BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, for Approval to Replace and Re-terminate Approximately 200 feet of the Existing Breinigsville-Alburtis 500 kV Transmission Line in Lower Macungie Township, Lehigh County, Pennsylvania	:	Docket No. A-2017-_____

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 expedited approval from the Pennsylvania Public Utility Commission ("Commission") to replace and re-terminate approximately 200 feet of the existing single circuit Breinigsville-Alburtis 500 kV Transmission Line in Lower Macungie Township, Lehigh County, Pennsylvania (the "Project"). As explained below, the proprosed Project is required to coordinate with and take advantage of outages at the Alburtis 500-230 kV Substation scheduled to begin in late September 2017. Therefore, PPL Electric respectfully requests that the Commission consider this Letter of Notification on an expedited basis. 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 Design & Engineering Description.
- Attachment 3 Description of Right-of-Way.

- Attachment 4 PPL Electric 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

1. Existing System

8. The Wescosville 500-138-69 kV Substation is currently supplied by a single 500 kV tap off the existing single-circuit Susquehanna-Wescosville 500 kV Transmission Line.

9. The Susquehanna-Wescosville 500 kV Transmission Line extends from the Susquehanna 500-230 kV Substation to the tap point with the Wescosville 500-138-69 kV Substation. From the tap point, the 500 kV line continues to the Breinigsville 500-138-69 kV Substation (this segment is referred to as the Wescosville-Breinigsville 500 kV Transmission Line).

10. The Breinigsville 500-138-69 kV Substation is also interconnected with the existing single-circuit Breinigsville-Alburtis 500 kV Transmission Line that extends approximately 6 miles from the Breinigsville 500-138-69 kV Substation located in Upper Macungie Township, Lehigh County, to the existing Alburtis 500-230 kV Substation in Lower Macungie Township, Lehigh County.

11. In addition, PPL Electric is currently sharing a control cubicle in the Alburtis 500-230 kV Substation with FirstEnergy Corporation ("FirstEnergy").

12. A description, aerial map, and one-line diagram of the existing system are provided in the Necessity Statement included as Attachment 1 to this Letter of Notification.

2. Need for the Project

13. PPL Electric's system planning studies identified an unacceptable voltage drop and low voltage on the 138 kV and 69 kV transmission lines supplied by the Wescosville 500-138-69 kV Substation and Breinigsville 500-138-69 kV Substation for an N-1-1 contingency.[1]

14. PPL Electric's system planning studies also determined that a fault along the 67-mile Susquehanna-Wescosville 500 kV Transmission Line would result in the loss of the single 500 kV source for the Wescosville 500-138-69 kV Substation. A fault along the 67-mile Susquehanna-Wescosville 500 kV Transmission Line would also remove one of the 500 kV sources to the Breinigsville 500-138-69 kV Substation.

15. A detailed description of the need for the proposed Project is provided in Attachment 1 to this Letter of Notification.

B. THE PROPOSED PROJECT

16. To address the low voltage and voltage drop issues described above, PPL Electric proposes to build a more reliable double bus double breaker 500 kV yard at the Wescosville 500-138-69 kV Substation, and to install a second 500 kV circuit to the existing single-circuit Breinigsville-Alburtis 500 kV Transmission Line.

17. The second 500 kV circuit will extend approximately 6 miles from the existing Breinigsville 500-138-69 kV Substation in Upper Macungie Township, Lehigh County, to the existing Alburtis 500-230 kV Substation in Lower Macungie Township, Lehigh County.

[1] An N-1-1 contingency involves the loss of one system element followed by manual system readjustments, and then the loss of a second system element, *e.g.*, outage of one transmission line followed by switching moves and then the loss of a second transmission line. These contingencies are referred to as the "N minus 1 minus 1" or "N-1-1" criteria.

18. This proposed reinforcement will resolve the low voltage and voltage drop caused by the N-1-1 contingency described above. The proposed reinforcement also will improve the reliability of Breinigsville 500-138-69 kV Substation by providing a third 500 kV source.

19. The addition of the second 500 kV circuit to the existing Breinigsville-Alburtis 500 kV Transmission Line has been presented at the PJM Mid-Atlantic Sub-Regional RTEP stakeholder meeting on April 9, 2015 and has been approved as part of supplemental project S0864 in the PJM RTEP.

20. PPL Electric is continuing to engineer and design the proposed second 500 kV circuit. As a result, the addition of the second 500 kV circuit to the existing Breinigsville-Alburtis 500 kV Transmission Line will be the subject of a future filing with the Commission, which PPL Electric anticipates filing in 2018.

21. In order to accommodate the addition of the second 500 kV circuit, the first span of conductors for the existing Breinigsville-Alburtis 500 kV Transmission Line needs to be moved from their current position in Bay 1 to a new Bay 2 at the Alburtis 500-230 kV Substation.

22. Outages at the Alburtis 500-230 kV Substation are currently scheduled to begin in September 2017. In order to take advantage of and coordinate with the scheduled outages, PPL Electric plans to complete the substation work necessary at the Alburtis 500-230 kV Substation during these outages. PPL Electric therefore proposes to re-terminate the first span of the existing Breinigsville-Alburtis 500 kV Transmission Line at the Alburtis 500-230 kV Substation during the scheduled outages.

23. In this filing PPL Electric seeks Commission approval to re-terminate the first span of the existing Breinigsville-Alburtis 500 kV Transmission Line at the Alburtis 500-230 kV Substation in order to coordinate with the outage schedule to being in late September 2017.

24. The proposed Project will involve the realignment of one span of new 500 kV conductors that will extend approximately 200 feet from the dead end structure to the new Bay 2 position at the Alburtis 500-230 kV Substation. Due to a difference in the positions of Bay 1 and Bay 2, the existing conductors will be replaced with new, slightly longer conductors.

25. No additional poles or tower structures are required for this Project. The Project will be constructed entirely within PPL Electric-owned property. No new additional right-of-way will be required.

26. The approximately 200-foot segment of new 500 kV conductors will utilize three power conductors and one overhead ground wire. The power conductors will be 3 phases of double bundle 2493 kcmil,[2] 54/37 stranding aluminum conductor alloy reinforced ("ACAR") conductors. The overhead ground wire will be a 19#9 Alumoweld wire with a diameter of 0.572 inches.

