing single-circuit will be rebuilt for double-circuit operation. One side of the rebuilt double-circuit will accommodate the renamed Williams Grove – West Shore 230 kV Transmission Line, and the other side of the double circuit structures will accommodate the Brunner Island – Williams Grove 230 kV Transmission Line.³ No new right-of-way is required to rebuild the approximately 3.9 miles of the existing single-circuit Cumberland – West Shore 230 kV Transmission Line for double-circuit operation.

26. The new Williams Grove – West Shore 230 kV and the Brunner Island – Williams Grove 230 kV circuits will occupy common double-circuit structures between the Williams Grove Substation and the West Shore 230-69 kV Substation, and will enter the Williams Grove Substation on the same set of structures. To interconnect this rebuilt double circuit line with the Williams Grove Substation, PPL Electric proposes to construct

³ Currently, the Brunner Island – West Shore #1 230 kV Transmission Line extends between the Brunner Island 230-69 kV Substation and the West Shore 230-69 kV Substation. PPL Electric proposes to disconnect the Brunner Island – West Shore #1 230 kV Transmission Line from the West Shore 230-69 kV Substation and tie it into the Williams Grove Substation using one side of the rebuilt double circuit structures. This line will be referred to as the Brunner Island – Williams Grove 230 kV Transmission Line. No changes to the existing line between the Brunner Island 230-69 kV Substation and the West Shore 230-69 kV Substation will be made as part of this Project.

approximately 0.18 miles of new 230 kV transmission line. The 0.18-mile segment of new transmission line will be located entirely on the PPL Electric-owned site for Williams Grove Substation. No additional right-of-way is required for the construction, operation or maintenance of this new segment of 230 kV transmission line.

27. In summary, to interconnect the Williams Grove Substation with the existing and proposed 230 kV transmission lines, PPL Electric seeks Commission approval to: (i) rebuild approximately 3.9 miles of the existing Cumberland – West Shore 230 kV Transmission Line for double-circuit operation; (ii) construct approximately 0.12 miles of new 230 kV transmission line located entirely on the PPL Electric-owned site for Williams Grove Substation to interconnect the new Cumberland-Williams Grove 230 kV Transmission Line with the Williams Grove Substation; and (iii) construct approximately 0.18 miles of new 230 kV transmission line located entirely on the PPL Electric-owned site for Williams Grove Substation to interconnect the new Williams Grove – West Shore 230 kV and the Brunner Island – Williams Grove 230 kV circuits with the Williams Grove Substation.⁴

28. A description and one-line diagrams of the proposed Project are provided in the Necessity Statement included as Attachment 1 to this Letter of Notification. An aerial exhibit showing the location of the proposed facilities is provided as Figure 3-1 to Attachment 3.

29. Each of the new 230 kV transmission lines to be constructed as part of this Project will utilize three phase conductors (one conductor per phase) and two 114-count fiber optic ground wires for lightning protection and for communications between the transmission system

⁴ The proposed Project also involves reconductoring/rebuilding certain 69 kV transmission lines in the Project area, as well as the construction of a new, approximately 2-mile 69 kV transmission line between the Williams Grove Substation and the Mechanicsburg Substation. Because PPL Electric does not need Commission approval to site, construct, or rebuild transmission lines operating at less than 100 kV, *see* 52 Pa. Code § 57.71, these 69 kV circuits are not the subject of this Letter of Notification.

facilities. The minimum conductor-to-ground clearance will be 32 feet, which occurs at a maximum conductor temperature of 125° C. An engineering description of the Project is provided in Attachment 2 to this Letter of Notification.

30. Along the rebuild portion of the Project, there currently are 20 steel lattice structures with an average height of approximately 90 feet. These lattice structures will be replaced by 20 new double-circuit monopoles. The new structures will be located in the same vicinity as the existing lattice structures.

31. The approximately 0.3 miles of new 230 kV transmission line will require four angle structures with a single-pole design. These new angle structures will be located entirely on the Williams Grove Substation property owned by PPL Electric.

32. The new and rebuilt 230 kV transmission lines will consist of self-weathering steel monopoles equipped with steel arms and glass 230 kV insulator assemblies, three power conductors, and two optical ground wires. All new poles will be self-supported on concrete caisson foundations. The new structures are expected to range between 105 and 145 feet in height, with an average height of approximately 130 feet.⁵ Typical 230 kV structures used for this Project are shown in Figure 2-1 through 2-4 of Attachment 2.

33. The proposed Project resolves all reliability issues explained above. The proposed Williams Grove Project will provide an alternate supply of power to the customers in Cumberland County in the event that the normal supply is interrupted, which will improve power restoration times and provide operating flexibility and improved reliability. The proposed Project also will improve the operation of the 69 kV lines in Cumberland County by reconfiguring the lines from network operation to radial operation, which reduce the likelihood

⁵ One proposed 135-foot-tall structure will include a 45-foot-tall pole for a telecommunications attachment.

of customers experiencing an outage on a given line. The proposed Project will provide the region with the required electric power supply reinforcement and will meet all NERC, PJM, and PPL Electric reliability criteria.

34. The proposed Project was presented, without any objections, before the PJM sub-regional RTEP committee for the mid-Atlantic zone on December 8, 2014. The Williams Grove Project was included in the 2014 RTEP Report as supplemental project.

35. The total estimated cost of the Project is approximately \$15 million for the construction of the proposed 230 kV transmission lines.⁶

36. Upon Commission approval, the Project has a scheduled construction start date in September 2017 to support an in-service date of September 2018.

III. HEALTH AND SAFETY

37. The proposed Project will not create any unreasonable risk of danger to the public health or safety.

38. The Project will be designed, constructed, operated, and maintained in a manner that meets or surpasses all applicable National Electrical Safety Code (“NESC”) minimum standards and all applicable legal requirements. Descriptions PPL Electric’s design criteria and safety practices are provided in Attachment 4 to this Letter of Notification.

39. Consistent with its Magnetic Field Management Program, PPL Electric will construct the Project for ground clearances that are a minimum of five feet higher than the required NESC minimum ground clearance for 230 kV lines in order to reduce the magnetic field

⁶ The estimated cost for the proposed Williams Grove Project is an order-of-magnitude estimate developed using averages of recent costs for similar projects and without an in-depth analysis or field investigation. The estimated cost is subject to change as the constructability of the Project, sequence of construction, and other factors that may affect the cost are identified and analyzed as the Project progresses.

exposure. Further, to the extent feasible from an engineering perspective, the 3.9-mile segment of the Project that will be rebuilt for double-circuit operation will be reverse-phased to minimize the potential for exposure to magnetic fields. A description of PPL Electric's Magnetic Field Management Program is provided in Attachment 2 to this Letter of Notification.

IV. DESCRIPTION OF RIGHT-OF-WAY

40. As explained above, to interconnect the Williams Grove Substation with the existing 230 kV system, PPL Electric proposes to rebuild approximately 3.9 miles of the existing Cumberland – West Shore 230 kV Transmission Line for double-circuit operation, and to construct approximately 0.3 miles of new 230 kV transmission lines entirely on the PPL Electric-owned site for Williams Grove Substation. An aerial map is provided at the end of Attachment 3 to this Letter of Notification.

41. The 3.9-mile-long rebuild portion of the Project will be rebuilt within the existing right-of-way for the Cumberland – West Shore 230 kV Transmission Line. The existing right-of-way generally varies between 100 and 200 feet in width, with the majority 100 feet in width. A description of the existing right-of-way for the rebuild portion of this Project is provided in Attachment 3. As explained in Attachment 2, PPL Electric has designed the rebuilt 230 kV line to fit within the existing right-of-way and meet NESC standards. PPL Electric does not require any additional right-of-way to rebuild the existing single-circuit Cumberland – West Shore 230 kV Transmission Line for double-circuit operation.

42. The 0.3 miles of new 230 kV transmission lines will be located entirely on the PPL Electric-owned Williams Grove Substation property, which currently is traversed by the existing Cumberland – West Shore 230 kV Transmission Line. A description of the site for the Williams Grove Substation is provided in Attachment 3.

43. Although the rebuilt and new structures will increase in height (from an average of 90 feet to an average of 145 feet), impacts will be minimal because the Project will be built entirely on PPL Electric owned property or right-of-way, and in close proximity to the existing structures. Further, no new poles will be placed on any property that currently does not have an existing pole.

44. Land use impacts are anticipated to be minimal due to the fact that the Project will be constructed entirely within the existing right-of-way and on the substation site owned in fee by PPL Electric. Where practical, PPL Electric will use previously established access roads for construction to further reduce interference with existing land uses.

45. The Project area previously has been cleared of vegetation. As a result, limited vegetation management will be required for this project. In areas where vegetation management is required to complete the project, PPL Electric will apply its "*Specifications for Transmission Vegetation Management LA-79827*" to mitigate any impacts.

46. There is one cell tower attachment located along the existing Cumberland – West Shore 230 kV Transmission Line. PPL Electric will coordinate with the cell tower attachment owner to relocate the attachment during construction. No other communication towers, pipelines, or utilities will be affected by the proposed Project.

47. PPL Electric does not anticipate any interference with airport operations because of the distance from the Project area and the presence of existing electrical facilities in the Project area.

48. As explained in Attachment 3, four community parks are currently traversed by the existing Cumberland – West Shore 230 kV Transmission Line that will be rebuilt for double-circuit operation. Impacts to these parks will be minimal due to the existing electrical facilities.

No other state lands, national parks, state parks, or local parks will be impacted by the proposed Project.

49. The Project will not traverse or affect any unique geological, scenic, or natural areas.

50. The Project will not affect any recreational areas or natural landmarks.

51. PPL Electric conducted a review of the online State Historic Preservation Office (“SHPO”) Bureau for Historic Preservation Cultural Resources Geographic Information System database to determine if National Register of Historic Places listed or eligible historic properties are located in the Project vicinity. The SHPO has requested additional information and a Phase I archeological survey as explained in Attachment 3. It is anticipated that the proposed Project will have minimal impacts to cultural resources because the Project is located in areas that contain existing transmission facilities, will be a rebuild of an existing 230 kV transmission line within the existing right-of-way, and the new tower structures will be placed in close proximity to the existing tower structures. PPL Electric will coordinate with the SHPO and comply with any terms and conditions required by the SHPO.

52. Although eight streams and two wetlands were identified within the existing right-of-way along the rebuild portion of the Project, PPL Electric will avoid impacts to streams and wetlands located in the Project area to the maximum extent practical.

53. PPL Electric will obtain all necessary permits from the Pennsylvania Department of Environmental Protection and the United States Army Corps of Engineers and will comply with all of the terms and conditions placed on those permits.

54. PPL Electric will acquire any required soil erosion and sedimentation control permits and will comply with any conditions placed on those permits.

55. PPL Electric has consulted with state and federal agencies to obtain information regarding endangered and threatened species in close proximity to the Project. PPL Electric has reviewed the Pennsylvania Natural Diversity Inventory records under the jurisdiction of the Pennsylvania Department of Conservation and Natural Resources, the Pennsylvania Fish and Boat Commission, and the Pennsylvania Game Commission. .

56. The Project is located in Cumberland County, which is within the known range of the federally threatened bog turtle (*Clemmys muhlenbergii*). Therefore, the U.S. Fish and Wildlife Service indicated that further review is required for the presence of the federally threatened bog turtle. PPL Electric retained a qualified bog turtle surveyor to conduct Phase I bog turtle surveys. Based on this survey, the the U.S. Fish and Wildlife Service indicated that no federally listed species are known or likely to occur in the project area.

57. The Pennsylvania Fish and Boat Commission search indicated that the Project is located within the range of an unidentified threatened species. However, in a letter dated December 3, 2015, the Pennsylvania Fish and Boat Commission advised that the proposed Project is not anticipated to impact any known rare, candidate, threatened, or endangered species under its jurisdiction.

V. NOTICE

58. PPL Electric has provided information regarding the Project to representatives of Upper Allen Township and Cumberland County.

59. Copies of this Letter of Notification will be served on the governmental agencies, municipalities, and other public entities agencies in accordance with 52 Pa. Code § 57.72(d)(3).

60. Copies of this Letter of Notification will be served on the owners of land subject to the 230 kV right-of-way and easement in accordance with 52 Pa. Code § 57.72(d)(3).

VI. LETTER OF NOTIFICATION

61. PPL Electric is proceeding by means of a Letter of Notification, instead of a full Application, pursuant to the Commission's regulations at 52 Pa. Code § 57.72(d)(1)(v).

62. The proposed Project qualifies for use of a Letter of Notification because the approximately 3.9-miles of rebuilt lines will be located entirely within PPL Electric's existing right-of-way for the Cumberland - West Shore 230 kV Transmission Line, and the approximately 0.3 miles of new 230 kV transmission line will be located and constructed entirely on PPL Electric's property for the Williams Grove Substation.