27. Upon completion of the Project, the line will be renamed the Breinigsville-Alburtis #2 500 kV Transmission Line.

28. An engineering description of the proposed Project is provided in Attachment 2 to this Letter of Notification.

29. The total estimated cost of the Project is $430,500 which includes substation work and the transmission line re-termination.[3]

[2] A kcmil is a thousand circular mils. A circular mil is the cross-sectional area of a wire 1 mil in diameter, where 1 kcmil = 0.5067 square millimeters.

[3] The estimated cost for the proposed Project is an order-of-magnitude estimate developed using averages of recent costs for similar projects and without an in-depth analysis of filed investigation. The estimated

III. HEALTH AND SAFETY

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

31. 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.

32. Consistent with its Magnetic Field Management Program, the proposed Project will utilize structures that have a ground clearance that is a minimum of five feet higher than NESC standards. A description of PPL Electric's Magnetic Field Management Program is provided in Attachment 2 to this Letter of Notification.

IV. DESCRIPTION OF THE RIGHT-OF-WAY

33. The entire Project will be constructed entirely within PPL Electric's property for the Alburtis 500-230 kV Substations. No additional rights-of-way or easements are necessary for the proposed Project.

34. As explained in Attachment 3 to this Letter of Notification, land use and environmental impacts are anticipated to be minimal due to the fact that the Project will be constructed entirely on PPL Electric's substation property.

35. 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.

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cost is subject to change as the constructability of the Project, sequence of construction, and other factors that may affect cost are identified and analyzed as the Project progresses.

36. No communication towers, pipelines, or other utilities will be affected by the proposed Project.

37. 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.

38. The Project area contains no state lands, national parks, state parks, or local parks.

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

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

41. No cultural and archaeological resources are located within the Project area.

42. No wetlands, 100-year floodplains, or waterways are located within the Project area.

43. No state or federal environmental permits are required for this project. However, to the extent necessary, PPL Electric will obtain all approvals and permits needed for the construction of the Project, and will comply with any conditions placed on those permits.

V. NOTICE

44. PPL Electric has provided information regarding the Project to representatives of Lower Macungie Township, and Lehigh County. These entities have not objected to the proposed Project.

45. 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).

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

VI. LETTER OF NOTIFICATION

47. 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)(vi).

48. The proposed Project replacement and re-termination of approximately 200 feet of the existing single circuit Breinigsville-Alburtis 500 kV Transmission Line entirely within the PPL Electric-owned property for the Alburtis 500-230 kV Substation.

49. Based on the foregoing, PPL Electric submits that the proposed Project qualifies as a Letter of Notification.

50. 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. EXPEDITED CONSIDERATION

51. As explained above, PPL Electric proposes to reconfigure the 500 kV yard at the Wescosville 500-138-69 kV Substation and install a second 500 kV circuit to the existing single circuit Breinigsville-Alburtis 500 kV Transmission Line in order to resolve the low voltage and voltage drop issues described in Attachment 1.

52. As part of the work required to add the second 500 kV circuit, the first span of the existing single circuit Breinigsville-Alburtis 500 kV Transmission Line will be re-terminated from Bay 1 to Bay 2 at the Alburtis 500-230 kV Substation.

53. In order to complete the substation work at the Alburtis 500-230 kV Substation, including the re-termination of the first span of the existing single circuit Breinigsville-Alburtis

500 kV Transmission Line, PPL Electric plans to coordinate with the outages scheduled at the Alburtis 500-230 kV Substation.

54. Currently the Alburtis 500-230 kV Substation is schedule to being outages in late September 2017.

55. Upon Commission approval, construction is scheduled to begin in September 2017 to coordinate with the outages scheduled at the Alburtis 500-230 kV Substation and to support the Project's scheduled in-service date of October 2017.

56. Therefore, PPL Electric respectfully requests that the Commission consider this Letter of Notification on an expedited basis.

VIII. CONCLUSION

WHEREFORE, PPL Electric Utilities Corporation respectfully requests Pennsylvania Public Utility Commission (i) consider this Letter of Notification on an expedited basis, and (ii) approve the proposed replacement and re-termination of approximately 200 feet of the existing single circuit Breinigsville-Alburtis 500 kV Transmission Line in Lower Macungie Township, Lehigh County, Pennsylvania, as explained above and in the Attachments hereto.

Respectfully submitted,

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Date: August 4, 2017

Attorneys for PPL Electric Utilities Corporation

Before the
Pennsylvania Public Utility Commission

Alburtis Substation
500 kV Termination

ATTACHMENTS IN SUPPORT OF THE
LETTER OF NOTIFICATION

Application Docket No. _____

Submitted by: PPL Electric Utilities Corp.

ATTACHMENT 1

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List of Figures

1.0 INTRODUCTION

PPL Electric Utilities Corporation ("PPL Electric") is seeking approval from the Pennsylvania Public Utility Commission ("Commission") to re-terminate one span of the existing Breinigsville-Alburtis 500 kV Transmission Line at the Alburtis 500-230 kV Substation in Lower Macungie Township, Lehigh County (the "Project"). As explained below, PPL Electric proposes to install a second 500 kV circuit to the existing single-circuit Breinigsville-Alburtis 500 kV Transmission Line to to improve reliability and operational performance, reduce the potential for and duration of outages to customers, and increase system operability in Lehigh County. The proposed Project is required to accommodate the construction of a second 500 kV transmission line and is being planned to coordinate with currently scheduled outages at the Alburtis 500-230 kV Substation.

Subject to the Commission's approval, construction is scheduled to begin September 2017 to coordinate with currently scheduled outages at the Alburtis 500-230 kV Substation. The total estimated cost of the Project is $430,500 which includes substation work and the transmission line re-termination.[1]

2.0 TRANSMISSION SYSTEM PLANNING PROCESS

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

The entire cost for this transmission line Project will be paid by PPL Electric. The costs and cost recovery of this transmission line Project is subject to the regulatory jurisdiction of the Federal Energy Regulatory Commission.

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

[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.

system reinforcements that are required to, among other things, meet the NERC Reliability Standards, PJM reliability planning criteria, and Transmission Owner reliability criteria.

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 14B[5] outlines the RTEP process and reliability criteria use 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 1000[6] 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. Estimated costs and lead times to implement the reinforcements are prepared. PPL Electric then proposes

[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

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 NERC and PJM 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, improve operational performance, and replace poor performing transmission assets in order to provide an advanced 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, the proposed Project is required to accommodate the construction of a second 500 kV transmission line circuit from the Breinigsville to Alburtis substations, and is being planned to coordinate with an already scheduled outage at the Alburtis 500-230 kV substation.

3.0 NEED FOR THE PROJECT

3.1 Description of Existing System

The existing Wescosville 500-138-69 kV Substation is part of the bulk power transmission system. The existing Wescosville 500-138-69 kV Substation serves customers in parts of Lehigh County, Pennsylvania and is powered by a single 500 kV tap, the Susquehanna-Wescosville 500 kV Transmission Line, which limits our ability to restore customers for various reliability and resiliency events.

The Susquehanna-Wescosville 500 kV Transmission Line extends from the Susquehanna 500-230 kV Substation to the tap point with the Wescosville 500-138-69 kV Substation. From the tap point, the 500 kV line continues to the Breinigsville 500-138-69 kV Substation (this segment is referred to as the Wescosville-Breinigsville 500 kV Transmission Line). The Breinigsville 500-138-69 kV Substation is also interconnected with the existing single-circuit Breinigsville-Alburtis 500 kV Transmission Line that extends approximately 6 miles from the Breinigsville 500-138-69 kV Substation located in Upper Macungie Township, Lehigh County, to the existing Alburtis 500-230 kV Substation in Lower Macungie Township, Lehigh County.

At the Alburtis 500-230 kV Substation, PPL Electric is currently sharing a control house with FirstEnergy Corporation ("FirstEnergy").

A typical one-line diagram and map of the existing system are provided as **Figure 1-1** and **Figure 1-2**, respectively.

3.2 Need for the Project

PPL Electric's system planning studies identified unacceptable low voltage and unacceptable voltage drop load drop for an N-1-1 contingency.[7] Specifically, PPL Electric's studies have

[7] An N-1-1 contingency involves the loss of one system element followed by manual system readjustments, and then the loss of a second system element, *e.g.*, outage of one transmission line followed by switching moves and then the loss of a second transmission line. These contingencies are referred to as the "N minus 1 minus 1" or "N-1-1" criteria.

determined that the loss of two of the 500 kV lines in the area of the Wescosville Substation and Breinigsville Substation creates an unacceptable voltage drop[8] and low voltage[9] on the 138 kV and 69 kV systems supplied by the Wescosville and Breinigsville Substations.

In addition, the Wescosville 500-138-69 kV Substation is the only 500 kV substation in PPL Electric's service territory that doesn't meet the PPL Electric Substation Design Standard. The 500 kV yard has a 500-138 kV transformer that is directly tapped off the Susquehanna-Wescosville 500 kV Transmission Line, which is a non-standard design. The Susquehanna-Wescosville 500 kV Transmission Line is approximately 67 miles long, which puts the line at high risk of exposure to faults. A fault on the 67-mile Susquehanna-Wescosville 500 kV Transmission Line would trip the 500-138 kV transformer, which is the single 500 kV source for the Wescosville 500-138-69 kV Substation. A fault on this line would remove one of the 500kV sources to the Breinigsville 500-138-69 kV Substation.

4.0 PROPOSED SOLUTION

To resolve these low voltage and voltage drop concerns on the 138 kV and 69 kV systems caused by the N-1-1 contingency described above, PPL Electric proposes to build a more reliable double bus double breaker 500 kV yard at the Wescosville 500-138-69 kV Substation[10] and to

[8] As per PPL Electric Transmission Owner (TO) Criteria, more than 8% voltage drop is not allowed on the 138 kV Transmission System post N-1-1 contingency event. Similarly more than 7.5% voltage drop is not allowed on the 69 kV system post N-1-1 contingency event. The Transmission Owner Criteria (TO) has been filed with the FERC and PJM under Form 715. Table 4.2-2 on page 15 shows the PPL Electric Voltage Drop Criteria. The copy of TO criteria is available at http://www.pjm.com/~/media/planning/plan-standards/private-ppl/point-of-contact-requirements.ashx.

[9] PPL Electric TO Criteria doesn't allow lower than 0.92 and 0.90 per unit voltage on 138 kV and 69 kV system respectively post N-1-1 contingency event.

[10] The 500-138 kV transformer will be rearranged and will no longer be directly tapped from the Susquehanna-Wescosville 500 kV Transmission Line. The Susquehanna-Wescosville 500 kV Transmission Line will be terminated into the new 500 kV yard as the Susquehanna-Wescosville and Wescosville-Breinigsville 500 kV Transmission Lines. As a result, the 500-138 kV transformer will still remain in service after the loss of the Susquehanna-Wescosville 500 kV Transmission Line.

install a second 500 kV circuit to the existing single-circuit Breinigsville-Alburtis 500 kV Transmission Line.

The second 500 kV circuit will extend approximately 6 miles from the existing Breinigsville 500-138-69 kV Substation in Upper Macungie Township, Lehigh County, to the existing Alburtis 500-230 kV Substation in Lower Macungie Township, Lehigh County. This proposed reinforcement will resolve the low voltage and voltage drop caused by the N-1-1 contingency described above. The proposed reinforcement also will improve the reliability of Breinigsville 500-138-69 kV Substation by providing a third 500 kV source. The existing substation currently has only two 500 kV sources: the Wescosville-Breinigsville and Breinigsville-Alburtis 500 kV Transmission lines. During maintenance scenarios when one of the two 500 kV transmission lines is taken out of service for maintenance and a fault occurs on the other 500 kV transmission line that remains in service, the entire Breinigsville 500-138-69 kV Substation would lose power. The addition of the second 500 kV circuit to the existing Breinigsville-Alburtis 500 kV Transmission Line will provide a third 500 kV source, which will avoid any interruptions during maintenance of the 500 kV transmission lines and for any N-1-1 contingency events.

The addition of the second 500 kV circuit to the existing Breinigsville-Alburtis 500 kV Transmission Line is necessary to improve reliability and operational performance, reduce the potential for and duration of outages, and increase system operability in Lehigh County. The addition of the second 500 kV circuit to the existing Breinigsville-Alburtis 500 kV Transmission Line has been presented at the PJM Mid-Atlantic Sub-Regional RTEP stakeholder meeting on April 9, 2015 and has been approved as supplemental project S0864 in the PJM RTEP.

PPL Electric is continuing to engineer and design the proposed second 500 kV circuit. As a result, the future addition of the 6-mile, second 500 kV circuit to the existing Breinigsville-Alburtis 500 kV Transmission Line is not the subject of the pending filing. The addition of the second 500 kV circuit to the existing Breinigsville-Alburtis 500 kV Transmission Line will be the subject of a future filing with the Commission, which PPL Electric anticipates filing in 2018.