63. Further, the proposed lines to be rebuilt from single-circuit to double-circuit will not substantially alter the existing right-of-way. As explained above, the new poles for the reconstructed portions of the Project will be placed in close proximity to the existing poles, and no new poles will be placed on any property that currently does not have an existing pole. In addition, the replacement of the existing lattice tower structures with new steel monopoles will result in smaller footprints within the right-of-way.

64. This Letter of Notification is filed on the date set forth below. As provided in 52 Pa. Code § 57.72(d)(5), the Commission will review and, by order, approve or disapprove this Letter of Notification. If the Commission approves this Letter of Notification, the proposed Project will be constructed as proposed herein without the formal application process set forth at 52 Pa. Code §§ 57.71, *et seq.*

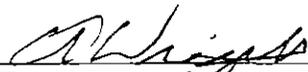
VII. CONCLUSION

WHEREFORE, PPL Electric Utilities Corporation respectfully requests that the Pennsylvania Public Utility Commission approve the rebuild of approximately 3.9 miles of the existing Cumberland – West Shore 230 kV Transmission Line for double-circuit operation and

the construction of approximately 0.3 miles of new 230 kV transmission lines in Upper Allen Township, Cumberland County, Pennsylvania, as explained above and in the Attachments hereto.

Respectfully submitted,

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Date: June 26, 2017

Attorneys for PPL Electric Utilities Corporation

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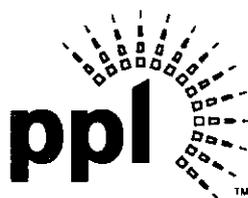
Before the
Pennsylvania Public Utility Commission

**WILLIAMS GROVE 230 KV
CONNECTING LINES PROJECT**

ATTACHMENTS IN SUPPORT OF THE
Letter of Notification

Application Docket No. _____

Submitted by: PPL Electric Utilities Corporation



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ATTACHMENT 1
WILLIAMS GROVE 230 KV CONNECTING LINES PROJECT
NECESSITY STATEMENT

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JUN 26 2017

PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

ATTACHMENT 1
WILLIAMS GROVE 230 KV CONNECTING LINES PROJECT
NECESSITY STATEMENT

A. INTRODUCTION

PPL Electric Utilities Corporation (PPL Electric) is requesting Pennsylvania Public Utility Commission ("PUC" or "Commission") approval for the construction of 230 kV transmission lines needed to interconnect the proposed new Williams Grove 230-69 kV Substation ("Williams Grove Substation") located in Upper Allen Township, Cumberland County, Pennsylvania (the "Project"). As explained below, to interconnect the new Williams Grove Substation to the 230 kV system, PPL Electric proposes to rebuild approximately 3.9 miles of the existing single-circuit Cumberland – West Shore 230 kV Transmission Line as a double-circuit 230 kV transmission line, and to construct approximately 0.3 miles of new 230 kV transmission lines that will be located entirely within the proposed substation property. The Project will be located in Upper Allen Township. As explained below, the Project is needed to avoid a reliability violation, and to reinforce the 230 kV and 69 kV systems serving Cumberland County.

The estimated cost to site, design and construct the proposed 230 kV transmission lines is \$15 million.¹ Subject to the Commission's approval, construction is scheduled to begin in September 2017 to support an in-service date of September 2018. A one-line diagram and map of the existing system are provided as Figures 1-1, 1-4 and 1-2, 1-6, respectively.

B. SYSTEM PLANNING PROCESS AND GUIDELINES

The nation's interconnected transmission grid serves as the backbone for the safe and reliable delivery of large amounts of electricity from generating stations over substantial distances to customers served by transmission and local distribution systems. It is critically important that this interconnected transmission system (transmission grid) be planned and designed to be highly reliable so that reliable electric service can be provided under peak and all loading conditions

¹ The estimated cost for the proposed Williams Grove Project is an order-of-magnitude estimate developed using averages of recent costs for similar projects and without an in-depth analysis or field investigation. The estimated cost is subject to change as the constructability of the Project, sequence of construction, and other factors that may affect the cost are identified and analyzed as the Project progresses.

and when certain elements of the system are out of service (system contingencies) due to planned or unplanned outages.

System Planning is the process that assures that the transmission system can supply electricity to all customer loads in a manner that is reliable and economical. This System Planning process assures that both the Bulk Electric System (BES)² and non-Bulk Electric System (non-BES)³ are planned and constructed so that:

- They are able to accommodate forecasted system flows during summer and winter peak load;
- They can adequately serve each customer's need with regard to capacity, voltage and reliability for all load levels throughout the daily load cycle;
- They can sustain probable contingencies and disturbances with minimal customer service interruptions; and
- They are in conformance with North American Electric Reliability Corporation ("NERC"), PJM Interconnection, LLC ("PJM"), and the Transmission Owner's reliability criteria for all normal and emergency operating conditions.

PJM is a FERC-approved Regional Transmission Organization ("RTO") charged with ensuring the reliability of the electric transmission system under its functional control (100 kV and above), 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")⁴ to identify system reinforcements that are required to, among other things, meet the NERC Reliability Standards, PJM reliability planning criteria, and Transmission Owner reliability criteria.

² Bulk Electric System (BES) – Includes transmission facilities operated at voltages of 100 kV or higher.

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

⁴ 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.

PJM conducts RTEP studies in conjunction with its Transmission Owners and applies NERC, regional, and Transmission Owner reliability criteria to specific conditions on the transmission system. 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. PJM's manual 14B⁵ outlines the RTEP process and reliability criteria used for this process. As mentioned in manual 14B, every year PJM perform various reliability tests such as Baseline Thermal, Baseline Voltage, Load Deliverability, Generation Deliverability and Baseline Stability to ensure safe reliable of operation of electric grid.

When the studies show an inability of the transmission system to meet specific reliability criteria under these conditions, PJM opens an RTEP Window in accordance with FERC Order 1000⁶ to identify the optimal solution to resolve the criteria violation.

PPL Electric, as a Transmission Owner and member of PJM, undertakes an independent analysis of both its BES transmission facilities, and its non-BES transmission facilities in concert with the PJM RTEP process. PPL Electric identifies all conditions where the future system does not meet the NERC criteria, PJM reliability criteria, or PPL Electric Transmission Owner criteria. In this way, PPL Electric actively participates in the PJM RTEP process, and through this participation PPL Electric provides results of its independent studies to PJM for consideration and inclusion in the PJM RTEP.

Alternatives that can mitigate violations to the reliability criteria are developed and analyzed to ensure that the PPL Electric transmission system meets the reliability criteria and that an optimal solution is identified. Estimated costs and lead times to implement the reinforcements are prepared. PPL Electric then proposes solutions to PJM through an RTEP window. If the project is awarded to PPL Electric, it then becomes a baseline RTEP project.

PPL Electric's Transmission Owner Criteria address thermal, voltage, short circuit, and stability limits specific to the PPL Electric zone and also ensure compliance with NERC⁵ and PJM

⁵ PJM Manual 14B is available at <http://www.pjm.com/~media/documents/manuals/m14b.ashx>

⁶ <http://www.ferc.gov/industries/electric/indus-act/trans-plan.asp>

reliability criteria. These criteria ensure adequate and appropriate levels of electric service to PPL Electric customers in accordance with good utility practices. In addition to these criteria, PPL Electric plans the system according to its own Transmission System Development Standards.

In addition to NERC, PJM, and Transmission Owner criteria-based projects, PPL Electric also initiates projects based on the Transmission System Development Standards. These projects address local load growth, provide load restoration flexibility, and replace poor performing transmission assets in order to provide a robust level of reliability on the local system.

PPL Electric's Transmission System Development Standards also consider transmission needs to support the development of the distribution system. When the distribution system needs to either expand existing distribution substations with new transformation or install new distribution substations to support local load growth on the distribution system, new transmission facilities are required to accommodate that expansion.

Projects created to support PPL Electric's Transmission System Development Standards are presented to PJM stakeholders at either a TEAC or Sub-Regional RTEP meeting and are assigned a Supplemental project number in the RTEP. PJM incorporates these projects into the power flow model which they use to perform various reliability analyses for the RTEP.

As explained below, studies conducted for PPL Electric's transmission system concluded that the proposed Project is necessary to maintain the reliability of the transmission system serving Cumberland County according to PPL Electric reliability practices and standards. The proposed Project has been presented at a PJM Mid-Atlantic Sub-Regional RTEP stakeholder meeting and has been approved as supplemental project S0943 in PJM's RTEP process.

C. DEFINITION OF THE PROBLEM

The proposed Project is one part of a large comprehensive plan to improve the reliability of service to approximately 130,000 customers served from the West Shore, Cumberland, and

Juniata 230-69 kV regional substations in the greater Harrisburg area. This comprehensive plan is required to address the following:

1. To rebuild the existing 230-69 kV substations to meet the current standards. The Juniata, Cumberland and West Shore 230-69 kV substations have outdated design and need to be rebuilt to current standards. Major equipment in these substations including transformers, circuit breakers, electromechanical relays, battery bank have reached the end of their useful lives.
2. To convert many network lines to radial configuration, which will reduce the line exposure by approximately 30%, and, thereby, reduce the number of customers exposed to a single outage event. As explained in greater detail below, this will result in greater reliability performance on the lines in this area and provide better power delivery to the customers at both the distribution and transmission level.
3. To improve the physical security of Juniata, Cumberland and West Shore substations.
4. To install smart devices called Motor Operated Load Break Air Break ("MOLBAB") switches, which will allow the system operators to isolate faults within minutes and restore service to the customers within a very short period of time. This benefit will be spread out across all of the 69 kV lines in this area and all substations served by those lines.
5. To install fiber optic cables to provide communications between system facilities. The availability of fiber optics on the 69 kV lines in this area is the prime requirement for successful operation of the protective and relay devices.
6. To replace wooden poles with modern steel poles. The wood pole replacement work will increase the resiliency of 69 kV transmission systems serving this area.
7. To rebuild old transmission lines with current design standards. Over the past 5-10 years, the existing lines in this area have exhibited reduced reliability due to degrading structure and/or conductor health along with vintage transmission line designs that do not meet current performance standards for reliable power delivery to customers, which directly correlates to an increase in the probability for material/structural failures and resulting long-term power outages. The planned rebuilds of these lines will resolve these asset driven reliability concerns, while reconfiguring the system to reduce customer exposure during outage events in the future.

This comprehensive plan will improve the reliability of the transmission and distribution systems serving the greater Harrisburg area by replacing facilities that have reached the end of their useful lives with modern facilities that meet current design standards and have the ability to reduce the occurrence and duration of outages experienced by customers. The improved transmission and distribution systems will allow quicker load restoration after a system interruption, which will contribute to a higher level of reliability for the customers served from these lines. Importantly, the proposed Project is a critical part of the larger comprehensive plan to improve the reliability of electric service to approximately 130,000 customers in the Harrisburg area.

1. Existing System

Presently, customers in Cumberland County receive their bulk electric power supply through 230 kV transmission lines. These 230 kV transmission lines provide power to two regional 230-69 kV transmission substations, the Cumberland 230-69 kV Substation and the West Shore 230-69 kV Substation. The existing Cumberland – West Shore 230 kV Transmission line extends approximately 11.6 miles between the Cumberland 230-69 kV Substation and the West Shore 230-69 kV Substation. The Cumberland 230-69 kV Substation is interconnected with the Juniata 230-69 kV Substation, via the Juniata – Cumberland 230 kV Transmission Line. The West Shore 230-69 kV Substation is interconnected with the Brunner Island 230-69 kV Substation, via the Brunner Island – West Shore #1 230 kV Transmission Line.

The Cumberland 230-69 kV Substation and the West Shore 230-69 kV Substation are regional substations that supply power to several 69 kV transmission lines, which in turn supply power to various 69-12 kV distribution substations in Cumberland County. These 69-12 kV distribution substations supply power to the majority of commercial and residential homes in the area. The 230 kV system in Cumberland County serves approximately 90,900 customers.

The Cumberland – West Shore #3 and Cumberland – West Shore #4 69 kV transmission lines are networked transmission lines that extend approximately 20 miles and 23 miles, respectively.⁷ The Cumberland-West Shore #3 & #4 69 kV transmission lines occupy common tower structures (a double-circuit configuration) between the Cumberland 230-69 kV Substation and the West Shore 230-69 kV Substation. These 69 kV transmission lines provide the non-bulk electric power supply to this region and collectively serve approximately 30,646 customers.

One-line diagrams and maps of the existing 230 kV and 69 kV systems are provided as Figures 1-1 through 1-6.

2. Reliability Risks

Load flow studies conducted for PPL Electric's transmission system revealed transmission lines at risk of excessive load drop violation on the system in the Cumberland County area by the summer of 2018. Specifically, PPL Electric studies concluded that, by the summer of 2018, an outage of the networked Cumberland – West Shore #3 and #4 69 kV transmission lines due to a tower structure failure would result in the loss of 165 MW load or 30,646 customers in Cumberland County until repairs could be made. There currently are no alternative sources to transfer the load should this contingency occur. This amount of interrupted load would violate PPL Electric Transmission System Development Standards for maximum allowable load loss due to a 69 kV multi-circuit structure failure, which standard only allows 120 MW of load or 20,000 customers on a line to be interrupted until repairs can be completed.