In this filing, PPL Electric is only seeking Commission approval to re-terminate the first span of the existing Breinigsville-Alburtis 500 kV Transmission Line at the Alburtis 500-230 kV Substation in Lower Macungie Township, Lehigh County. In order to add the second 500 kV circuit to the existing Breinigsville-Alburtis 500 kV Transmission Line, one span of conductors for the existing line needs to be moved from their current position in Bay 1 to Bay 2. Upon completion, the existing 500 kV circuit will terminate into Bay 2 and the future second 500 kV circuit will terminate into Bay 1 when it is constructed.

Due to a difference in the positions of Bay 1 and Bay 2, this realignment involves replacing one span of conductors with new, slightly longer 500 kV conductors that will extend approximately 200 feet from the dead end structure to the new Bay 2 position. The realignment will remain on property owned in fee by PPL Electric and will not require any additional land.

A typical one-line diagram and map of the proposed Project are provided as **Figure 1-3** and **Figure 1-4**, respectively.

Outages at the Alburtis 500-230 kV Substation are currently scheduled to begin in late September 2017. In order to coordinate with the scheduled outages, PPL Electric plans to complete the substation work necessary at the Alburtis 500-230 kV Substation during these outages. PPL Electric therefore proposes to re-terminate the first span of the existing Breinigsville-Alburtis 500 kV Transmission Line at the Alburtis 500-230 kV Substation during the scheduled outages. PPL Electric herein requests Commission approval to re-terminate one span of the existing Breinigsville-Alburtis 500 kV Transmission Line at the Alburtis 500-230 kV Substation as explained above.

As explained above, PPL Electric is currently sharing a control cubicle in the Alburtis 500-230 kV Substation with FirstEnergy. An additional benefit of the proposed Project is that PPL Electric will be able to separate its relay and control equipment at the Alburtis 500-230 kV Substation from the control cubicle currently shared with FirstEnergy, which is consistent with industry practice.

Figure 1-1 - Existing 500 kV Configuration

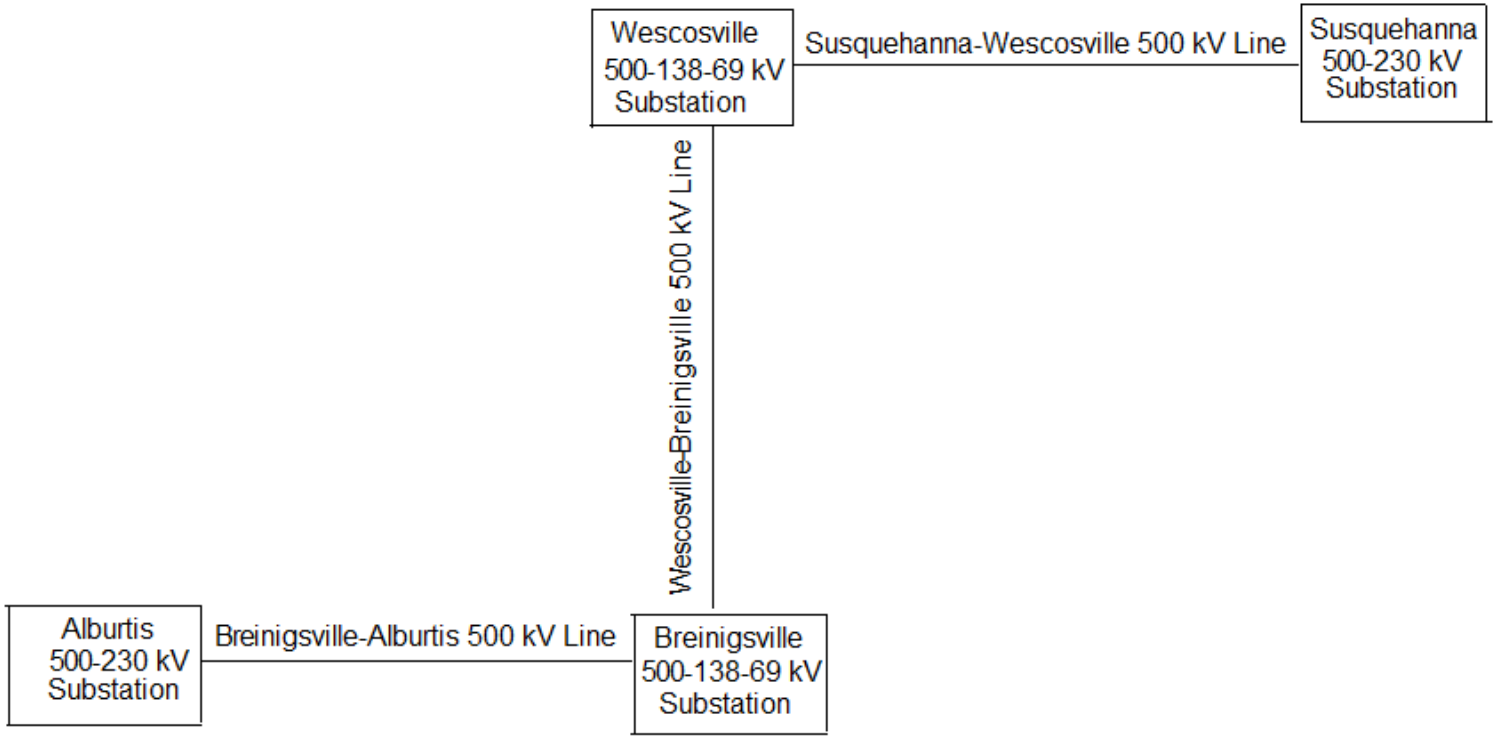
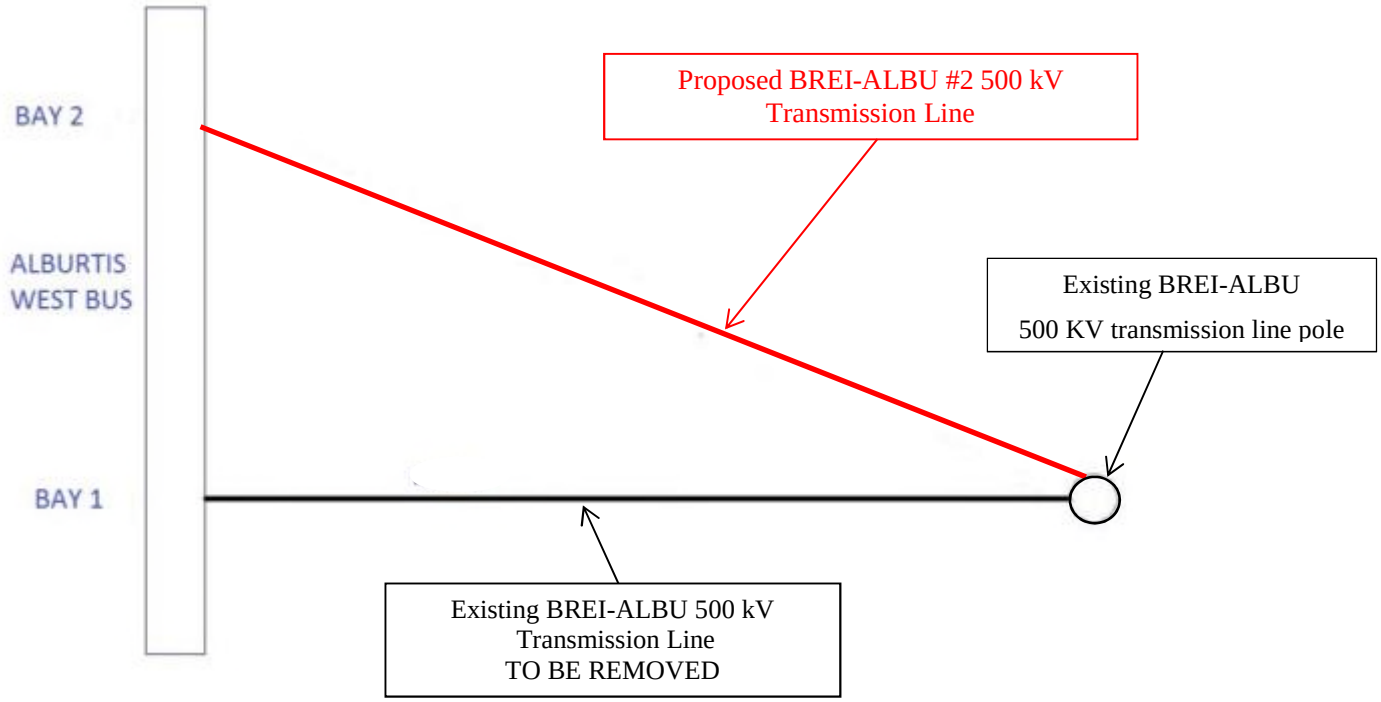