In addition, there are concerns operating the 69 kV transmission system in a networked configuration. When either a pre-arranged or unplanned outage occurs on the BES, the flow of electricity needs to find alternate paths to reach the load. In some contingency scenarios, that alternate path would be a lower voltage networked transmission line on the 69 kV system, which is not designed to accommodate BES network power flows. The 69 kV transmission level facilities are designed to serve load at the 69-12 kV distribution substations that ultimately serve the customers. On the PPL Electric system, a radial configuration is preferred for 69 kV

⁷ In a "networked" configuration, the transmission line has a voltage source and power supply available at each end of the line. Power can flow from either end of the line to serve customer load.

transmission lines, using shorter line lengths and normally open ties (switches) with adjacent transmission lines for restoration in the event of an interruption.

In order to minimize outages, ensure the safety of customers and the communities served, and to maintain the integrity and reliability of the electrical system, PPL Electric's transmission system is designed with a protective relaying scheme. PPL Electric uses a protective relaying scheme to identify, isolate and clear faults, and to communicate between transmission facilities. The protective relaying scheme opens and closes circuit breakers and switches in the transmission facilities when a fault is detected.⁸

Due to the nature of the protection schemes, circuit breaker clearing times can be slower on networked lines than radially configured lines. With slower clearing times, transient voltage dips will last for a longer period of time with networked transmission lines than if the lines were operated radially. Slower clearing times for a fault may result in extended periods of transient voltage dips until the fault condition is cleared from the system. This may result in additional outages due to customer equipment tripping off due to low voltage.

With radial configuration, the protective relaying scheme is basic in design and configuration. For lines operated in a networked configuration, the protective relaying scheme is more complicated. Protective settings, recloser preference switches, and relay communication circuits must be changed in order to properly protect a networked circuit when it is abnormally configured to a radial line. Because of this issue, the protective relaying becomes more complicated in a network configured system in order to cover different topology scenarios.

With the current transmission topology in the Cumberland County area, the Cumberland-West Shore #3 & #4 69 kV transmission lines are required to remain in network operation to maintain proper thermal load support on the system. With the new proposed Williams Grove Substation and 230 kV connecting lines, PPL Electric will be able to (i) break this 69 kV network, (ii)

⁸ Like a circuit breaker on household electric lines, the protective relaying scheme opens an electric switch and shuts off power when a fault occurs. Where a household circuit breaker remains shut off until it is manually reset, the protective relaying scheme tests the electrical line to determine whether the fault has been removed. If the fault is only temporary, the protective relaying scheme closes the switch and restores electric power.

reduce the overhead transmission line exposure by shortening the distances of the Cumberland-West Shore #3 & #4 69 kV transmission lines, and (iii) operate the Cumberland-West Shore #3 & #4 69 kV transmission lines radially to improve system reliability.

D. PROPOSED SOLUTION

To resolve the reliability issues explained above, PPL Electric proposes to construct the Williams Grove 230-69 kV Substation in Upper Allen Township, Cumberland County, Pennsylvania. The new Williams Grove Substation will provide a new 230 kV backbone source that will be located more central to the load it will serve. It will also remediate the significant initial load drop violation, and networked line conditions described above.

The proposed Williams Grove Substation will be interconnected with three 230 kV lines. The proposed Williams Grove Substation property currently is crossed by the existing Cumberland – West Shore 230 kV Transmission Line. Two of the 230 kV lines interconnected with Williams Grove Substation will come from splitting the existing single-circuit Cumberland – West Shore 230 kV transmission line into two lines and tying them into the new Williams Grove Substation. The resulting lines will be referred to as the Cumberland – Williams Grove 230 kV Transmission Line and the Williams Grove – West Shore 230 kV Transmission Line.

The third 230 kV line will be interconnected with the Williams Grove Substation by disconnecting the Brunner Island – West Shore #1 230 kV Transmission Line from the West Shore Substation and re-terminating this line into Williams Grove Substation. This line will be referred to as the Brunner Island – Williams Grove 230 kV Transmission Line. In order to do this, the existing 230 kV line between West Shore Substation and the proposed Williams Grove Substation will be rebuilt as a double-circuit line to accommodate the new Williams Grove – West Shore 230 kV Transmission Line (the split portion of the existing, single-circuit Cumberland – West Shore 230 kV Transmission Line) and the new Brunner Island – Williams Grove 230 kV Transmission Line. The total length of transmission line rebuild from single-circuit to double-circuit will be approximately 3.9 miles.

The Williams Grove – West Shore 230 kV and the Brunner Island – Williams Grove 230 kV circuits will enter the Williams Grove Substation on the same set of structures, i.e., on double-circuit tower structures. To interconnect this rebuilt double circuit line with the Williams Grove Substation, PPL Electric proposes to construct approximately 0.18 miles of new 230 kV

transmission line that will be located and constructed entirely on the Williams Grove Substation property. The Cumberland – Williams Grove 230 kV circuit (the split portion of the existing, single-circuit Cumberland – West Shore 230 kV Transmission Line) will enter the Williams Grove Substation as a single circuit line. To interconnect this single-circuit 230 kV transmission line with the Williams Grove Substation, PPL Electric proposes to construct approximately 0.12 miles of new 230 transmission line that will be located and constructed entirely on the Williams Grove Substation Property. In total, approximately 0.3 miles of new 230 kV transmission will be constructed on the PPL Electric-owned property for the Williams Grove Substation to interconnect the three 230 kV transmission lines (one single-circuit and one double-circuit) with the 230 kV yard at the Williams Grove Substation. Having these three 230 kV transmission lines connect into the proposed substation will improve operational flexibility and improve the ability to get maintenance outages on the BES system in the area.

The Williams Grove Substation also will be interconnected with four 69 kV lines that will pick up load from the Cumberland – West Shore #3 and the Cumberland – West Shore #4 69 kV transmission lines. This Project will improve the operation of the 69 kV lines from network operation to radial operation. The reconfiguration of the transmission lines into a radial configuration will reduce the number of customers per transmission line. This will reduce the number of customers that experience an outage due to a fault on a given line. These new 69 kV lines will reduce the number of transmission line wire miles per line and will therefore reduce the likelihood of customers experiencing an outage on a given line.

The proposed Williams Grove 230-69 kV Substation arrangement will also provide an alternate supply of power to the customers in this area in the event that the normal supply is interrupted, which will improve power restoration times and provide operating flexibility and improved reliability. Tables 1-1 and 1-2 below illustrate the new customer counts per circuit and the number of line miles of exposure for each 69 kV transmission line.

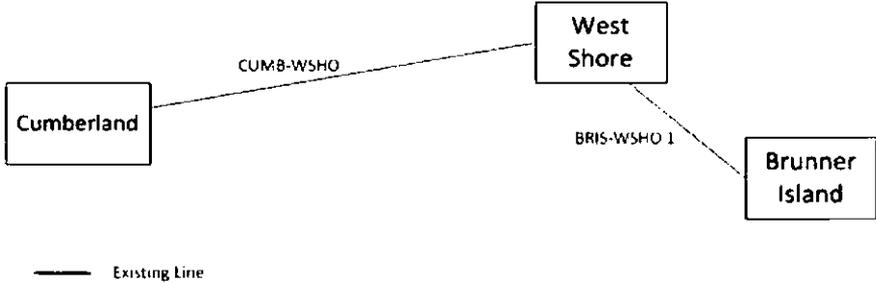
Table 1-1. System Configuration Before Project		
Current Line Name	Circuit Mileage	Customers
Cumberland-West Shore 3	20	30,646
Cumberland-West Shore 4	23	

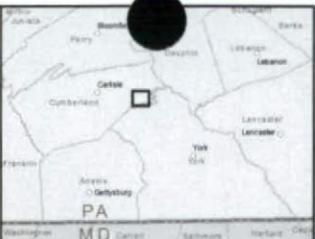
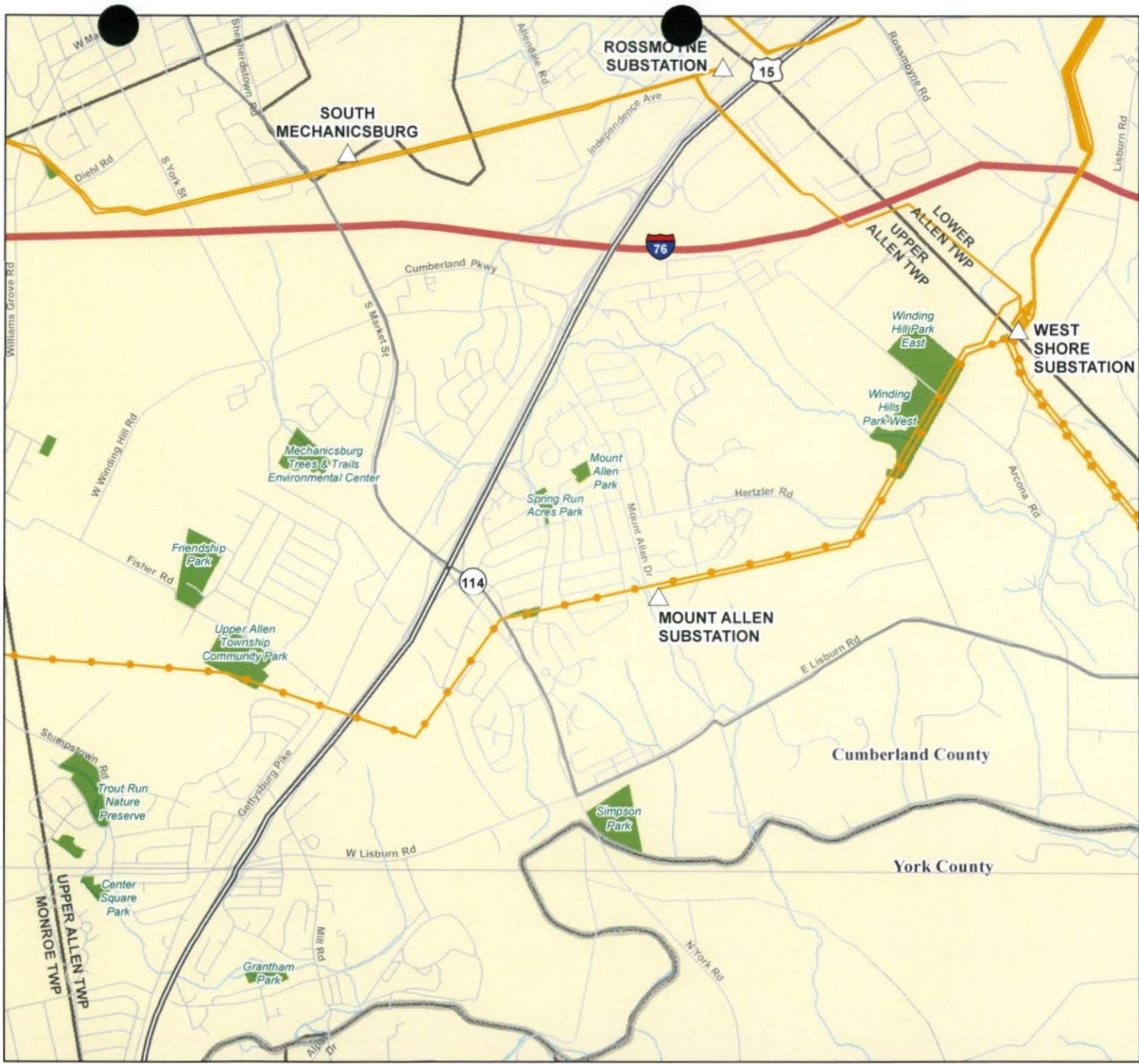
Table 1-2. System Configuration After Project		
Future Line Name	Circuit Mileage	Customers
Williams Grove-West Shore 1	5.0	6,942
Williams Grove-West Shore 2	5.0	5,351
Williams Grove-Mechanicsburg 1	6.6	4,822
Williams Grove-Mechanicsburg 2	6.6	4,290

One-line diagrams and maps of the existing 230kV and 69kV systems are provided as Figures 1-1 through 1-6. An engineering description of the new and rebuilt 230 kV transmission lines is provided in Attachment 2.

The Williams Grove Project resolves the reliability risks described above. The Project was presented, without any objections, before the PJM sub-regional RTEP committee for the mid-Atlantic zone on December 8, 2014. The Williams Grove Project was included in the 2014 RTEP Report as supplemental project S0943.

Figure 1-1. One-Line Diagram of Existing 230 kV Transmission Facilities





**Williams Grove 230 kV
Connecting Lines
Project
Figure 1-2: Map of
Existing Facilities**

- △ Substation
- Stream
- Local Park
- ▭ County Boundary
- ▭ Municipality Boundary
- Existing Transmission**
- 230kV
- 69kV



ppl **Louis Berger**
 PPL Electric Utilities
 Projected Coordinate System: PA State Plane, South Datum: North American Datum of 1983 (NAD83).
 Projection: Lambert Conformal Conic.
 Linear Unit: Feet
 Ellipsoid: Geodetic Reference System 80

Figure 1-3. One-Line Diagram of Proposed 230 kV Transmission Facilities

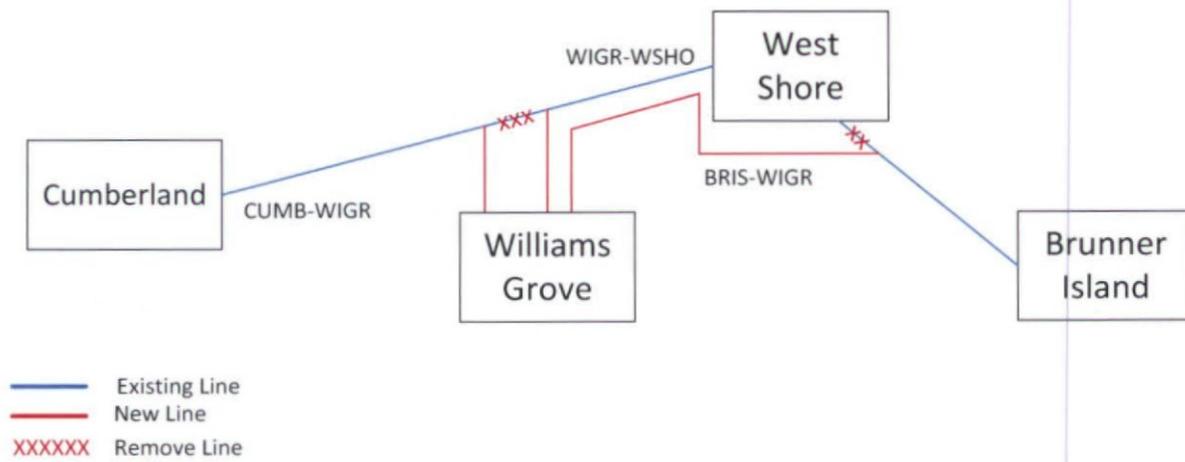
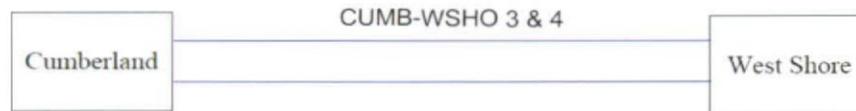
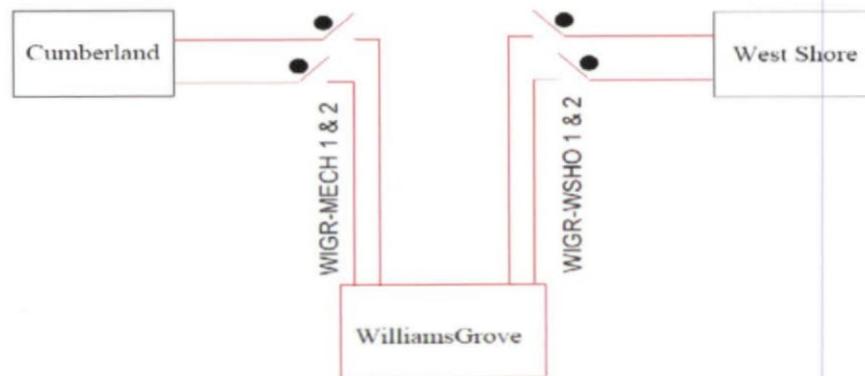


Figure 1-4. One-Line Diagram of Existing Networked 69 kV Transmission Facilities

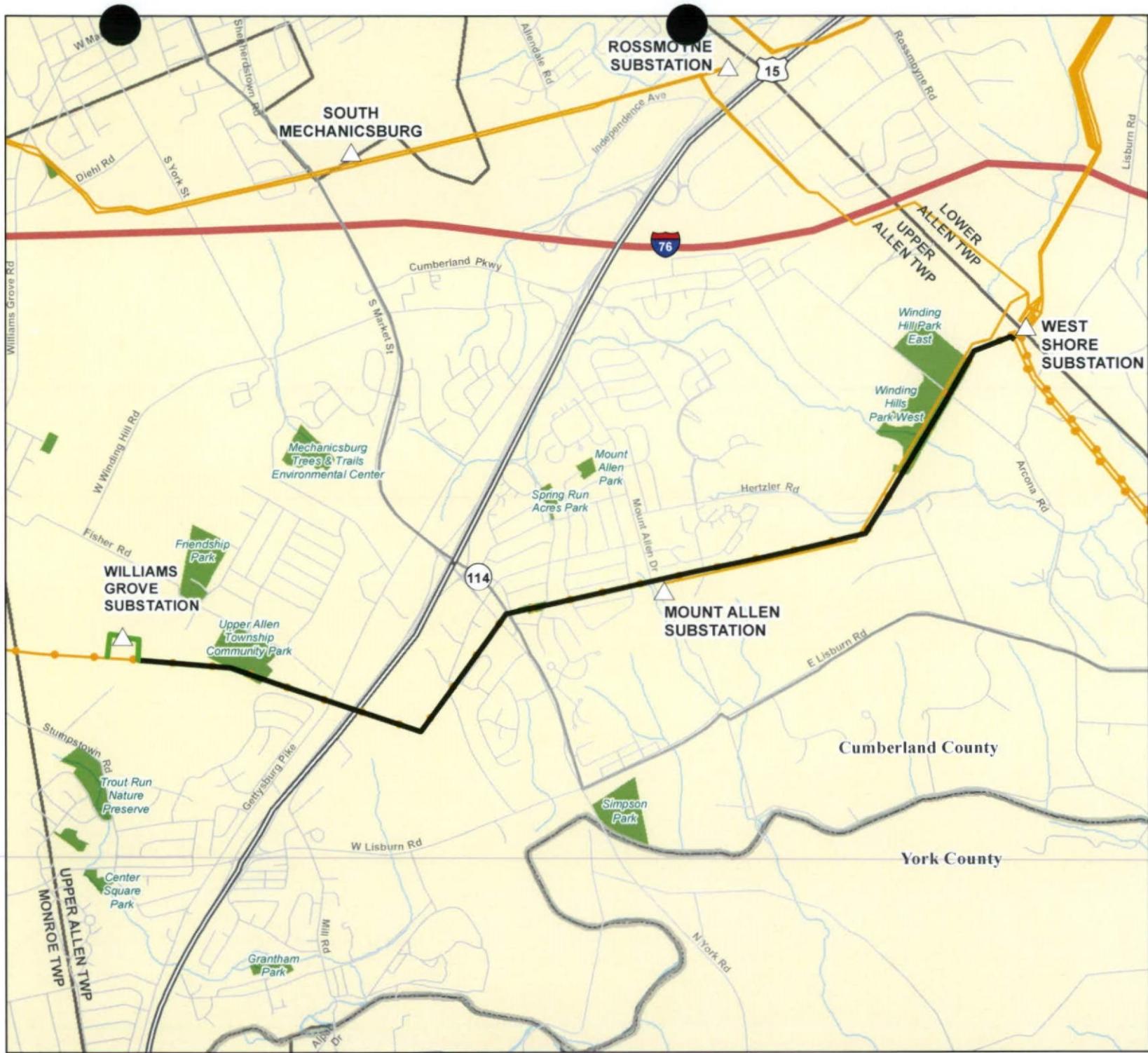


— Existing

Figure 1-5. One-Line Diagram of Proposed Radial 69 kV Transmission Facilities

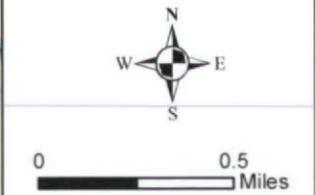


- New
- / Normally Open Switch



**Williams Grove 230 kV
Connecting Lines
Project
Figure 1-6: Map of
Proposed Facilities**

- △ Substation
- New Construction
- ▬ Rebuild
- Stream
- Local Park
- ▭ County Boundary
- ▭ Municipality Boundary
- Existing Transmission**
- 230kV
- 69kV



ATTACHMENT 2
WILLIAMS GROVE 230 KV CONNECTION LINES PROJECT
ENGINEERING DESCRIPTION

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ATTACHMENT 2
WILLIAMS GROVE 230 KV CONNECTING LINES PROJECT
ENGINEERING DESCRIPTION

A. INTRODUCTION

PPL Electric Utilities Corporation (“PPL Electric”) proposes to construct a new 230-69 kV Substation (the “Williams Grove Substation”) adjacent to the existing Cumberland – West Shore 230 kV Transmission Line in Upper Allen Township, Cumberland County, Pennsylvania. As explained in Attachment 1, PPL Electric herein seeks approval from the Pennsylvania Public Utility Commission (“PUC” or the “Commission”) to rebuild approximately 3.9 miles of the existing Cumberland – West Shore 230 kV Transmission Line for double-circuit operation and to construct approximately 0.3 miles of new 230 kV transmission line to interconnect the Williams Grove Substation with the existing and proposed 230 kV transmission lines (the “Project”).

An aerial exhibit showing the location of the proposed facilities is provided in Figure 3-1 to Attachment 3.

B. DESCRIPTION OF THE PROPOSED 230 kV LINES

As explained in Attachment 1, PPL Electric proposes to construct the new Williams Grove Substation in Upper Allen Township, Cumberland County, Pennsylvania to avoid a reliability violation, and to reinforce the 230 kV and 69 kV systems in serving Cumberland County. To interconnect the new Williams Grove Substation to the 230 kV system, PPL Electric requests Commission approval to rebuild approximately 3.9 miles of the existing single-circuit Cumberland – West Shore 230 kV Transmission Line for double-circuit operation, and to construct approximately 0.3 mile of new 230 kV transmission lines on the PPL Electric-owned Williams Grove Substation property.

The Williams Grove Substation property currently is crossed by the existing, single-circuit Cumberland – West Shore 230 kV Transmission Line, which extends approximately 11.6 miles from the Cumberland 230-69 kV Substation to the West Shore 230-69 kV Substation. The Cumberland – West Shore 230 kV Transmission Line has been in service since 1964 and is operating utilizing 1033 kcmil¹ aluminum-conductor steel-reinforced (ACSR) conductors. The Cumberland – West Shore 230 kV Transmission Line consists of mainly steel lattice towers that do not have the structural capacity to hold the second circuit proposed to be added as part of this Project. The existing structures average approximately 90 feet in height.

The existing Cumberland – West Shore 230 kV Transmission Line will be split and tied into the proposed Williams Grove Substation Property. The resulting new lines will be referred to as the Cumberland – Williams Grove 230 kV Transmission Line and the Williams Grove – West Shore 230 kV Transmission Line.

Currently, the Brunner Island – West Shore #1 230 kV Transmission Line extends approximately 16 miles between the Brunner Island 230-69 kV Substation and the West Shore 230-69 kV Substation. PPL Electric proposes to disconnect the Brunner Island – West Shore #1 230 kV Transmission Line from the West Shore 230-69 kV Substation and tie it into the proposed new Williams Grove Substation. This line will be referred to as the Brunner Island – Williams Grove 230 kV Transmission Line. To interconnect the Brunner Island – Williams Grove 230 kV Transmission Line with the new Williams Grove Substation, PPL Electric proposes to rebuild approximately 3.9 miles of the existing Cumberland – West Shore 230 kV Transmission Line between the West Shore 230-69 kV Substation and the proposed Williams Grove Substation as a double-circuit. One side of the rebuilt double-circuit will accommodate the existing single-circuit Cumberland – West Shore 230 kV Transmission Line (renamed as the Williams Grove – West Shore 230 kV Transmission Line), and the other side of the double circuit structures will accommodate the new Brunner Island – Williams Grove 230 kV Transmission Line.

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

The total length of transmission line to be rebuilt from single-circuit to double-circuit will be approximately 3.9 miles. The existing right-of-way generally varies from 100 to 200 feet in width. PPL Electric has designed the rebuilt, double-circuit 230 kV line to fit entirely within the existing right-of-way.

The new Williams Grove – West Shore 230 kV and the Brunner Island – Williams Grove 230 kV circuits will occupy common double-circuit structures and will enter the Williams Grove Substation on the same set of structures. To interconnect this rebuilt double-circuit line with the Williams Grove Substation, PPL Electric proposes to construct approximately 0.18 miles of new 230 kV transmission line. The new Cumberland – Williams Grove 230 kV circuit will enter the substation as a single-circuit line. To interconnect this single-circuit 230 kV transmission line with the Williams Grove, PPL Electric proposes to construct approximately 0.12 miles of new 230 kV transmission line. In total, approximately 0.3 miles of new 230 kV transmission will be required to interconnect the three 230 kV transmission lines (one single-circuit and one double-circuit) with the 230 kV yard at the Williams Grove Substation. The approximately 0.3 miles of new 230 kV transmission line will be located and constructed entirely on the PPL Electric-owned Williams Grove Substation property.