Figure 1-2 - Existing System Map

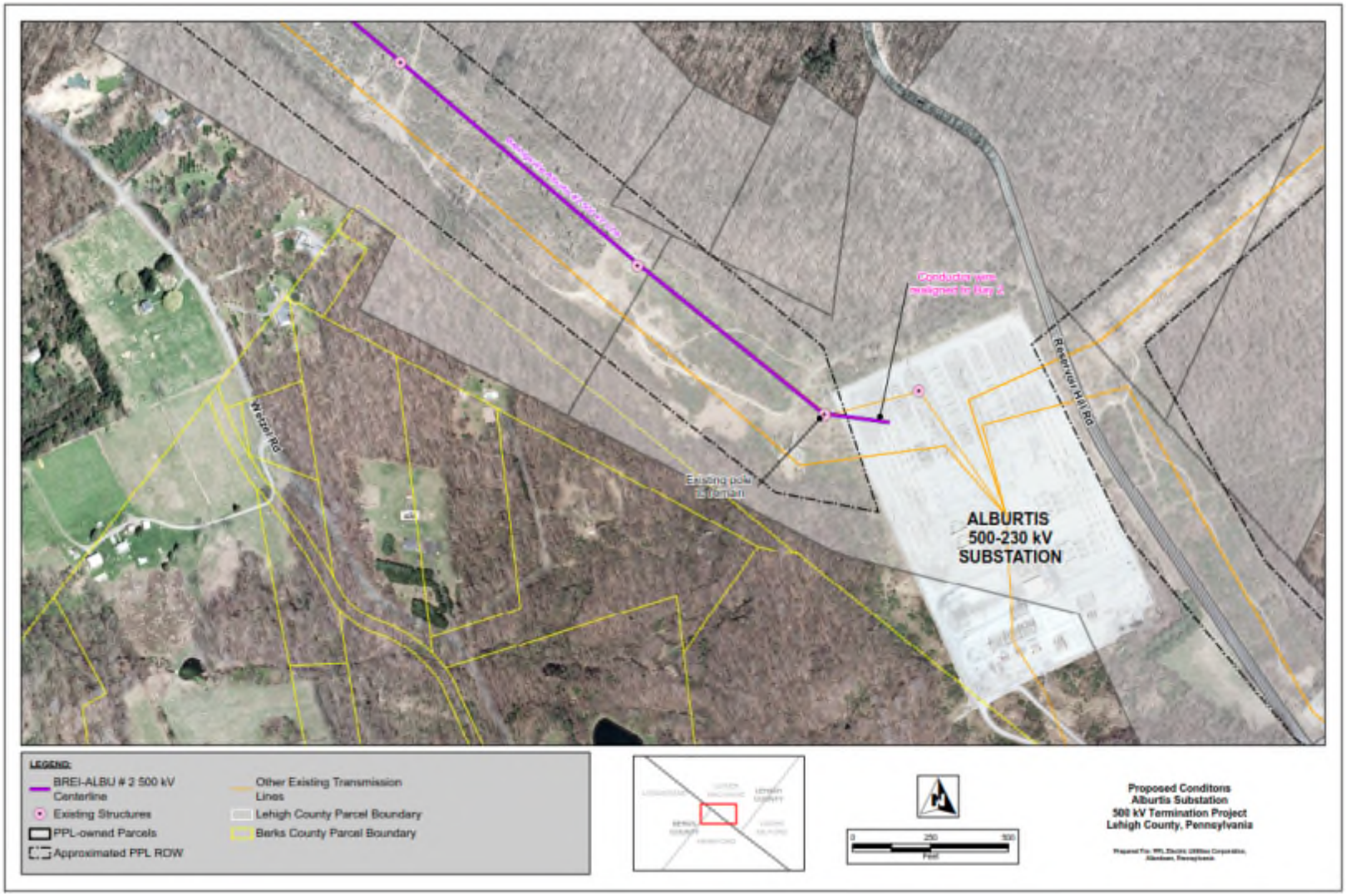
Figure 1-3 - Existing/Proposed 500 kV Termination Configuration