The new and rebuilt 230 kV transmission lines will consist of self-weathering steel monopoles equipped with steel arms and glass 230 kV insulator assemblies, three phase conductors (one conductor per phase), and two 144-fiber-count optical ground wires. All new poles will be self-supported on concrete caisson foundations. The new structures are expected to range between 105 and 145 feet in height, with an average height of approximately 130 feet. One proposed 135-foot-tall structure includes a 45-foot-tall pole for a telecommunications attachment. With the pole and attachment included, the total height of the structure is 187 feet. Figures 2-1 through 2-4 depict typical structure types that will be used for the Project.

Along the rebuild portion of the Project, there currently are 20 steel lattice structures that will be replaced by 20 new double-circuit monopoles. The new structures will be located

in the same vicinity as the existing tower structures. No new poles will be placed on any property that currently does not have an existing structure.

The approximately 0.3 miles of new 230 kV transmission line that will be located and constructed entirely on the PPL Electric-owned Williams Grove Substation property will require four new steel, single-pole angle structures. Two of these angle structures will be required to interconnect the double-circuit Williams Grove – West Shore 230 kV and Brunner Island – Williams Grove 230 kV Transmission Lines with the Williams Grove Substation, and two of these angle structures will be required to interconnect the single-circuit Cumberland – Williams Grove 230 kV Transmission Line with the Williams Grove Substation. These new angle structures will be located entirely on the Williams Grove Substation property owned by PPL Electric.

Each 230 kV circuit will utilize three phase conductors (one conductor per phase) and the structures will include two 144-fiber-count optical ground wires. The power conductors will be 1590 kcmil, 45/7 stranding, aluminum conductor steel reinforced (“ACSR”) conductors. The fiber optic ground wires will be 0.791-inch diameter Optical Ground Wires (“OPGW”).

The proposed lines will be designed according to, and generally exceed, all National Electrical Safety Code (“NESC”) minimum standards. The minimum conductor-to-ground clearance will be 32 feet, which occurs at a maximum conductor temperature of 125°C. The design minimum conductor clearances and conductor thermal ratings for the proposed 230 kV lines are shown in Tables 2-1 and 2-2. Design specifications and safety rules practiced by PPL Electric are included in Attachment 4.

Table 2-1 Design for Minimum Conductor Clearances for 1590 kcmil 54/19 strand ACSR²	
Condition	Transmission Double-Circuit Design Clearance-to-Ground
Heavy Ice (1.5" Ice at 0°C ambient temperature)	32 feet
Predicted extreme thermal load (125°C conductor temperature)	32 feet
Predicted blowout (6 lbs., 16°C, ambient temperature)	32 feet

Table 2-2 Conductor Thermal Rating 1590 kcmil 54/19 Stranding ACSR 125°C Maximum Conductor			
Condition	Ambient Temperature (°C)	Wind Speed (Ft./sec)	Ampacity (Amps)
Summer Normal	35	0	1626
Winter Normal	10	0	1873
Summer Emergency	35	2.533	2013
Winter Emergency	10	2.533	2267

C. MAGNETIC FIELD MANAGEMENT

PPL Electric's Magnetic Field Management Program 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 with ground clearance that is five feet higher than NESC standards and reverses phasing of new double-circuit lines where it is feasible to do so at low or no cost. The Project will be designed with structures that have a ground

² Clearances based on an initial maximum tension of 6,000-10,000 pounds at ½ inch ice, 0°F, 4# wind and maximum ruling span of 200-1,250 feet.

clearance that is five feet higher than NESC standards and the double-circuit portion of the Project will use reverse phasing provided there are no design restrictions.

Figure 2-1. Typical Double-Circuit 230 kV 2-Pole Angle Suspension Structure

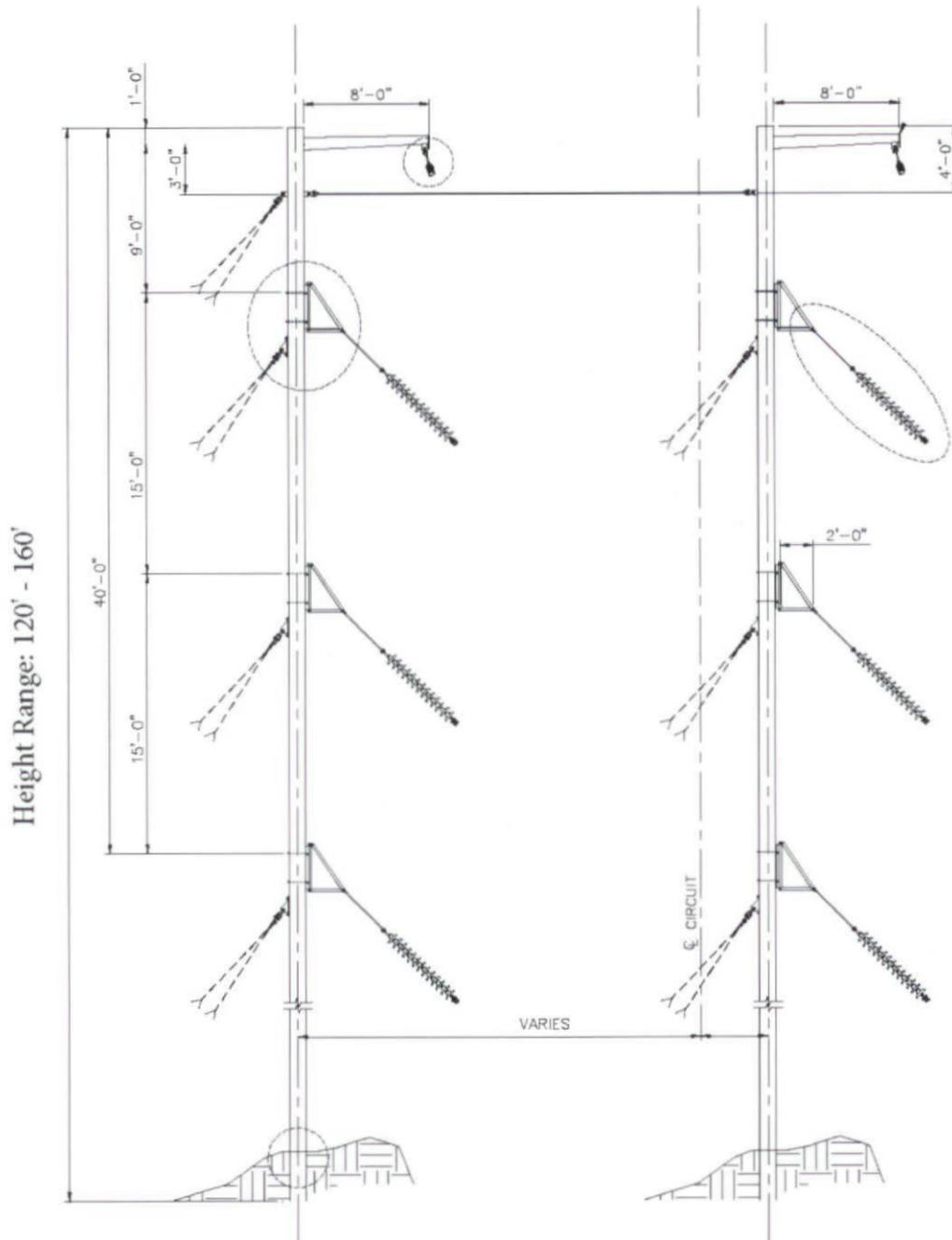


Figure 2-2. Typical Double-Circuit 230 kV Single Pole Angle Suspension Structure

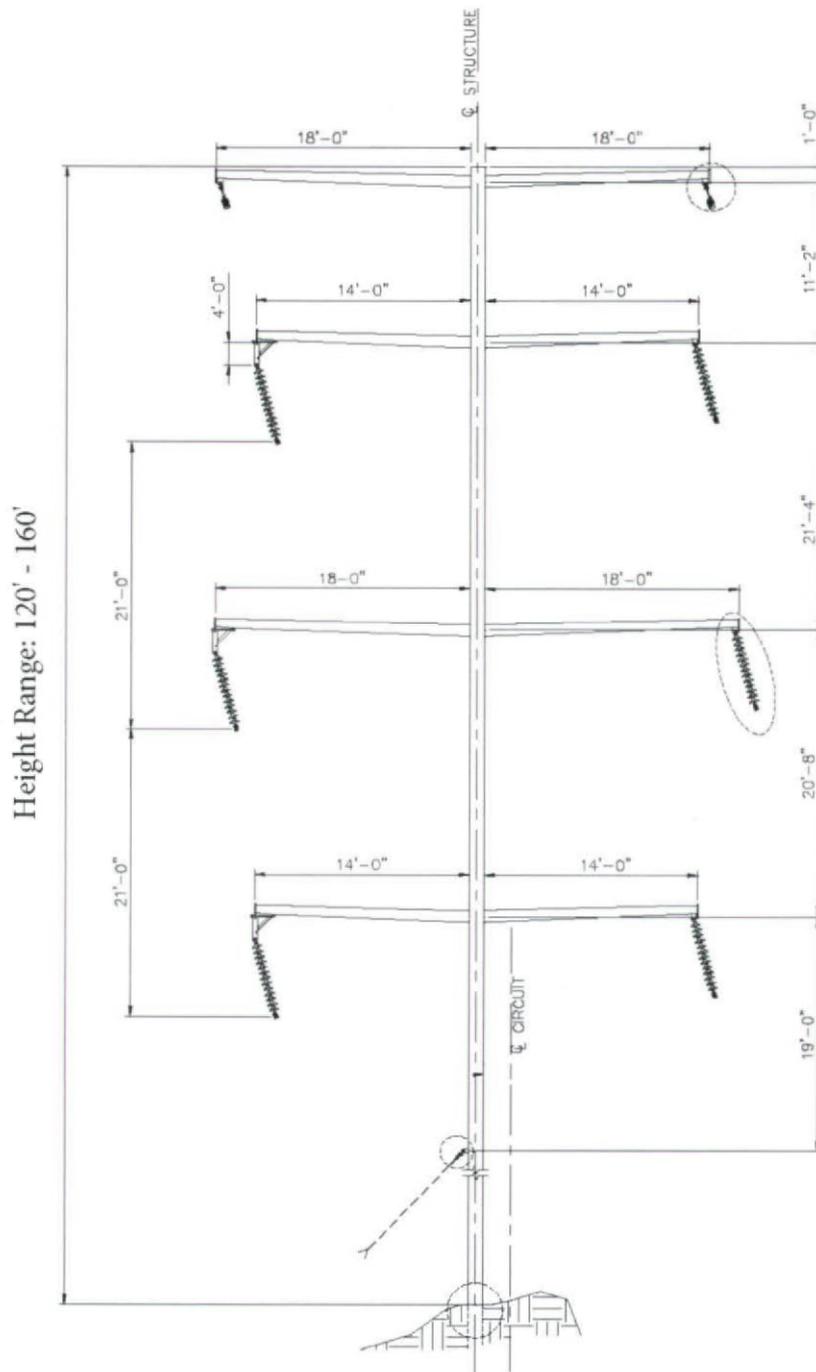
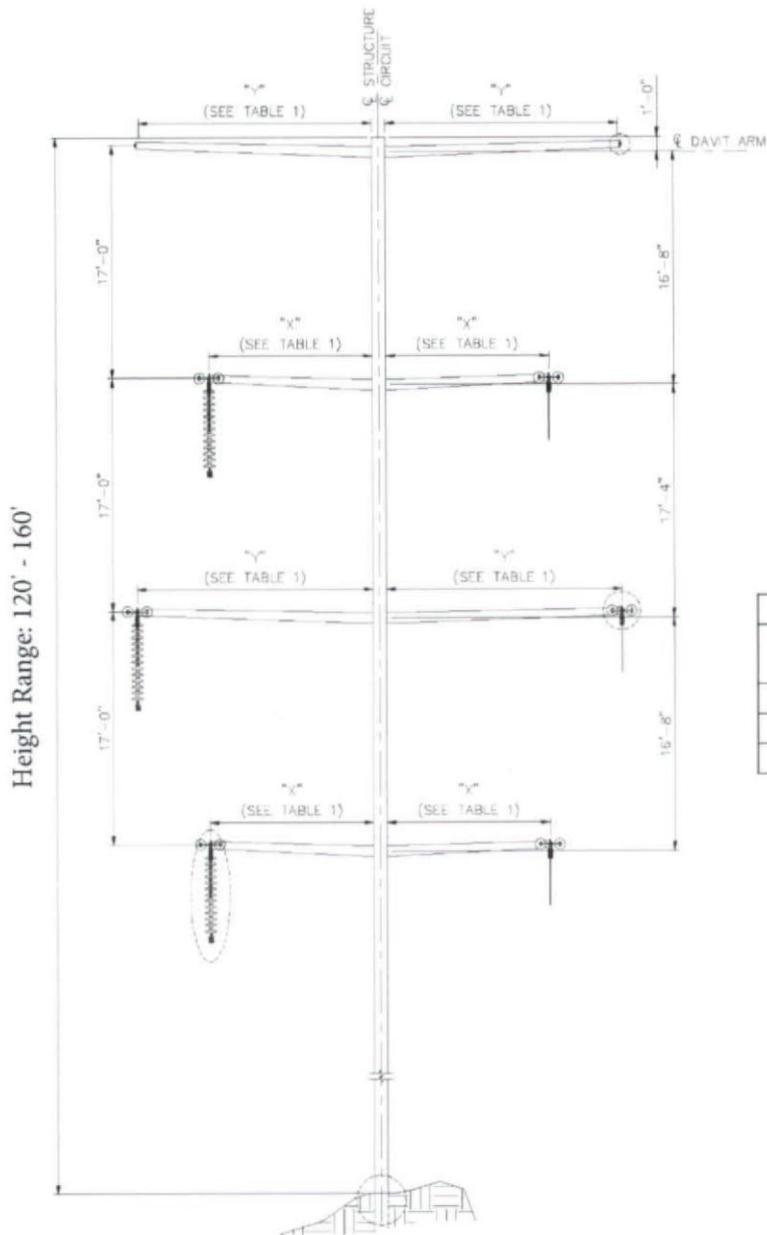