 - **Substation Symbol**

 - **Pole Symbol**

Figure 1-4 - System Map of Proposed 500 kV Termination Configuration



ATTACHMENT 2

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List of Tables

List of Figures

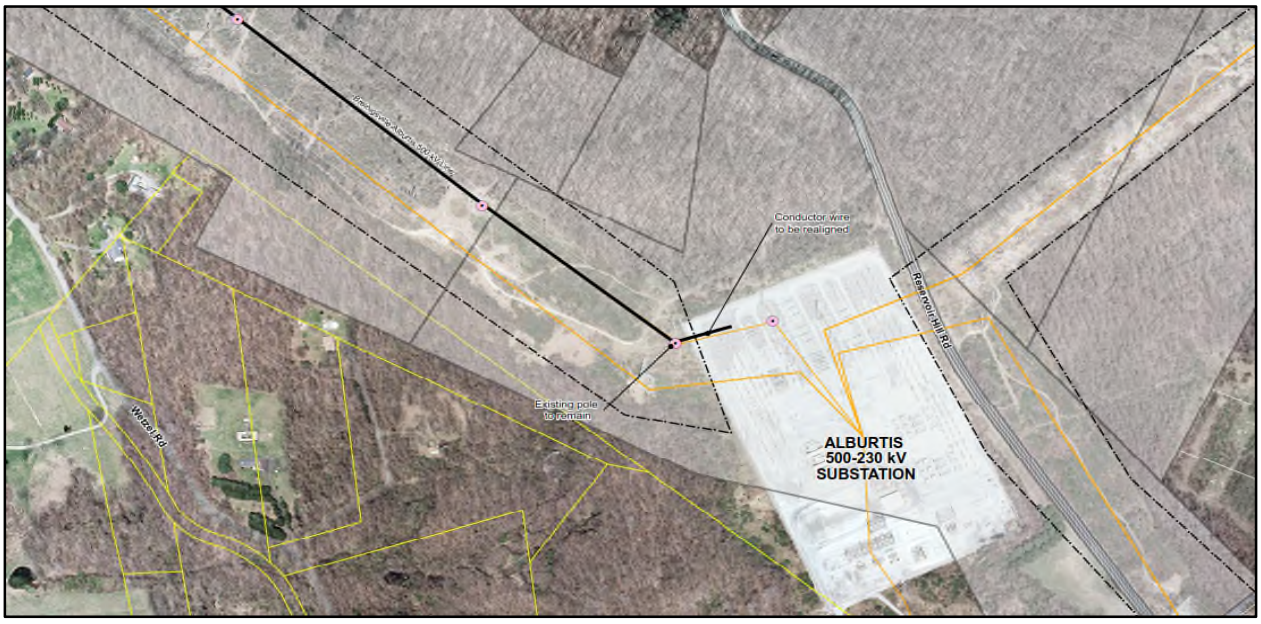
1.0 INTRODUCTION

As explained in **Attachment 1**, PPL Electric Utilities Corporation ("PPL Electric") is requesting Pennsylvania Public Utility Commission ("PUC" or "the Commission") approval re-terminate one span of the Breinigsville-Alburtis 500 kV Transmission Line from Bay 1 into Bay 2 at the existing Alburtis 500-230 kV Substation in Lower Macungie Township, Lehigh County (the "Project"). The proposed Project is being carefully planned to coordinate with and take advantage of outages scheduled at the Alburtis 500-230 kV Substation beginning in September 2017.

2.0 DESCRIPTION OF THE PROPOSED 500 kV CONDUCTOR AND ALIGNMENT

As explained in **Attachment 1**, the Project will involve the realignment of one span of new 500 kV conductors that will extend approximately 200 feet from the dead end structure to the new Bay 2 position at the Alburtis 500-230 kV Substation (**Figure 2-1**). Due to a difference in the positions of Bay 1 and Bay 2, the existing conductors will be replaced with new, slightly longer conductors. No additional poles or tower structures are required for this Project. As described in **Attachment 3**, the Project will be constructed entirely within PPL Electric-owned property. No new additional right-of-way will be required.

FIGURE 2-1: Alburtis 500-230 kV Substation 500 kV Transmission Line



The approximately 200-foot segment of new 500 kV conductors will utilize three power conductors and one overhead ground wire. The power conductors will be 3 phases of double bundle 2493 kcmil,[1] 54/37 stranding aluminum conductor alloy reinforced ("ACAR") conductors. The overhead ground wire will be a 19#9 Alumoweld wire with a diameter of 0.572 inches.

The new 500 kV conductor wire will be installed to meet, and generally exceed, National Electrical Safety Code ("NESC") minimum standards. Design specifications and safety rules practiced by PPL Electric are included in **Attachment 4**. The designed minimum conductor clearances and conductor thermal ratings are set forth in **Table 2-1** and **Table 2-2** below.

TABLE 2-1: DESIGN MINIMUM 500 kV CONDUCTOR CLEARANCES*

Condition	Line Design Clearance-to-Ground
Normal load; average weather (16°C ambient temperature)	79.6 feet
Predicted extreme thermal load (100°C conductor temperature)	76.1 feet
Predicted PPL Extreme wind load (100 mph, 16°C)	79.6 feet
Predicted extreme weather conditions (1.5 inch ice, 0 lbs. wind, 0°C)	77.7 feet
*Clearances based on a maximum tension of 17,400 pounds at 1.25 inch ice, 0º F, 0# wind	

*Based on 2493 kcmil 54/37 stranding ACAR

[1] A kcmil is a thousand circular mils. A circular mil is the cross-sectional area of a wire 1 mil in diameter, where 1 kcmil = 0.5067 square millimeters.

TABLE 2-2: 500 kV CONDUCTOR THERMAL RATING*

Condition	Ambient Temperature °C	Wind Speed ft/sec	Ampacity Amps
Summer Normal	35	0	3394
Winter Normal	10	0	4178
Summer Emergency	35	2.533	4310
Winter Emergency	10	2.533	5108

*Based on double bundle 2493 kcmil 54/37 stranding ACAR (212°F) 100°C Maximum Conductor Temperature

3.0 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 efforts 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 to have a ground clearance that is at a minimum five feet higher than NESC standards. Because the 500 kV line will be a single-circuit, it cannot be reverse-phased.

ATTACHMENT 3

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List of Figures

1.0 INTRODUCTION

As explained in **Attachment 1**, PPL Electric Utilities Corporation ("PPL Electric") is requesting Pennsylvania Public Utility Commission ("PUC" or "the Commission") approval re-terminate one span of the Breinigsville-Alburtis 500 kV Transmission Line from Bay 1 into Bay 2 at the existing Alburtis 500-230 kV Substation in Lower Macungie Township, Lehigh County (the "Project"). The proposed Project is being carefully planned to coordinate with and take advantage of outages scheduled at the Alburtis 500-230 kV Substation beginning in September 2017.

2.0 DESCRIPTION OF THE RIGHT-OF-WAY

The proposed Project will extend for approximately 200 hundred feet from an existing transmission line dead-end structure (PPL Grid Number 60206S42601) located adjacent to the Alburtis 500-230 kV Substation into a new Bay 2 position at the substation. The entire extent of the proposed Project, as explained in **Attachment 2**, will be located on property that is owned in fee by PPL Electric. **Figure 3-1** is an aerial map that depicts the location of the proposed Project.

3.0 LAND USE

Evaluation of existing land uses in the Project area focused on the PPL Electric owned parcel on which the Alburtis 500-230 kV Substation is located and adjacent lands. Land uses were determined based on review of the 2011 National Land Cover Data ("NLCD").

Assessment of the data shows that the industrial based Alburtis 500-230 kV Substation is the dominant land use, accounting for over 60% of the review area. Adjacent forested areas account for approximately 25% of the area and the shrub/grass dominated open lands under the existing transmission lines account for another 15% of the land use.

Impacts to land use to complete the Project are anticipated to be minimal because the work will be conducted in the open areas under the existing transmission line or within the Alburtis 500-230 kV Substation.

State and Conserved Lands

No State-owned lands are located in the Project area.

Airports

The Lehigh Valley International Airport is located approximately 14.7 miles northeast of the Alburtis 500-230 kV Substation. PPL Electric does not anticipate any interference with airport operations because the Project will not involve the development of any new transmission structures.

Cultural Resources

No cultural resources are located in the Project area.

4.0 ENVIRONMENTAL FACTORS

Environmental factors reviewed for the Project included unique natural features, soils, waterways, wetlands, 100-year floodplains, vegetation, and threatened and endangered species.

Unique Natural Features

No unique geological, scenic, or natural areas are located within the Project review area.

Soils

No earth disturbance is anticipated for the Project, thus no erosion and sedimentation control plans will be developed.

Waterways

Based on review of U.S. Geological Survey ("USGS") maps, no waterways are located in the Project area.

Wetlands

Based on review of the U.S. Fish and Wildlife Service's ("USFWS") National Wetlands Inventory ("NWI"), no wetlands are located in the Project area.

100-year Floodplains

The National Flood Hazard Layer ("NFHL") for Pennsylvania was obtained through the Pennsylvania Spatial Data Access ("PASDA") database and analyzed for 100-year floodplains within the Project area and surrounding landscape. No Federal Emergency Management Agency ("FEMA") floodplains are located in the Project area.

Vegetation

Vegetative cover surrounding the Project area is composed of second growth hardwood forest that includes oaks, maples, and hickories. The maintained area under the transmission lines consists of herbaceous plants and shrubs that are compatible with the overhead transmission line.

Limited vegetation management required to complete the Project may include clearing branches located along the access roads or shrubs in the immediate area between the existing dead-end structure (PPL Grid Number 60206S42601) and the Alburtis 500-230 kV Substation. In areas where vegetation management is required, PPL Electric will apply its "*Specifications for Transmission Vegetation Management LA-79827*" to minimize any potential impacts.

Threatened and Endangered Species

A review of the threatened and endangered species that may be located in the Project area was not conducted as the proposed activity will not involve any earth disturbance and only minimal vegetation management.