Figure 2-3. Typical Double-Circuit 230 kV Angle Tension Structure



LINE ANGLE	DAVIT ARM LENGTH "X"	DAVIT ARM LENGTH "Y"
0° - 30°	12'-0"	16'-0"
31° - 60°	14'-0"	18'-0"
61° - 90°	17'-0"	21'-0"

ATTACHMENT 3
WILLIAMS GROVE 230 KV CONNECTING LINES PROJECT
DESCRIPTION OF THE RIGHT-OF-WAY

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LIST OF FIGURES

FIGURE 3-1 AERIAL MAP OF THE PROJECT.....End of Attachment

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ATTACHMENT 3
WILLIAMS GROVE 230 KV CONNECTING LINES PROJECT
DESCRIPTION OF THE RIGHT-OF-WAY

A. INTRODUCTION

PPL Electric Utilities Corporation (“PPL Electric”) proposes to construct a new 230-69 kV Substation (the “Williams Grove Substation”) adjacent to the existing Cumberland – West Shore 230 kV Transmission Line in Upper Allen Township, Cumberland County, Pennsylvania. As explained in Attachment 1, PPL Electric herein seeks approval from the Pennsylvania Public Utility Commission (“PUC” or the “Commission”) to rebuild approximately 3.9 miles of the existing Cumberland – West Shore 230 kV Transmission Line for double-circuit operation and to construct approximately 0.3 miles of new 230 kV transmission line to interconnect the Williams Grove Substation with the existing and proposed 230 kV transmission lines (the “Project”). The entire Project is located in Upper Allen Township, Cumberland County, Pennsylvania. PPL Electric has provided information about the proposed Project to representatives from Cumberland County and Upper Allen Township.

B. DESCRIPTION OF THE RIGHT-OF-WAY

As explained in Attachment 1, PPL Electric proposes to construct the new Williams Grove Substation in Upper Allen Township, Cumberland County, Pennsylvania to avoid a reliability violation, and to reinforce the 230 kV and 69 kV systems in serving Cumberland County. As explained in Attachments 1 and 2, to interconnect the 230 kV yard at the Williams Grove Substation with the 230 kV system, PPL Electric requests Commission approval to rebuild approximately 3.9 miles of the existing single-circuit Cumberland – West Shore 230 kV Transmission Line for double-circuit operation, and to construct approximately 0.3 mile of new 230 kV transmission lines on the PPL Electric-owned Williams Grove Substation property. Figure 3-1 is an aerial map of the Project that identifies the location and properties crossed by the proposed Project.

1. REBUILT TRANSMISSION LINE RIGHT-OF-WAY

The 3.9-mile-long rebuild portion of the Project will be rebuilt within the existing right-of-way for the Cumberland – West Shore 230 kV Transmission Line. The existing right-of-way generally varies between 100 and 200 feet in width, with the majority 100 feet in width. As explained in Attachment 2, PPL Electric has designed the line to fit within the existing right-of-way and meet NESC standards. No new right-of-way is required for the construction, operation, or maintenance of the rebuild portion of the Project.

As shown on Figure 3-1, the first 0.3 mile of the existing Cumberland – West Shore 230 kV Transmission Line extending from the Williams Grove Substation is located entirely in undeveloped agricultural areas. The existing right-of-way for this 0.3-mile segment of the Cumberland – West Shore 230 kV Transmission Line is 100 feet in width.

The next 2.1 miles of the existing Cumberland – West Shore 230 kV Transmission Line traverses through more densely populated areas. In these areas, residential development is the primary land use. Portions of Community Park and Aspen Park/Mimosa Open Space are also crossed by the Project's existing right-of-way throughout this 2.1-mile stretch. Similar to Winding Hills East and West parks, portions of these parks may need to be closed during construction, but no further impacts would be anticipated as a result of rebuilding the line within the existing right-of-way. The existing right-of-way for this section of the existing Cumberland – West Shore 230 kV Transmission Line varies from 100 to 200 feet in width, with the majority of the right-of-way being 100 feet.

The last 1.5 miles of the Cumberland – West Shore 230 kV Transmission Line terminating at the West Shore Substation is located in largely undeveloped agricultural and forested areas. The eastern portion of Winding Hills East Park and Winding Hills West Park is located just southwest of the West Shore Substation and is crossed by the existing right-of-way. Although a portion of the park may need to be closed during construction, no additional impacts are anticipated as a result of rebuilding the line within the existing right-of-way. The existing right-of-way for this segment of the Cumberland

– West Shore 230 kV Transmission Line is generally between 100 and 125 feet with the exception of several locations where the right-of-way extends to between 150 and 200 feet wide.

The existing Cumberland – West Shore 230 kV Transmission Line right-of-way is currently maintained in accordance with PPL Electric’s Vegetation Management Program. In some areas, PPL Electric has additional tree clearing/tree trimming rights and/or building restrictions in place to prevent encroachments and minimize the potential impacts of danger trees. In areas where any vegetation management is required, PPL Electric will apply its “Specifications for Initial Clearing and Control of Vegetation On or Adjacent to Electric Line Right-of-Way Through Use of Herbicides, Mechanical and Hand Clearing Techniques” to minimize any potential impacts.

As explained in Attachment 2, the existing Cumberland – West Shore 230 kV structures are steel lattice that average 90 feet in height. The new structures will consist of steel monopoles and are expected to range between 110 and 135 feet in height, with an average height of approximately 115 feet. PPL Electric intends to install the new steel transmission structures as close as feasible to the existing pole locations. Angle structures will be located in the same locations as the existing angled structures; tangent structures will be located within 20 feet of the existing tangent structures.

Although the new structures will increase in height, impacts will be minimal because the monopoles have a smaller footprint compared to lattice structures and the new structures will be placed in close proximity to the existing structures. Further, no new poles will be placed on any property that currently does not have an existing pole.

2. PPL ELECTRIC SUBSTATION PROPERTY

As explained in Attachment 1, the Williams Grove Substation property currently is crossed by the existing, single-circuit Cumberland – West Shore 230 kV Transmission Line. The approximately 11.6-mile Cumberland – West Shore 230 kV Transmission

Line will be split and tied into the proposed Williams Grove Substation Property. As explained in Attachment 2, the rebuilt segment of the project (the new Williams Grove – West Shore 230 kV and the Brunner Island – Williams Grove 230 kV circuits) will occupy common double-circuit structures and will enter the Williams Grove Substation on the same set of structures. To interconnect this rebuilt double circuit line with the Williams Grove Substation, PPL Electric proposes to construct approximately 0.18 miles of new 230 kV transmission line. The new Cumberland – Williams Grove 230 kV circuit will enter the substation as a single-circuit line. To interconnect this single-circuit 230 kV transmission line with the Williams Grove, PPL Electric proposes to construct approximately 0.12 miles of new 230 transmission line. In total, approximately 0.3 miles of new 230 kV transmission will be required to interconnect the three 230 kV transmission lines (one single-circuit and one double-circuit) with the 230 kV yard at the Williams Grove Substation.

The new 0.3 miles of new 230 kV transmission lines will be located entirely on the PPL Electric-owned Williams Grove Substation property. The substation property is located in an undeveloped agricultural area. As explained in Attachment 2, the approximately 0.3 miles of new 230 kV transmission line will require four new steel, two-pole angle structures to interconnect the double-circuit Williams Grove – West Shore 230 kV and Brunner Island – Williams Grove 230 kV Transmission Lines and the single-circuit Cumberland – Williams Grove 230 kV Transmission Line with the Williams Grove Substation. These new transmission lines and supporting structures will be located and constructed entirely on the Williams Grove Substation property owned in fee by PPL Electric.

C. **CULTURAL RESOURCES**

PPL Electric conducted a review of the online Pennsylvania State Historic Preservation Office (SHPO) Bureau for Historic Preservation (BHP) Cultural Resources Geographic Information System (CRGIS) database to determine if National Register of Historic Places (NRHP)-listed or eligible historic properties are located in the Project vicinity.

PPL Electric submitted a review letter to the SHPO on November 19, 2015. The SHPO response letter dated December 18, 2015, indicated that significant archaeological sites are located in or near the Project and others are likely to exist requested a Phase I archeological survey. The SHPO response also requested additional information in order to assess the Project's effect on historic architectural resources. PPL Electric will continue to consult with the SHPO to address any cultural resource concerns. It is anticipated that the Project will have minimal impacts to cultural resources because the Project is located in areas that contain existing electrical facilities, involves rebuilding an existing 230 kV transmission line, and the new tower structures will be placed in close proximity to the existing tower structures.

D. LAND USE AND NATURAL FEATURES

Impacts to land use are anticipated to be minimal because the proposed Project will be constructed within the existing right-of-way, and no additional property will be required to complete the proposed Project. PPL Electric will use and update previously established access roads for construction to the extent practical to further reduce interference with existing land uses.

There is one cell tower attachment located on the existing Cumberland – West Shore 230 kV Transmission Line. PPL Electric will coordinate with the cell tower attachment owner to relocate the attachment during construction. No other communication towers, pipelines, or other utilities will be affected by the proposed Project.

The closest airport is the Vogelsong Airport, a privately owned facility, located approximately 3 miles south of the right-of-way for the proposed Project. PPL Electric does not anticipate any interference with airport operations because the Project is located in an area where there are existing electrical facilities and because the new facilities will be a similar height as the existing facilities. However, PPL Electric will file any required documentation with the Federal Aviation Administration and the Pennsylvania Department of Transportation, Bureau of Aviation.

The proposed Project will not affect any unique geological, scenic, or natural areas. Trout Run Nature Preserve is located approximately 0.3 miles south of the proposed Williams Grove Substation site, but impacts to this core habitat are not anticipated.

PPL Electric retained an environmental consultant to identify and delineate all wetlands and watercourses within the area of the proposed Project. Eight streams and two wetlands were identified within the existing right-of-way along the rebuild portion of the Project. No features were identified within the right-of-way for the new 230 kV line connections to the Williams Grove Substation. PPL Electric will avoid impacts to wetlands and streams where possible by aerially spanning these features. PPL Electric will obtain all necessary permits from the Pennsylvania Department of Environmental Protection and the United States Army Corps of Engineers and will comply with all of the terms and conditions placed on those permits. PPL Electric also will consult with the Cumberland County Conservation District, prepare any required soil erosion and sedimentation control plans, and obtain National Pollutant Discharge Elimination System (NPDES) permits and comply with any conditions placed on those permits.

E. THREATENED AND ENDANGERED SPECIES

PPL Electric conducted an online Pennsylvania Natural Diversity Inventory (PNDI) database review on August 19, 2015¹. Based on this review, the Pennsylvania Game Commission (PGC), the Pennsylvania Department of Conservation and Natural Resources (DCNR), and the U.S. Fish and Wildlife Service (USFWS) reported that the proposed Project will not impact any threatened and endangered species, or special concern species and resources located within the Project area. Cumberland County is located within the range of the federally threatened bog turtle (*Clemmys muhlenbergii*). PPL Electric retained a qualified bog turtle surveyor to conduct Phase I Bog Turtle surveys. The survey identified two wetlands as potential bog turtle habitat. PPL Electric

¹ PNDI Project Search ID: 20150819528155

submitted a report to the USFWS on October 7, 2016. USFWS' October 24, 2016 response indicated that no federally listed species under their jurisdiction are known or likely to occur in the project area. Therefore, no further consultation with USFWS is required for this Project.

The Pennsylvania Fish and Boat Commission (PFBC) search indicated that the Project is located within the range of an unidentified threatened species. PPL Electric submitted a follow-up letter to the PFBC on November 17, 2015, to request additional information. The December 3, 2015 response letter from PFBC indicated that the Project is not anticipated to impact any known rare, candidate, threatened or endangered species under their jurisdiction.



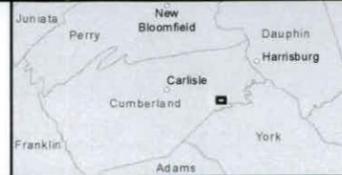
Number	OWNER
1	PPL ELECTRIC
2	STROCK, J PAUL ETAL
3	UPPER ALLEN TOWNSHIP
4	CLASSIC COMMUNITIES CORP
5	MCMICHAEL, JEREMY J
6	BITZ, ANDREW B
7	STAUFFER, JEFFREY R
8	WAUGHEN, JAMES E
9	NGUYEN, NGOC VAN
10	MURTOFF, TODD A
11	JUNKINS, CHARLES W & HELEN G
12	SEMANICK, ROBERT J & LAUREN M
13	MAGRUDER, WILLIAM D
14	LINT, DAVID E
15	STRONG, JAMES M VI
16 & 17	SHEPHERDSTOWN PH LP
18	KEANE REAL ESTATE LLC
19	LEET, JASON J
20	MILLER, HAROLD W & JOAN M
21	REIGEL, MARK A
22	CROWNOVER, JEFFREY
23	BUMBLE BEE HOLLOW LIMITED
24	AT&T NREA

Substation	Municipality Boundary
New Construction	Parcel
Rebuild	Stream
Substation Fenceline	Local Park
Substation Site	Existing Transmission
Parcel Crossed by ROW	230kV
	Railroad

ROW shown as white dashed line

Figure 3-1: Aerial Map

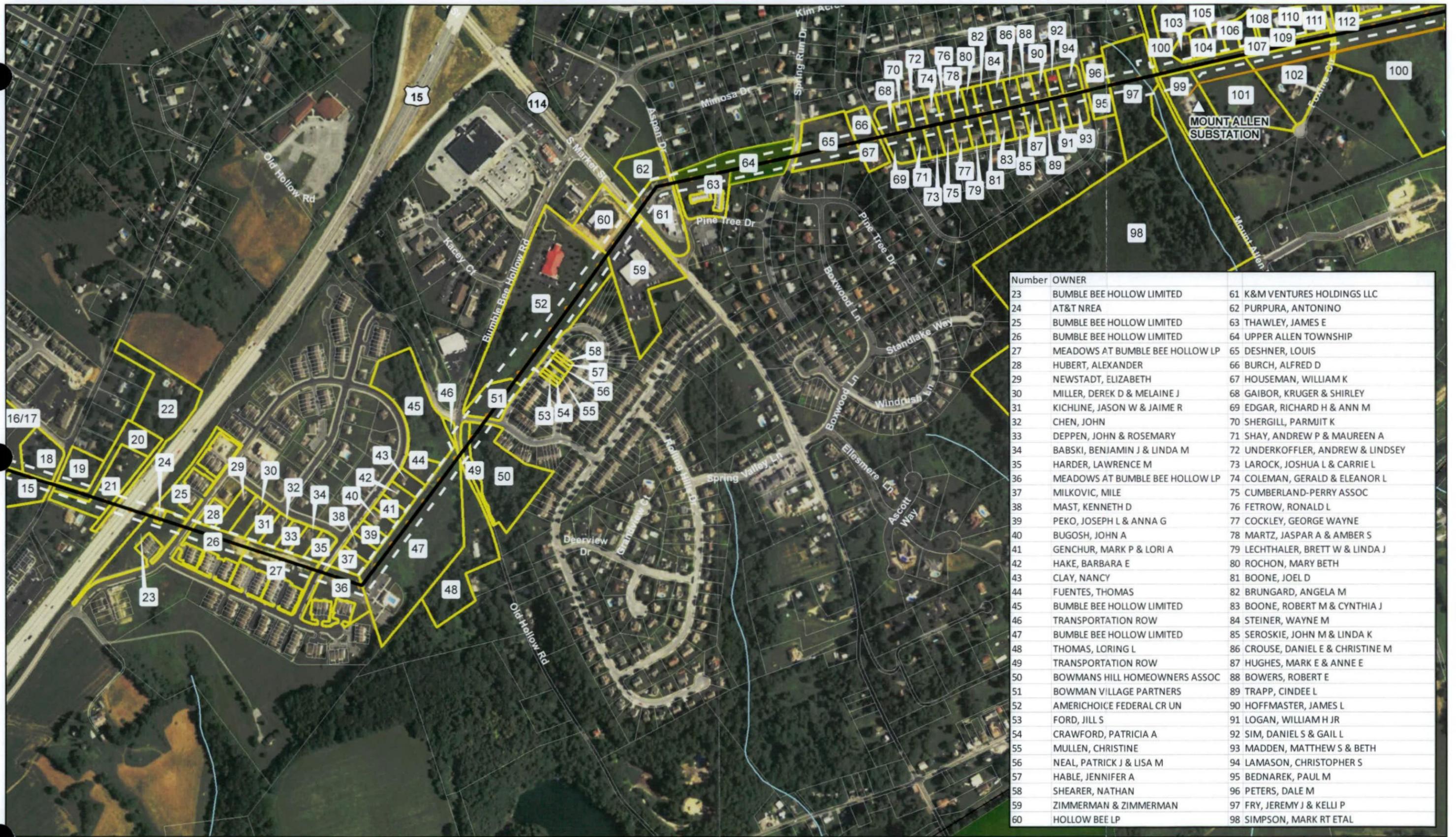
Coordinate System: PA State Plane, South.
Datum: North American Datum of 1983 (NAD83)



County: Cumberland



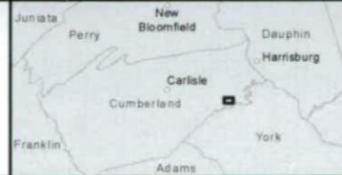
Sheet:	1 of 4
Date:	May 2017



Number	OWNER
23	BUMBLE BEE HOLLOW LIMITED
24	AT&T NREA
25	BUMBLE BEE HOLLOW LIMITED
26	BUMBLE BEE HOLLOW LIMITED
27	MEADOWS AT BUMBLE BEE HOLLOW LP
28	HUBERT, ALEXANDER
29	NEWSTADT, ELIZABETH
30	MILLER, DEREK D & MELAINE J
31	KICHLINE, JASON W & JAIME R
32	CHEN, JOHN
33	DEPPEN, JOHN & ROSEMARY
34	BABSKI, BENJAMIN J & LINDA M
35	HARDER, LAWRENCE M
36	MEADOWS AT BUMBLE BEE HOLLOW LP
37	MILKOVIC, MILE
38	MAST, KENNETH D
39	PEKO, JOSEPH L & ANNA G
40	BUGOSH, JOHN A
41	GENCHUR, MARK P & LORI A
42	HAKE, BARBARA E
43	CLAY, NANCY
44	FUENTES, THOMAS
45	BUMBLE BEE HOLLOW LIMITED
46	TRANSPORTATION ROW
47	BUMBLE BEE HOLLOW LIMITED
48	THOMAS, LORING L
49	TRANSPORTATION ROW
50	BOWMANS HILL HOMEOWNERS ASSOC
51	BOWMAN VILLAGE PARTNERS
52	AMERICHoice FEDERAL CR UN
53	FORD, JILL S
54	CRAWFORD, PATRICIA A
55	MULLEN, CHRISTINE
56	NEAL, PATRICK J & LISA M
57	HABLE, JENNIFER A
58	SHEARER, NATHAN
59	ZIMMERMAN & ZIMMERMAN
60	HOLLOW BEE LP
61	K&M VENTURES HOLDINGS LLC
62	PURPURA, ANTONINO
63	THAWLEY, JAMES E
64	UPPER ALLEN TOWNSHIP
65	DESHNER, LOUIS
66	BURCH, ALFRED D
67	HOUSEMAN, WILLIAM K
68	GAIBOR, KRUGER & SHIRLEY
69	EDGAR, RICHARD H & ANN M
70	SHERGILL, PARMUIT K
71	SHAY, ANDREW P & MAUREEN A
72	UNDERKOFFLER, ANDREW & LINDSEY
73	LAROCK, JOSHUA L & CARRIE L
74	COLEMAN, GERALD & ELEANOR L
75	CUMBERLAND-PERRY ASSOC
76	FETROW, RONALD L
77	COCKLEY, GEORGE WAYNE
78	MARTZ, JASPAR A & AMBER S
79	LECHTHALER, BRETT W & LINDA J
80	ROCHON, MARY BETH
81	BOONE, JOEL D
82	BRUNGARD, ANGELA M
83	BOONE, ROBERT M & CYNTHIA J
84	STEINER, WAYNE M
85	SEROSKIE, JOHN M & LINDA K
86	CROUSE, DANIEL E & CHRISTINE M
87	HUGHES, MARK E & ANNE E
88	BOWERS, ROBERT E
89	TRAPP, CINDEE L
90	HOFFMASTER, JAMES L
91	LOGAN, WILLIAM H JR
92	SIM, DANIEL S & GAIL L
93	MADDEN, MATTHEW S & BETH
94	LAMASON, CHRISTOPHER S
95	BEDNAREK, PAUL M
96	PETERS, DALE M
97	FRY, JEREMY J & KELLI P
98	SIMPSON, MARK RT ETAL

Figure 3-1: Aerial Map

Coordinate System: PA State Plane, South.
Datum: North American Datum of 1983 (NAD83)



County: Cumberland



Sheet: 2 of 4

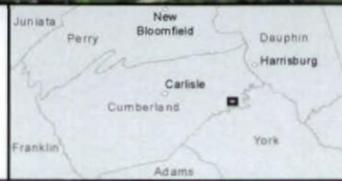
Date: May 2017



Number	OWNER
74	COLEMAN, GERALD & ELEANOR L
75	CUMBERLAND-PERRY ASSOC
76	FETROW, RONALD L
77	COCKLEY, GEORGE WAYNE
78	MARTZ, JASPAR A & AMBER S
79	LECHTHALER, BRETT W & LINDA J
80	ROCHON, MARY BETH
81	BOONE, JOEL D
82	BRUNGARD, ANGELA M
83	BOONE, ROBERT M & CYNTHIA J
84	STEINER, WAYNE M
85	SEROSKIE, JOHN M & LINDA K
86	CROUSE, DANIEL E & CHRISTINE M
87	HUGHES, MARK E & ANNE E
88	BOWERS, ROBERT E
89	TRAPP, CINDEE L
90	HOFFMASTER, JAMES L
91	LOGAN, WILLIAM H JR
92	SIM, DANIEL S & GAIL L
93	MADDEN, MATTHEW S & BETH
94	LAMASON, CHRISTOPHER S
95	BEDNAREK, PAUL M
96	PETERS, DALE M
97	FRY, JEREMY J & KELLI P
98	SIMPSON, MARK RT ETAL
99	PENNSYLVANIA POWER & LIGHT
100	ALLENVIEW HOME OWNERS
101	KINSEY, CARA BICKING
102	BARDO, BENJAMIN B
103	SMITH, WILLIAM F & WENDY C
104	LEFORGE, DAN K & TERI L
105	WILLIAMS, BRAD S & ROXANA
106	BRENNAN, MARY ANNE
107	SINCAVAGE, JOHN G & GEORGIANNA
108	RUSSO, DANIEL J & VIRGINIA
109	HONAFIUS, EMILY K & JEFFREY S
110	MOFFIT, KURT J & ERIN E
111	EDWARDS, LAWRENCE E & SUSAN L
112	BRLANSKY, THOMAS J & DOROTHY H
113	ALLENVIEW HOME OWNERS ASSOCIAT
114	HERTZLER ROAD ASSOC LP
115	HERTZLER ROAD ASSOC LP
116	UPPER ALLEN TOWNSHIP

Figure 3-1: Aerial Map

Coordinate System: PA State Plane, South.
Datum: North American Datum of 1983 (NAD83)



County: Cumberland



Sheet:	3 of 4
Date:	May 2017

Substation
 Rebuild
 Parcel Crossed by ROW
 Railroad
 Municipality Boundary
 Parcel
 Stream
 Local Park
 Existing Transmission
 230kV
 69kV
 ROW shown as white dashed line



Number	OWNER
116	UPPER ALLEN TOWNSHIP
117	UPPER ALLEN TOWNSHIP
118	UPPER ALLEN TOWNSHIP
119	PPL ELECTRIC
120	PPL ELECTRIC

△ Substation
 — Rebuild
 — Parcel Crossed by ROW
 + Railroad
 — Municipality Boundary
 — Parcel
 — Local Park
 — Stream
Existing Transmission
 — 230kV
 — 69kV
 ROW shown as white dashed line

Figure 3-1: Aerial Map

Coordinate System: PA State Plane, South.
 Datum: North American Datum of 1983 (NAD83)



County: Cumberland
 0 500 1,000 Feet

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ATTACHMENT 4

WILLIAMS GROVE 230 KV CONNECTING LINES PROJECT 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 Corporation ("PPL Electric") 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 Electric 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, with 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 Electric 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 Electric 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 Electric 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 Electric lines are designed to operate safely and reliably during inclement weather even more severe than assumed by the NESC. In addition, PPL Electric transmission lines are designed with more clearance to the ground than required by the NESC. The tables below compare PPL Electric 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 Electric 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 Electric 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 Electric 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 Electric 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.