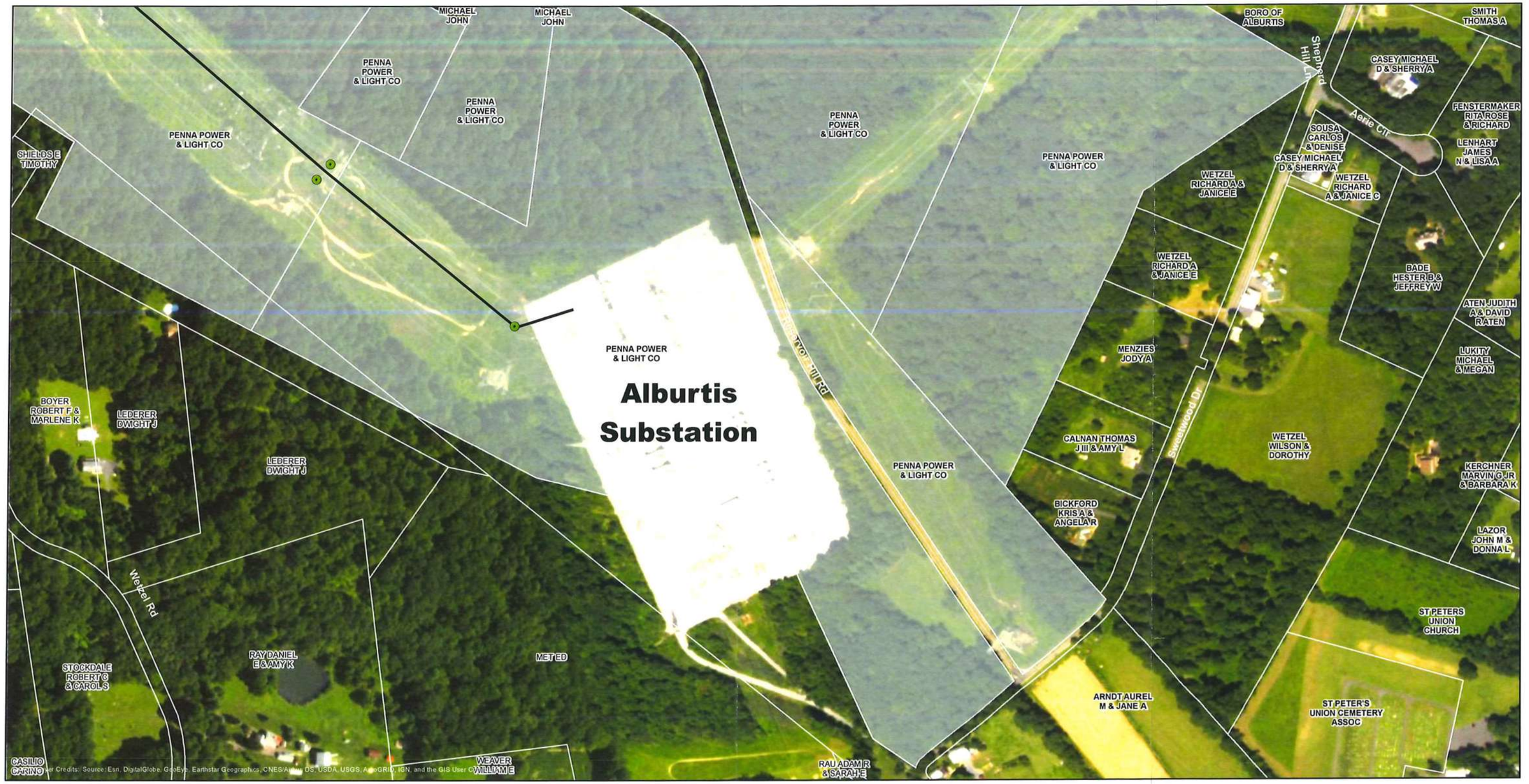
Natural Areas Inventory

The *Natural Areas Inventory for Lehigh County*, prepared by the Pennsylvania Natural Heritage Program ("PNHP"), noted that none of these potentially sensitive areas are located near the Project.

PNDI Review

A Pennsylvania Natural Diversity Inventory ("PNDI") review was not completed for the Project due to the minimal environmental impacts anticipated and further because no state permits are required for the Project.

FIGURES



Legend

- Exisitng Structures
- Existing Transmission Line Centerline
- County Parcel Boundary
- PPL-owned Parcels

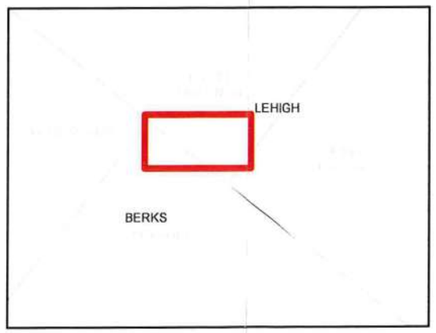
Notes

- Existing Project Centerline and Existing Poles digitized from files recieved from PPL in June 2014.

NAD 1983 State Plane
Pennsylvania North FIPS 3701
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
World Imagery Basemap (ESRI)
Lehigh Parcel Data (2013)
Berks Parcel Data (2010)

0 150 300 600
Feet
1 inch = 300 feet



AECOM

Figure 3-1: Aerial Overview Map
Alburtis Substation
500 kV Termination Project

Lehigh County, Pennsylvania

PPL Electric Utilities
Allentown, Pennsylvania

Prepared By: NB/BF	Checked By: DY
Job: Susquehanna-Jenkins	Date: 4/4/2017

ATTACHMENT 4

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1.0 DESIGN CONSIDERATIONS

The new transmission line will be designed according to, and generally exceed, all NESC minimum standards. The 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 has developed design specifications and safety rules which meet or surpass all requirements specified by the NESC.

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; 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 increased safety factors.

Another example is the design parameters utilized to account for ice and wind loadings on the wires and structure. The conductor sags and tensions along with the structure loading used in line designs are the result of various ice and wind combinations, PPL transmission lines are designed to exceed NESC requirements with additional load cases to account for various ice and wind loading conditions not required by NESC. 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.

TABLE 4-1: 69 kV Vertical Clearance to Ground

Surface Underneath Conductors	NESC Standard Clearance	Minimum Conductor Clearances
Roads, streets, alleys	19.2 Ft.	30 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	19.2 Ft.	30 Ft.
Spaces accessible to pedestrians only	15.2 Ft.	30 Ft.
Railroad tracks	27.2 Ft.	31.5 Ft.

TABLE 4-2: 138 kV Vertical Clearance to Ground

Surface Underneath Conductors	NESC Standard Clearance	Minimum Conductor Clearances
Roads, streets, alleys	20.6 Ft.	31 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	20.6 Ft.	31 Ft.
Spaces accessible to pedestrians only	16.6 Ft.	31 Ft.
Railroad tracks	28.6 Ft.	35 Ft.

TABLE 4-3: 230 kV Vertical Clearance to Ground

Surface Underneath Conductors	NESC Standard Clearance	Minimum Conductor Clearances
Roads, streets, alleys	22.4 Ft.	33 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	22.4 Ft.	33 Ft.
Spaces accessible to pedestrians only	18.4 Ft.	33 Ft.
Railroad tracks	30.4 Ft.	35 Ft.

TABLE 4-4: 500 kV Vertical Clearance to Ground

Surface Underneath Conductors	NESC Standard Clearance	Minimum Conductor Clearances
Roads, streets, alleys	28.4 Ft.	40 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	28.4 Ft.	40 Ft.
Spaces accessible to pedestrians only	24.4 Ft.	40 Ft.
Railroad tracks	36.4 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.

2.0 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 patrols as needed. A number of helicopter patrols are performed on all lines annually depending on voltage level. 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.

3.0 PERSONNEL SAFETY RULES

Overall PPL designs and constructs projects with high regards to public safety and follows or exceeds all codes and requirements.

The following are a few of the PPL Electric safety rules that demonstrate the Company's concern for employee and contractor 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.

o The red tag may be removed only after proper authorization to energize the equipment.

o Various other tags are used for limited operations and informational purposes.

o Employees or contractors 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 lineman 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.

- 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.
- 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.

4.0 MAGNETIC FIELD MANAGEMENT PLAN

PPL Electric's Magnetic Field Management Program is applied to new and reconstructed transmission line projects. In order to lower magnetic field exposures, the program generally prescribes the use of a line design that provides ground clearances higher than the required minimum NESC ground clearance and reverse phasing of new double circuit lines where it is feasible to do so at low or no cost. The implementation of additional modifications to reduce magnetic field levels, are considered, provided those modifications can be made at low or no cost and will not interfere with the operation of the line.

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VERIFICATION

I, David Gladey being the Director of Asset Management 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: 8/3/17