VERIFICATION

I, Stephanie Raymond being the Vice President-Transmission and Substations at PPL Electric Utilities Corporation, hereby state that the facts above set forth are true and correct to the best of my knowledge, information and belief and that I expect PPL Electric Utilities Corporation to be able to prove the same at a hearing held in this matter. I understand that the statements herein are made subject to the penalties of 18 Pa.C.S. § 4904 relating to unsworn falsification to authorities.

Date:

6/26/17



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2017 JUN 26 PM 3:06
PA PUC
SECRETARY'S BUREAU
FRONT DESK

CERTIFICATE OF SERVICE

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I hereby certify that a true and correct copy of the foregoing **Letter of Notification** has been served upon the following persons, in the manner indicated, in accordance with the requirements of 52 Pa. Code § 1.54 (relating to service by a participant).

**PA PUC
SECRETARY'S BUREAU
FRONT DESK**

**VIA CERTIFIED MAIL
RETURN RECEIPT REQUESTED**

PA Historical and Museum Commission
Bureau for Historic Preservation
Commonwealth Keystone Building
400 North Street, 2nd Floor
Harrisburg, PA 17120-0053
Attn: Douglas C. McLearen, Chief

Upper Allen Township
Planning Commission
100 Gettysburg Pike
Mechanicsburg, PA 17055
Attn: Wayne Willey, Chairman

Pennsylvania Department of Transportation
Honorable Leslie S. Richards, Secretary
c/o Office of Chief Counsel
Commonwealth Keystone Building
400 North Street, 8th Floor
Harrisburg, PA 17120
Attn: William J. Cressler

Upper Allen Township
100 Gettysburg Pike
Mechanicsburg, PA 17055
Attn: Lou Fazekas, Township Manager

PA Department of Environmental Protection
P.O. Box 2063
Market Street State Office Building
Harrisburg, PA 17105-2063
Attn: Office of Field Operations

Upper Allen Township
Board of Commissioners
100 Gettysburg Pike
Mechanicsburg, PA 17055
Attn: Kenneth M. Martin, President

Cumberland County Planning Department
310 Allen Road - Suite 101
Carlisle, PA 17013
Attn: Kirk Stoner, AICP

Charles E. Jones, President & CEO
FirstEnergy
76 South Main Street
Akron, OH 44308

Cumberland County
Board of Commissioners
1 Courthouse Square
2nd Floor, Suite 200
Carlisle, PA 17013
Attn: Vincent T. DiFilippo,
Commissioner, Chairman

Robert M & Cynthia J Boone
12 San Juan Drive
Mechanicsburg, PA 17055

Angela M Brungard
13 Big Horn Avenue
Mechanicsburg, PA 17055

Mary Beth Rochon
15 Big Horn Avenue
Mechanicsburg, PA 17055

Jaspar A & Amber S Martz
17 Big Horn Avenue
Mechanicsburg, PA 17055

Robert J & Lauren M Semanick
2182 Canterbury Drive
Mechanicsburg, PA 17055

Jeremy J & Kelli P Fry
600 Mount Allen Drive
Mechanicsburg, PA 17055

Elizabeth Newstadt
2102 Fowlers Hollow Drive
Mechanicsburg, PA 17055

Derek D & Melaine J Miller
2104 Fowlers Hollow Drive
Mechanicsburg, PA 17055

John A Bugosh
2285 Mill Road
Mechanicsburg, PA 17055

Classic Communities Corp
2151 Linglestown Road #300
Harrisburg, PA 17110

Bumble Bee Hollow Limited
225 North Presidential Blvd
Bala Cynwyd, PA 19004

Allenvew Homeowners Association
499 Allenvew Drive
Mechanicsburg, PA 17055

James E Thawley
PO Box 208
Essington, PA 19029

Mark R Simpson, et al
113 Turtle Hollow Drive
Lewisberry, PA 17339

Cara Bicking Kinsey
2302 Foxfire Circle
Mechanicsburg, PA 17055

Shepherdstown PH LP
1000 North Front Street, Suite 500
Wormleysburg, PA 17043

Americhoice Federal Credit Union
20 Sporting Green Drive
Mechanicsburg, PA 17050

Nrea AT&T
575 Morosgo Drive
Atlanta, GA 30324

Benjamin J & Linda M Babski
2112 Fowlers Hollow Drive
Mechanicsburg, PA 17055

Benjamin B Bardo
2300 Foxfire Circle
Mechanicsburg, PA 17055

Christine Mullen
84 Keefer Way
Mechanicsburg, PA 17055

Paul M Bednarek
603 Cascade Road
Mechanicsburg, PA 17055

Andrew B Bitz
2192 Canterbury Drive
Mechanicsburg, PA 17050

Joel D Boone
14 San Juan Drive
Mechanicsburg, PA 17055

Robert E Bowers
7 Big Horn Avenue
Mechanicsburg, PA 17055

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Mary Anne Brennan
PO Box 653
Mechanicsburg, PA 17055

Thomas J & Dorothy H Brlansky
400 Allenvue Drive
Mechanicsburg, PA 17055

Alfred D Burch
512 Appalachian Avenue
Mechanicsburg, PA 17055

John Chen
2108 Fowlers Hollow Drive
Mechanicsburg, PA 17055

Nancy Clay
2291 Mill Road
Mechanicsburg, PA 17055

George Wayne Cockley
18 San Juan Drive
Mechanicsburg, PA 17055

Gerald & Eleanor L Coleman
21 Big Horn Avenue
Mechanicsburg, PA 17055

Patricia A Crawford
86 Keefer Way
Mechanicsburg, PA 17055

Daniel E & Christine M Crouse
9 Big Horn Avenue
Mechanicsburg, PA 17055

Cumberland-Perry Assoc
71 Ashland Avenue
Carlisle, PA 17013

John & Rosemary Deppen
2110 Fowlers Hollow Drive
Mechanicsburg, PA 17055

Louis Deshner
468 Scotch Pine Road
Dillsburg, PA 17019

Richard H & Ann M Edgar
26 San Juan Drive
Mechanicsburg, PA 17055

Lawrence E & Susan L Edwards
340 Allenvue Drive
Mechanicsburg, PA 17055

Ronald L Fetrow
19 Big Horn Avenue
Mechanicsburg, PA 17055

Jill S Ford
88 Keefer Way
Mechanicsburg, PA 17055

Thomas Fuentes
2293 Mill Road
Mechanicsburg, PA 17055

Kruger & Shirley Gaibor
27 Big Horn Avenue
Mechanicsburg, PA 17055

Mark P & Lori A Genchur
2287 Mill Road
Mechanicsburg, PA 17055

Jennifer A Hable
80 Keefer Way
Mechanicsburg, PA 17055

Barbara E Hake
2289 Mill Road
Mechanicsburg, PA 17055

Lawrence M Harder
2114 Fowlers Hollow Drive
Mechanicsburg, PA 17055

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Hertzler Road Associates LP
4400 Deer Path Road
Harrisburg, PA 17110

James L Hoffmaster
5 Big Horn Avenue
Mechanicsburg, PA 17055

Hollow Bee LP
2701 North Front Street
Harrisburg, PA 17110

Emily K & Jeffrey S Honafius
336 Allenvue Drive
Mechanicsburg, PA 17055

William K Houseman
516 Appalachian Avenue
Mechanicsburg, PA 17055

Alexander Hubert
2389 Mill Road
Mechanicsburg, PA 17055

Mark E & Anne E Hughes
8 San Juan Drive
Mechanicsburg, PA 17055

Charles W & Helen G Junkins
550 Coventry Drive
Mechanicsburg, PA 17055

K&M Ventures Holdings LLC
248 West Ridge Road
Dillsburg, PA 17019-4522

Keane Real Estate LLC
334 Southview Drive
Mechanicsburg, PA 17055

Jason W & Jaime R Kichline
2106 Fowlers Hollow Road
Mechanicsburg, PA 17055

Christopher S Lamason
1 Big Horn Avenue
Mechanicsburg, PA 17055

Joshua L & Carrie L Larock
22 San Juan Drive
Mechanicsburg, PA 17055

Brett W & Linda J Lechthaler
16 San Juan Drive
Mechanicsburg, PA 17055

Jason J Leet
501 Gettysburg Pike
Mechanicsburg, PA 17055

Dan K & Teri L Leforge
326 Wister Circle
Mechanicsburg, PA 17055

David E Lint
2178 Canterbury Drive
Mechanicsburg, PA 17055

William H Logan Jr.
4 San Juan Drive
Mechanicsburg, PA 17055

Matthew S & Beth Madden
2 San Juan Drive
Mechanicsburg, PA 17055

William D Magruder
2180 Canterbury Drive
Mechanicsburg, PA 17055

Kenneth D Mast
2281 Mill Road
Mechanicsburg, PA 17055

Jeremy J Mcmichael
2194 Canterbury Drive
Mechanicsburg, PA 17055

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Mile Milkovic
2279 Mill Road
Mechanicsburg, PA 17055

Harold W & Joan M Miller
503 Gettysburg Pike
Mechanicsburg, PA 17055

Kurt J & Erin E Moffit
338 Allenvue Drive
Mechanicsburg, PA 17055

Todd A Murtoff
2184 Canterbury Drive
Mechanicsburg, PA 17055

Patrick J & Lisa M Neal
82 Keefer Way
Mechanicsburg, PA 17055

Ngoc Van Nguyen
2186 Canterbury Drive
Mechanicsburg, PA 17055

Joseph L & Anna G Peko
2283 Mill Road
Mechanicsburg, PA 17055

Dale M Peters
601 Cascade Road
Mechanicsburg, PA 17055

Antonino Purpura
107 West Main Street
Mechanicsburg, PA 17055

Mark A Reigel
505 Gettysburg Pike
Mechanicsburg, PA 17055

Daniel J & Virginia Russo
334 Allenvue Drive
Mechanicsburg, PA 17055

John M & Linda K Seroskie
10 San Juan Drive
Mechanicsburg, PA 17055

Andrew P & Maureen A Shay
24 San Juan Drive
Mechanicsburg, PA 17055

Nathan Shearer
78 Keefer Way
Mechanicsburg, PA 17055

Jeffrey Crownover
435 Gettysburg Pike
Mechanicsburg, PA 17055

Parmjit K Shergill
25 Big Horn Avenue
Mechanicsburg, PA 17055

Daniel S & Gail L Sim
3 Big Horn Avenue
Mechanicsburg, PA 17055

John G & Georgianna Sincavage
332 Wister Circle
Mechanicsburg, PA 17055

William F & Wendy C Smith
324 Wister Circle
Mechanicsburg, PA 17055

Jeffrey R Stauffer
2190 Canterbury Drive
Mechanicsburg, PA 17055

Wayne M Steiner
11 Big Horn Avenue
Mechanicsburg, PA 17055

Paul J Strock, et al
2105 Stumpstown Road
Mechanicsburg, PA 17055

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James M Strong VI
2176 Canterbury Drive
Mechanicsburg, PA 17055

Loring L Thomas
2312 Bumble Bee Hollow Road
Mechanicsburg, PA 17055

Cindee L Trapp
6 San Juan Drive
Mechanicsburg, PA 17055

Upper Allen Township
100 Gettysburg Pike
Mechanicsburg, PA 17055-5698

James E Waughen
2188 Canterbury Drive
Mechanicsburg, PA 17055

Andrew & Lindsey Underkoffler
23 Big Horn Avenue
Mechanicsburg, PA 17055

Brad S & Roxana Williams
328 Wister Circle
Mechanicsburg, PA 17055

Zimmerman & Zimmerman
234 South Market Street
Mechanicsburg, PA 17055

Date: June 26, 2017



Christopher T. Wright

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POST
&
SHELL^{PC}
ATTORNEYS AT LAW

Post & Schell, P.C.
17 North Second Street
12th Floor
Harrisburg, PA 17101-1601

165402

To: Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, 2nd Floor North
P.O. Box 3265
Harrisburg, PA 17105-3265